US012391500B2

(12) **United States Patent**
Namiki et al.

(10) **Patent No.: US 12,391,500 B2**
(45) **Date of Patent: Aug. 19, 2025**

(54) **MEDIUM FEEDING DEVICE AND IMAGE READING APPARATUS**

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(73) Assignee: **Seiko Epson Corporation**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 164 days.

(21) Appl. No.: **18/354,411**

(22) Filed: **Jul. 18, 2023**

(65) **Prior Publication Data**

US 2024/0025685 A1 Jan. 25, 2024

(30) **Foreign Application Priority Data**

Jul. 19, 2022 (JP) 2022-114810

(51) **Int. Cl.**
B65H 9/06 (2006.01)
B65H 3/34 (2006.01)
B65H 3/56 (2006.01)

(52) **U.S. Cl.**
CPC ***B65H 9/06*** (2013.01); ***B65H 3/34*** (2013.01); ***B65H 3/56*** (2013.01); *B65H 2301/331* (2013.01); *B65H 2301/42262* (2013.01); *B65H 2801/39* (2013.01)

(58) **Field of Classification Search**
CPC B65H 9/06; B65H 3/34; B65H 3/56
See application file for complete search history.

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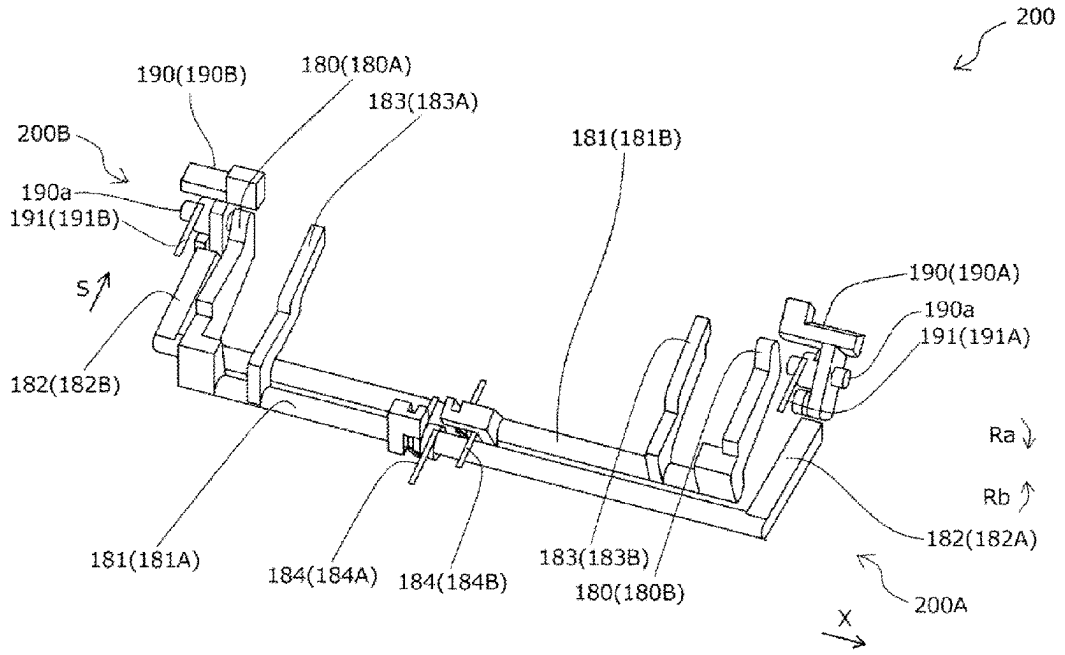
Primary Examiner — Patrick Cicchino
(74) *Attorney, Agent, or Firm* — WORKMAN NYDEGGER

(57) **ABSTRACT**

The medium feeding device includes a skew correction mechanism including a first lever member and a second lever member displaceable between an advanced position contactable with a document and a retracted position retracted from a transport path, and a first load member and a second load member displaceable between a blocking position at which a part of the transport path in a width direction is blocked and an opening position at which the transport path is opened without being blocked, and the first load member and the second load member overlap at least a part of a transport roller when seen in the width direction when they are located at the blocking position.

12 Claims, 26 Drawing Sheets



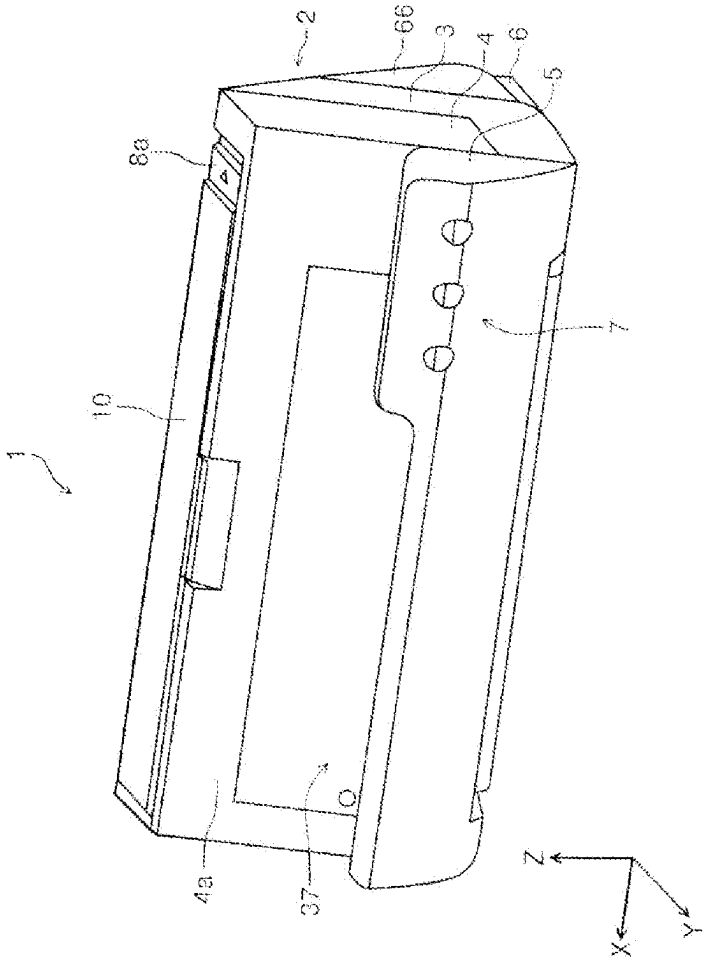


FIG. 1

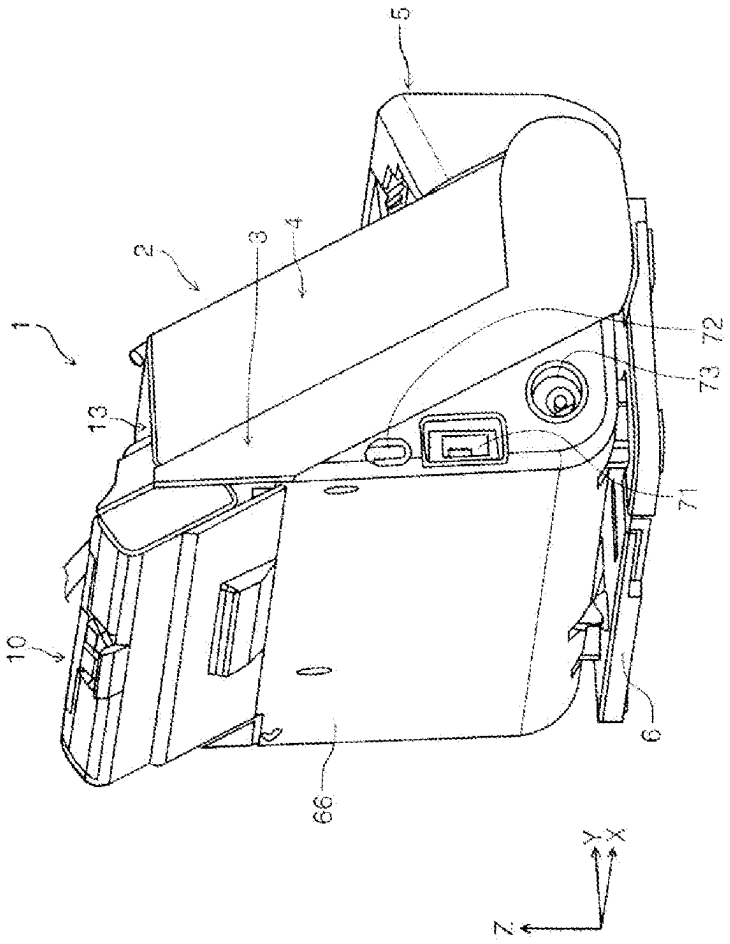


FIG. 2

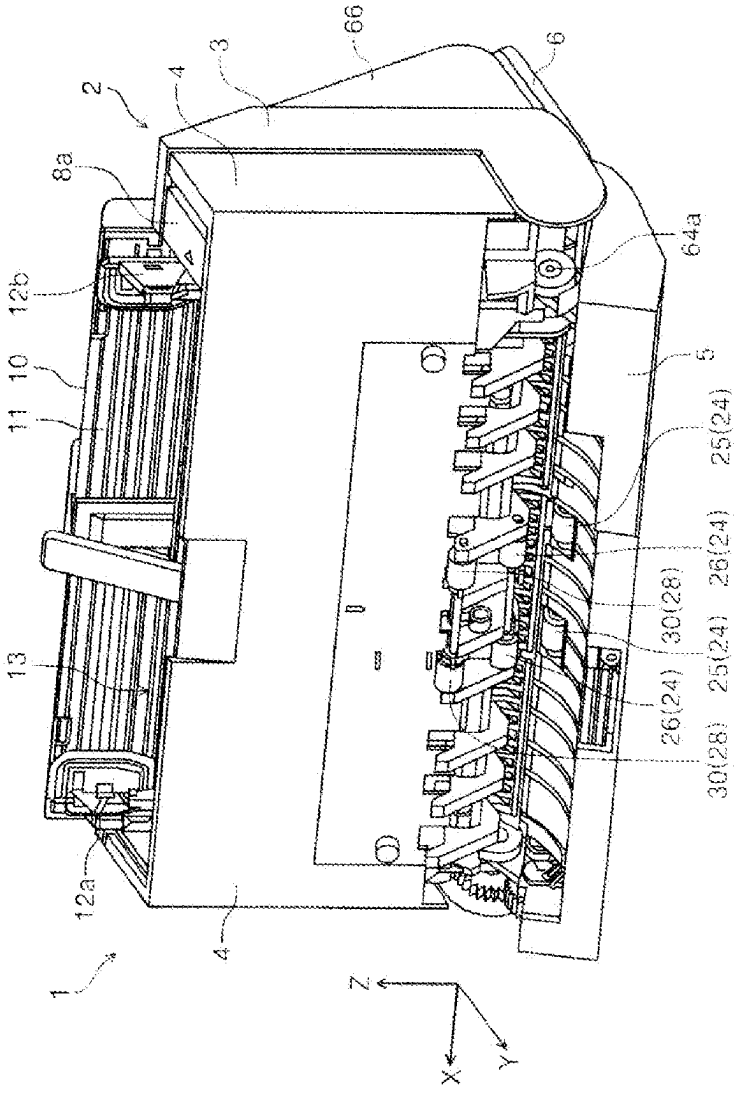
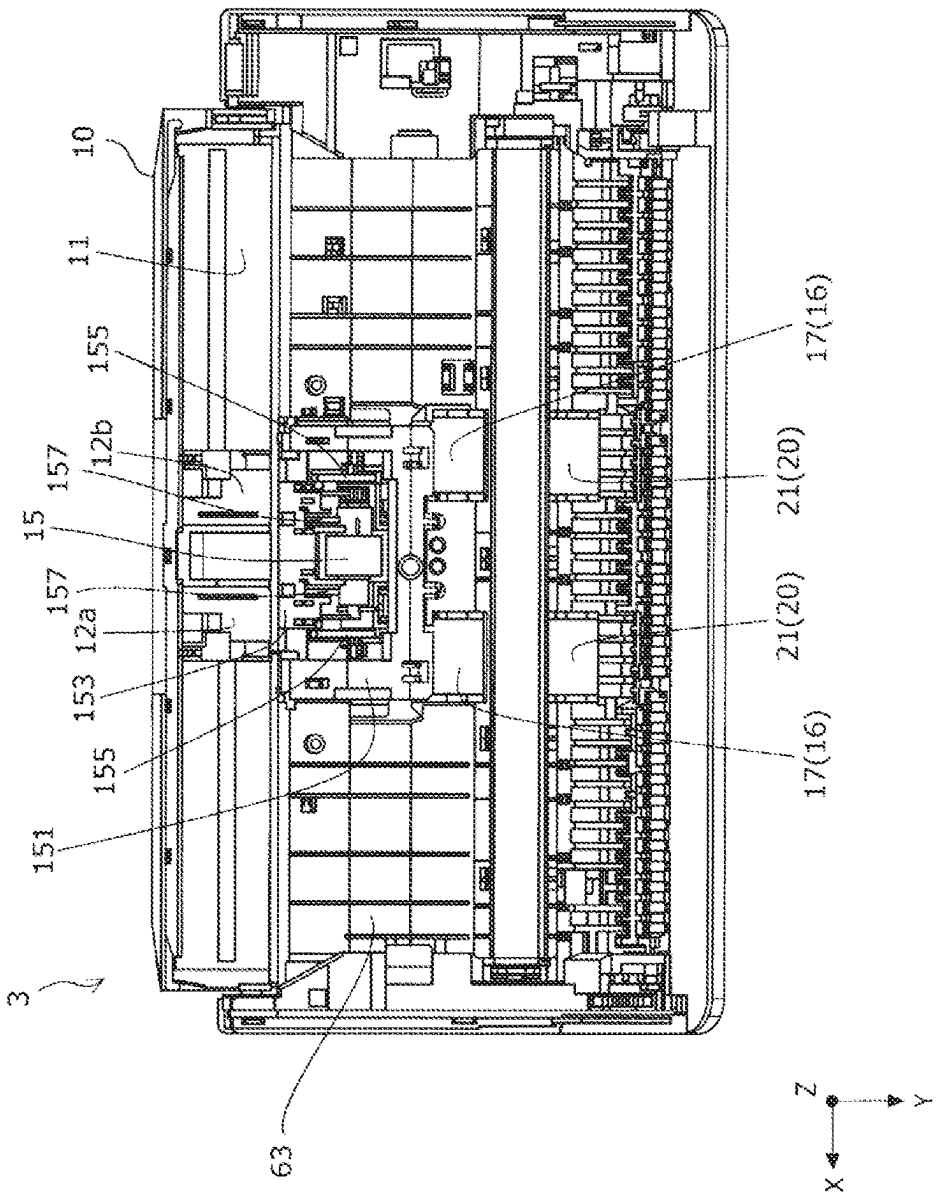


FIG. 3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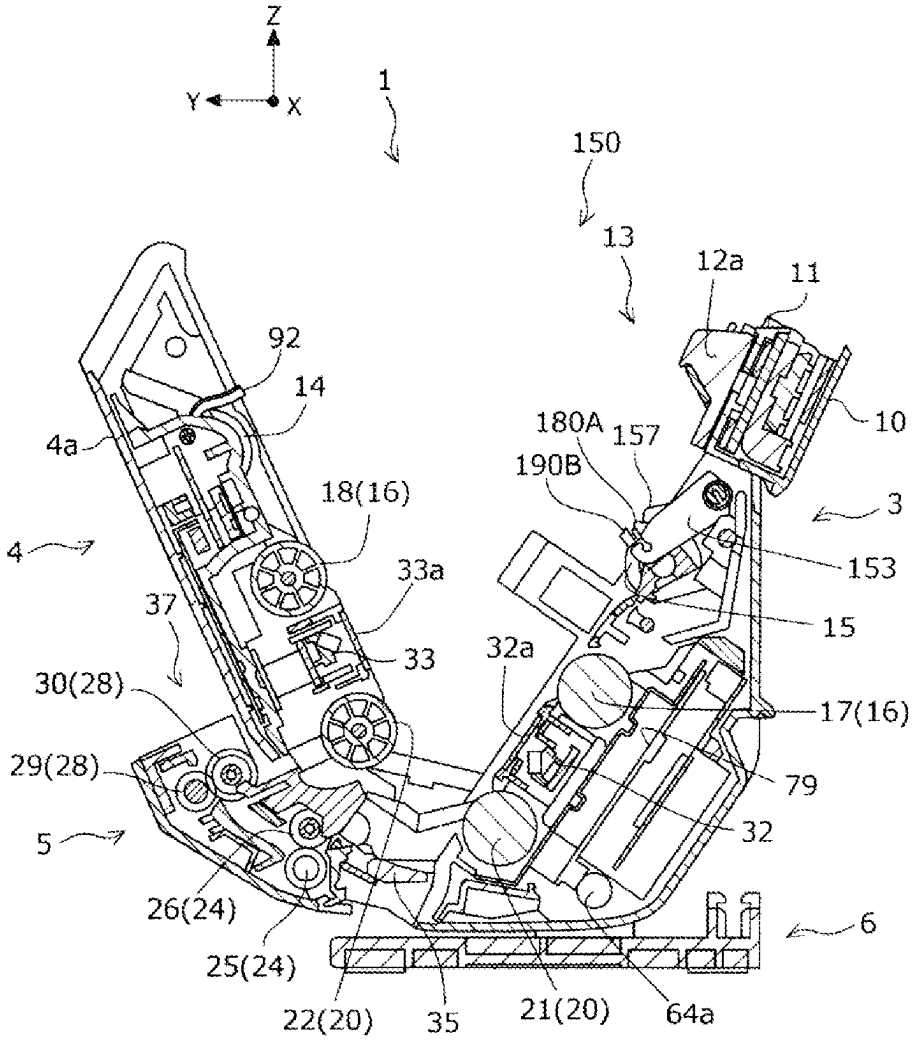
11
155
157
12b
15
157
12a
153
155
151
3
63
17(16)
21(20)
21(20)
17(16)
Z
Y
X

FIG. 4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Y
X
1
150
13
12a
11
92
14
4a
180A
157
10
190B
18(16)
3
4
153
33a
37
15
33
32a
30(28)
17(16)
29(28)
79
32
5
26(24)
6
25(24)
22(20)
35
21(20)
64a

FIG. 5

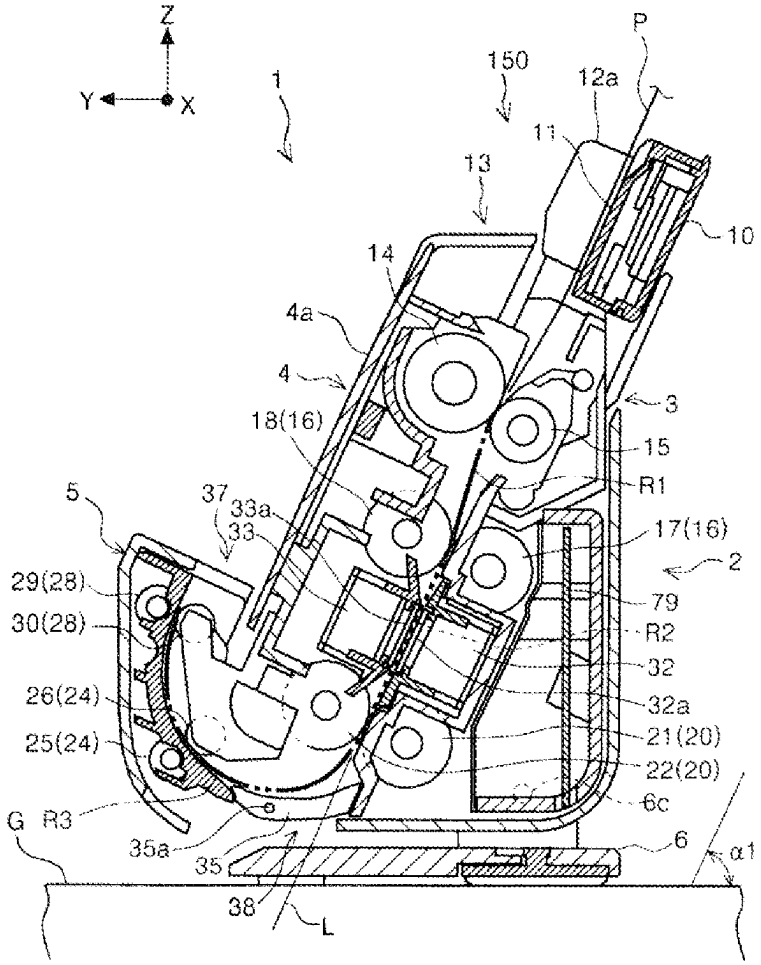
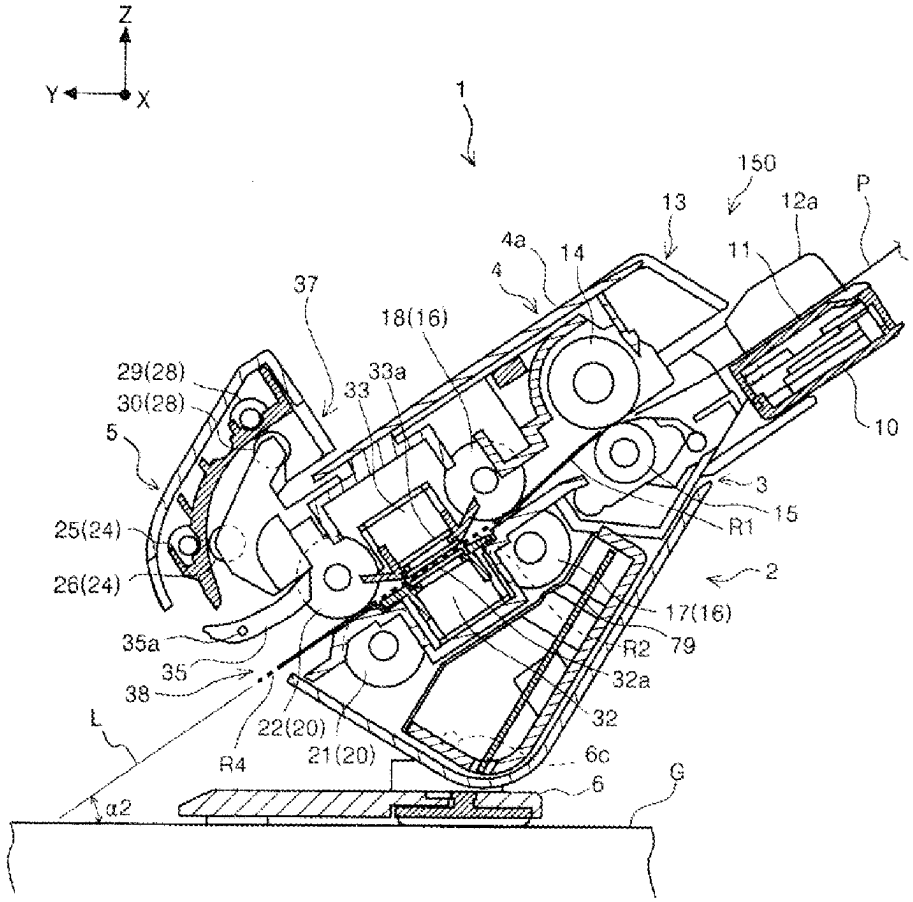

Z
Y
X
1
150
P
12a
11
13
10
14
4a
4
3
18(16)
15
R1
5
37
33a
33
17(16)
2
29(28)
79
30(28)
R2
32
26(24)
32a
25(24)
21(20)
22(20)
6c
G
R3
35a
6
α1
35
38
L

FIG. 6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Y
X
1
150
13
12a
P
4a
14
11
4
37
18(16)
29(28)
30(28)
33
33a
5
10
3
15
R1
25(24)
26(24)
2
17(16)
35a
R2
79
35
32a
38
32
L
22(20)
21(20)
6c
R4
6
G
α2

FIG. 7

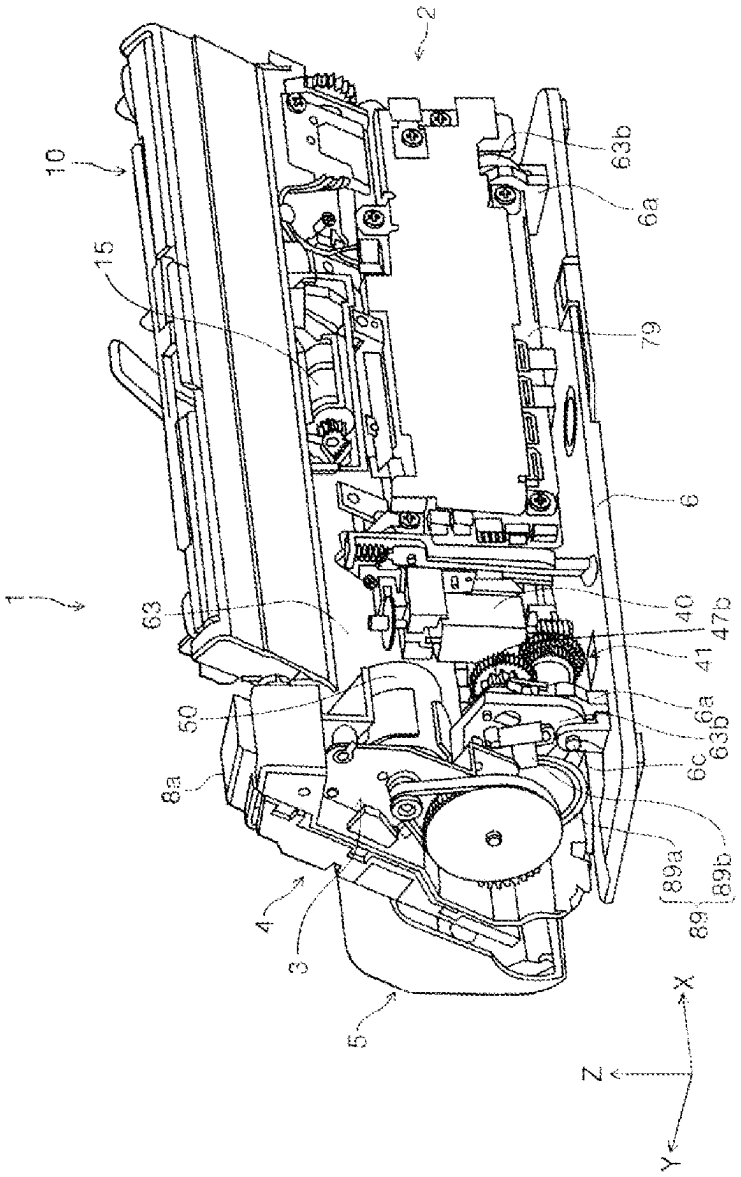


FIG. 8

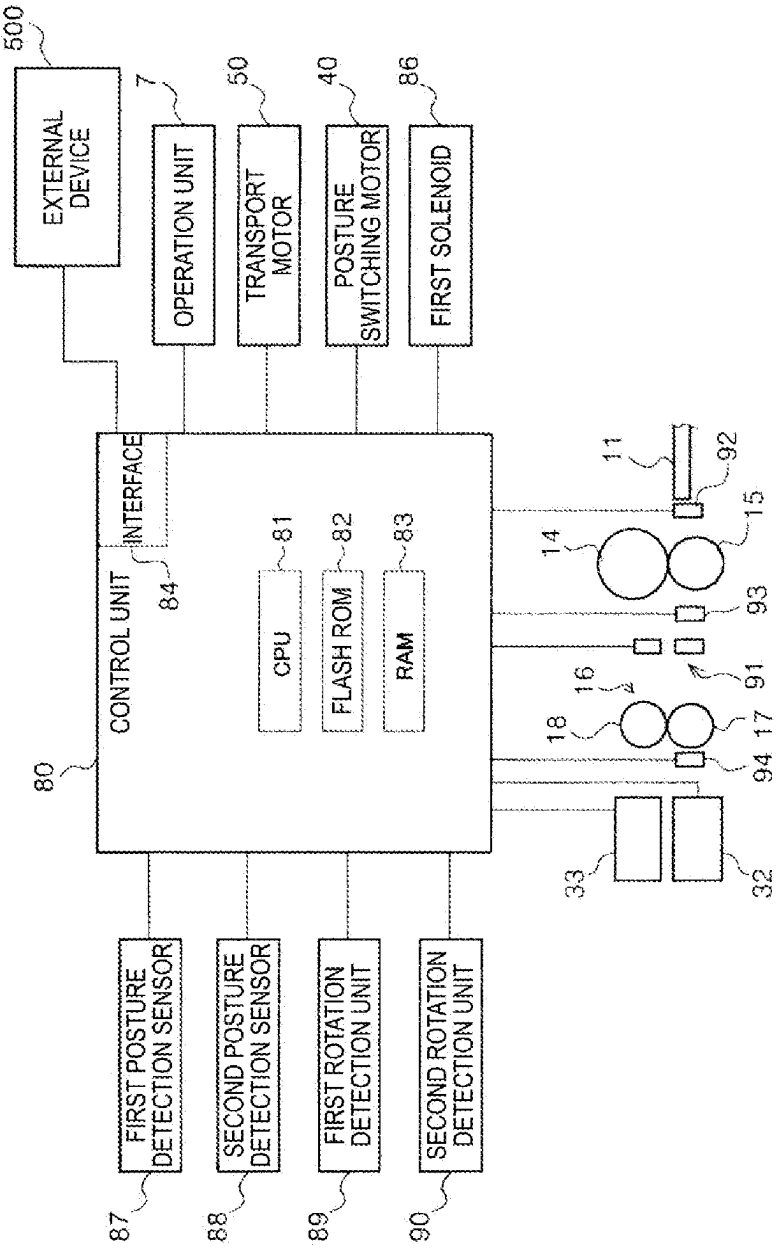

500
EXTERNAL DEVICE
7
OPERATION UNIT
50
TRANSPORT MOTOR
40
POSTURE SWITCHING MOTOR
86
FIRST SOLENOID
80
CONTROL UNIT
INTERFACE
84
CPU
81
FLASH ROM
82
RAM
83
11
92
15
14
93
91
16
18
17
94
33
32
FIRST POSTURE DETECTION SENSOR
87
SECOND POSTURE DETECTION SENSOR
88
FIRST ROTATION DETECTION UNIT
89
SECOND ROTATION DETECTION UNIT
90

FIG. 9

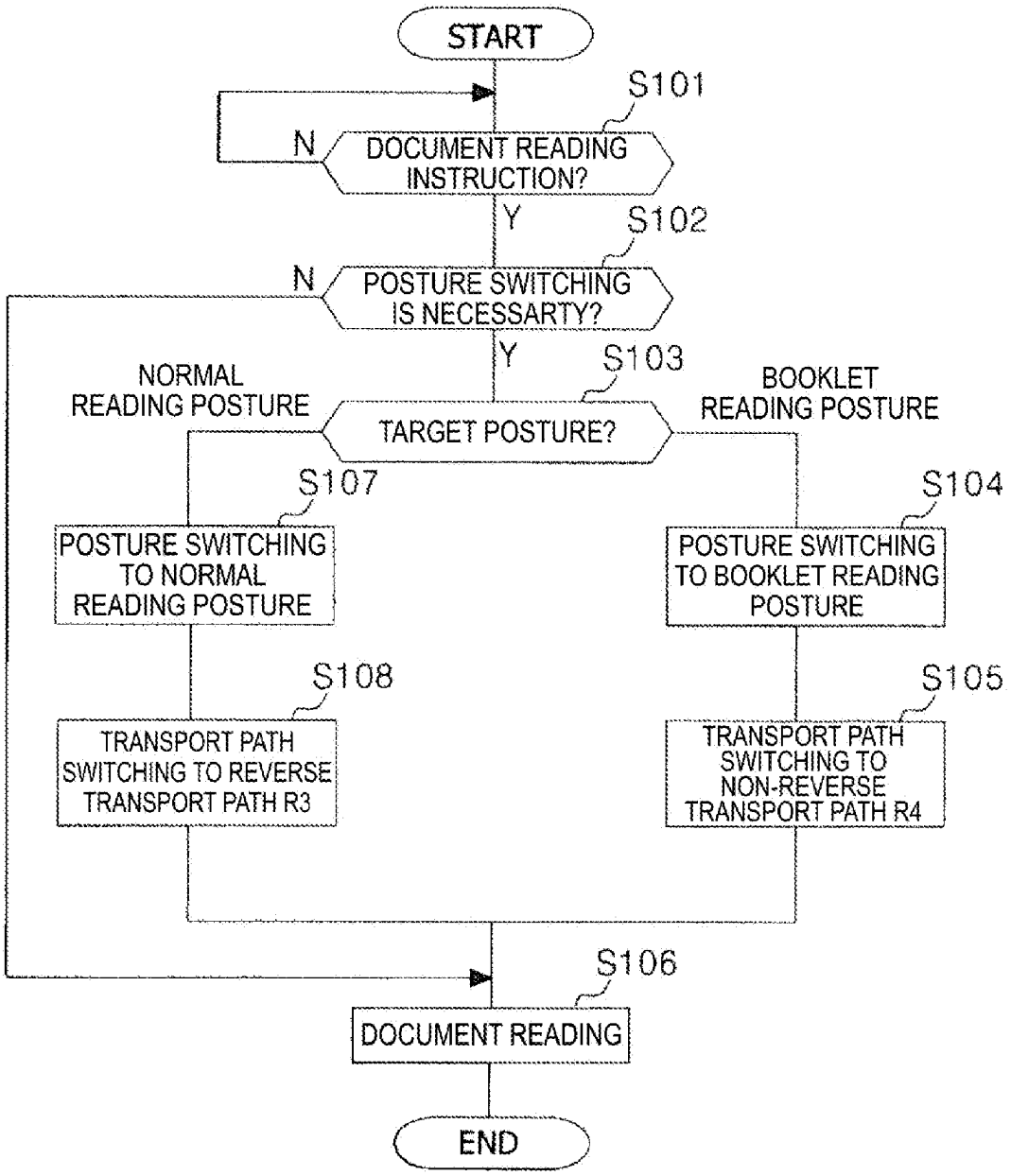
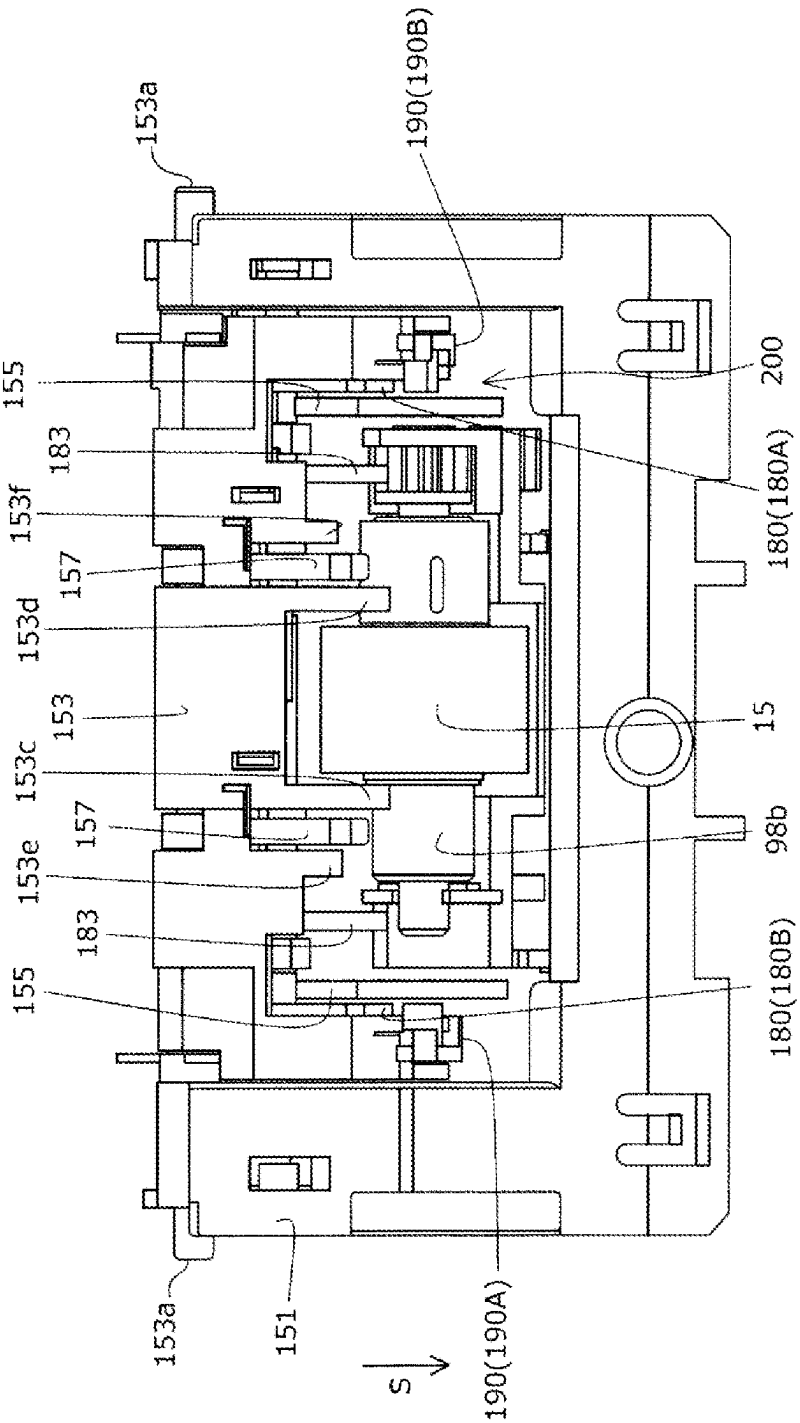

START
S101
N
DOCUMENT READING INSTRUCTION?
Y
S102
N
POSTURE SWITCHING IS NECESSARTY?
Y
S103
NORMAL READING POSTURE
TARGET POSTURE?
BOOKLET READING POSTURE
S107
POSTURE SWITCHING TO NORMAL READING POSTURE
S104
POSTURE SWITCHING TO BOOKLET READING POSTURE
S108
TRANSPORT PATH SWITCHING TO REVERSE TRANSPORT PATH R3
S105
TRANSPORT PATH SWITCHING TO NON-REVERSE TRANSPORT PATH R4
S106
DOCUMENT READING
END

FIG. 10


153a
190(190B)
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183
153f
157
153d
153
153c
157
153e
183
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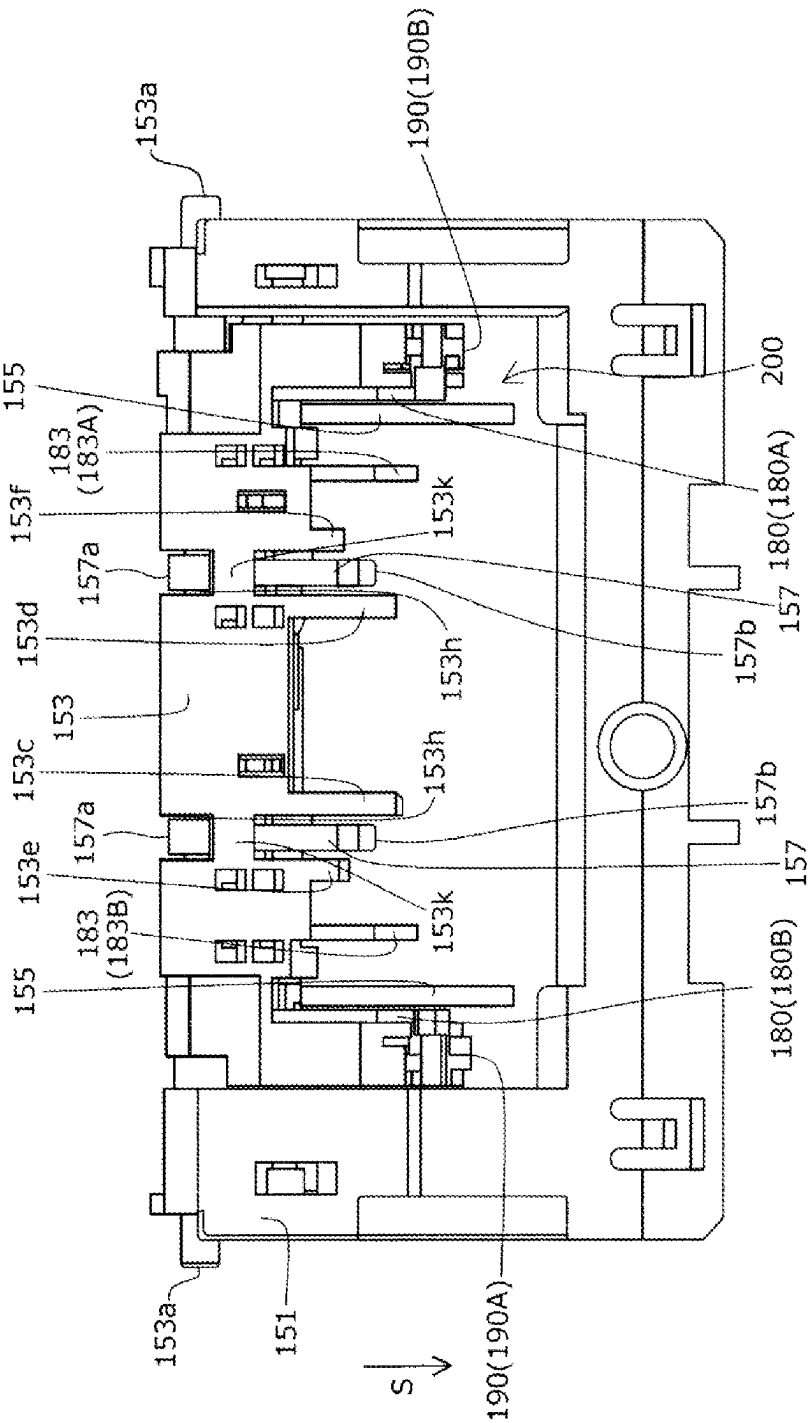
151
190(190A)
S
200
180(180A)
15
98b
180(180B)
X

FIG. 11


153a
190(190B)
155
183
(183A)
153F
153k
157a
153d
153h
153
153c
153h
157a
157b
153e
157
183
(183B)
153k
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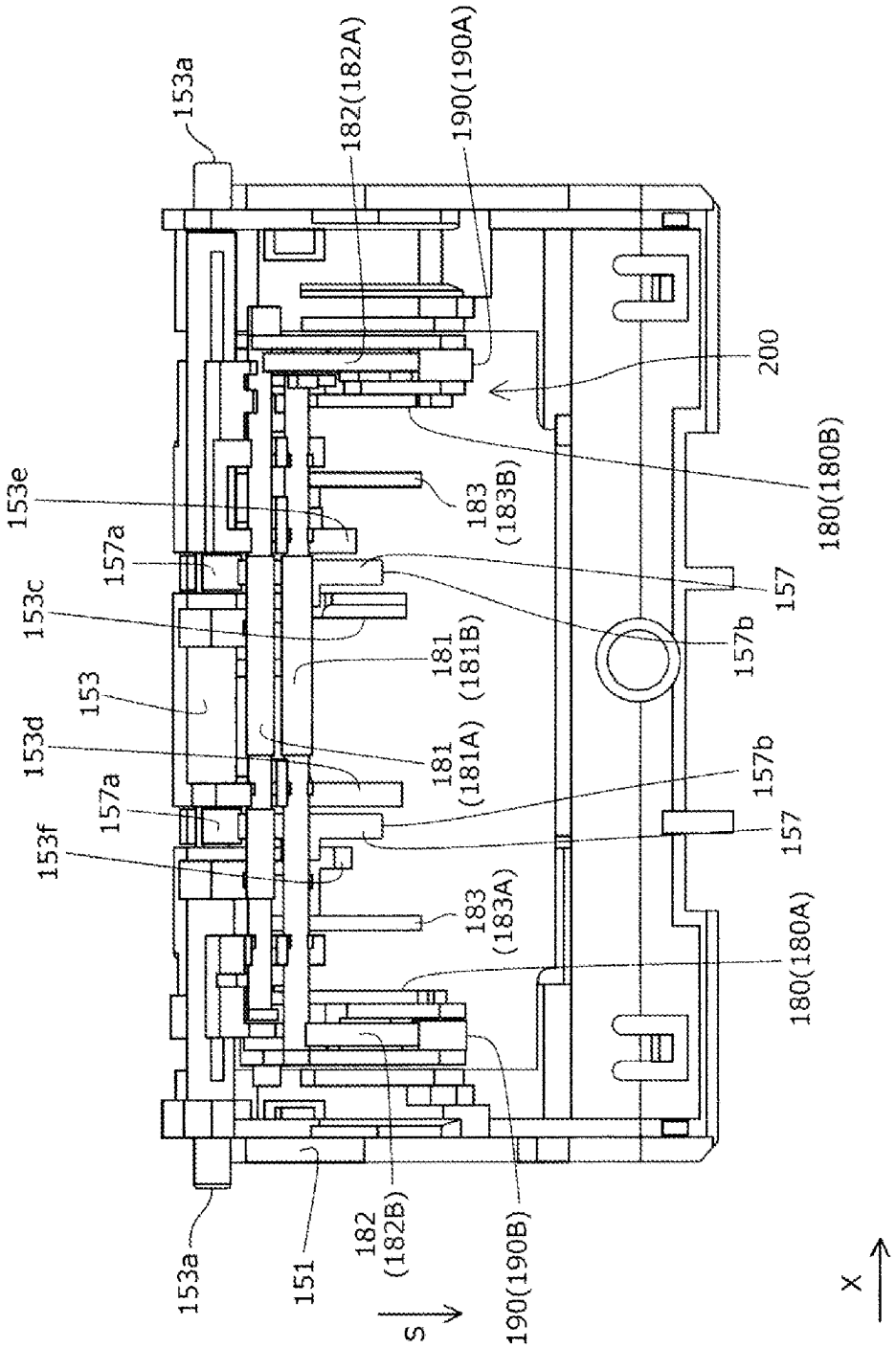
180(180B)
153a
151
190(190A)
S
200
180(180A)
157
157b
X

FIG. 12


153a
182(182A)
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200
180(180B)
153e
183
(183B)
157a
157
153c
157b
181
(181B)
153
153d
181
(181A)
157b
157a
157
153f
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(183A)
180(180A)
153a
151
182
(182B)
190(190B)
S
X

FIG. 13

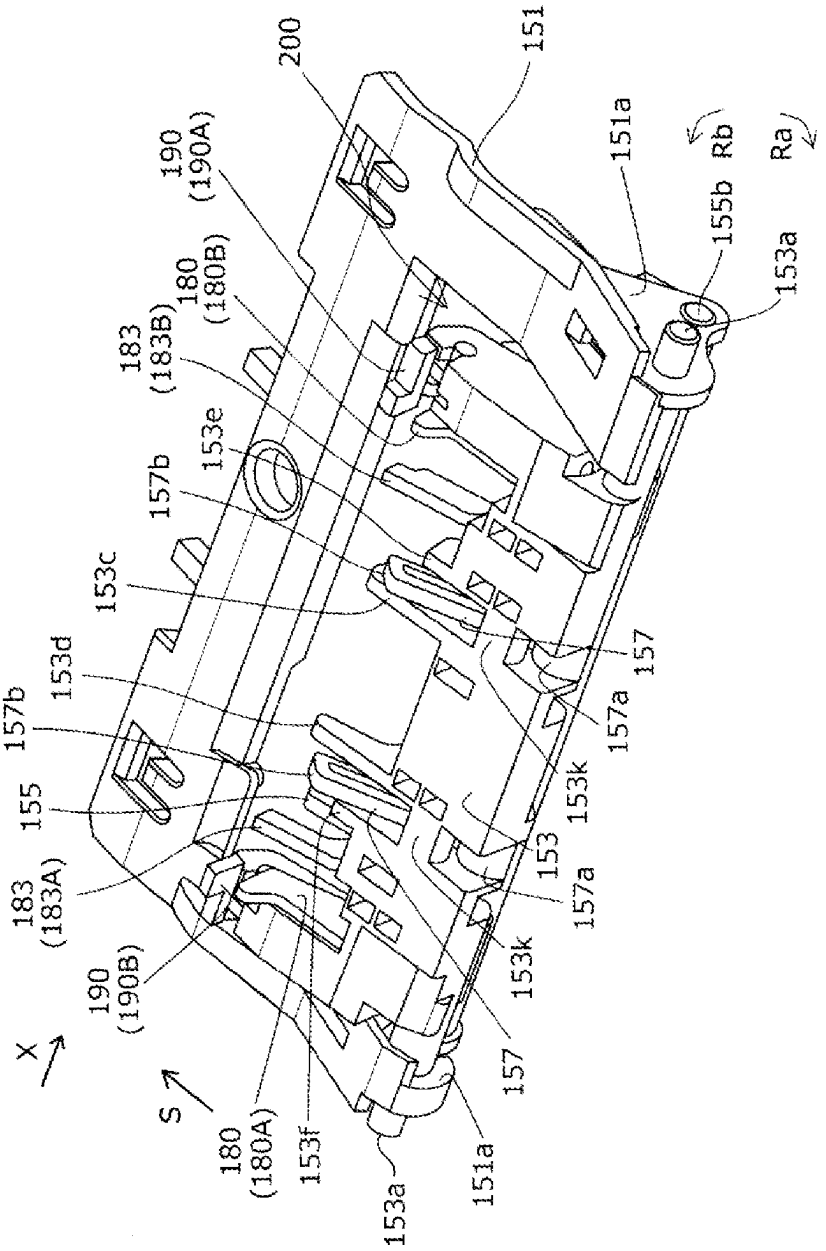
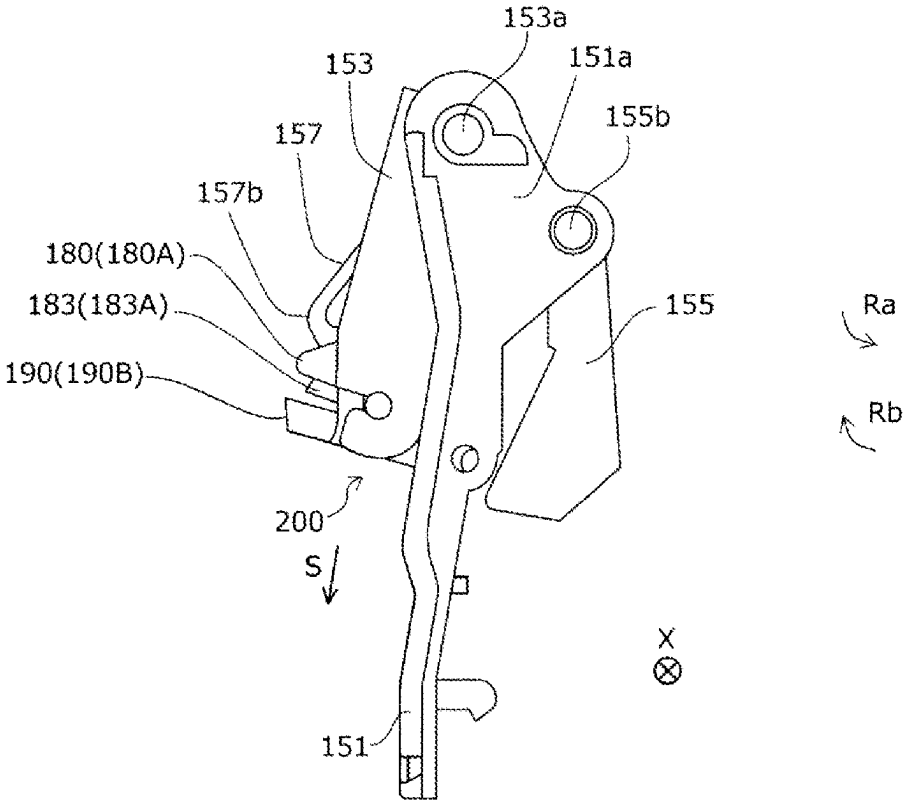

200
151
190
(190A)
180
(180B)
183
(183B)
153e
157b
153c
153d
157b
155
183
(183A)
190
(190B)
180
(180A)
153f
153a
151a
157
153k
153
157a
157a
153k
151a
155b
153a
Rb
Ra
X
S

FIG. 14


153a
153
151a
155b
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157b
180(180A)
183(183A)
190(190B)
155
Ra
Rb
200
S
X
151

FIG. 15

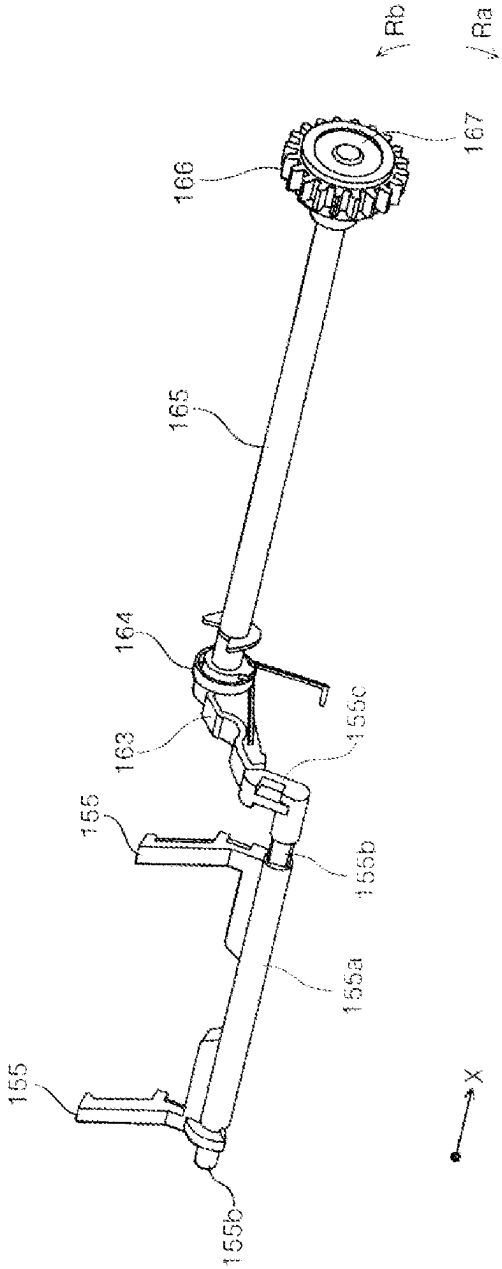


FIG. 16

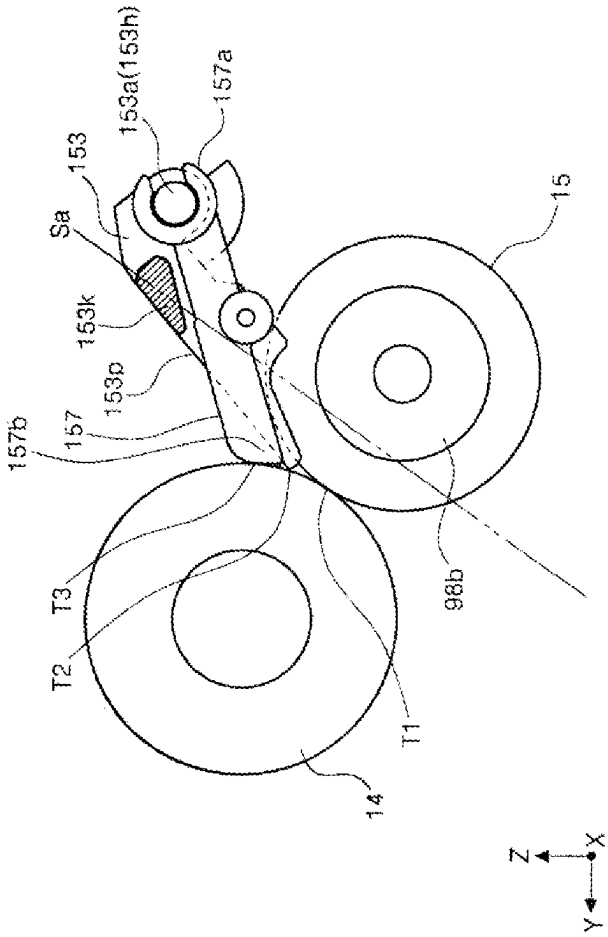


FIG. 17

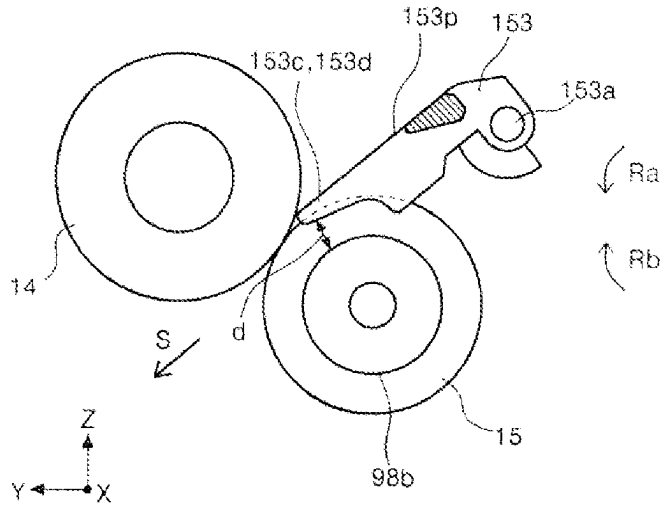


FIG. 18A

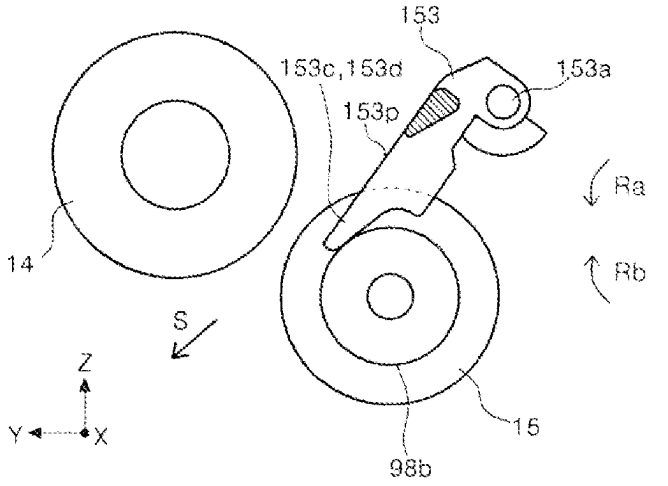


FIG. 18B

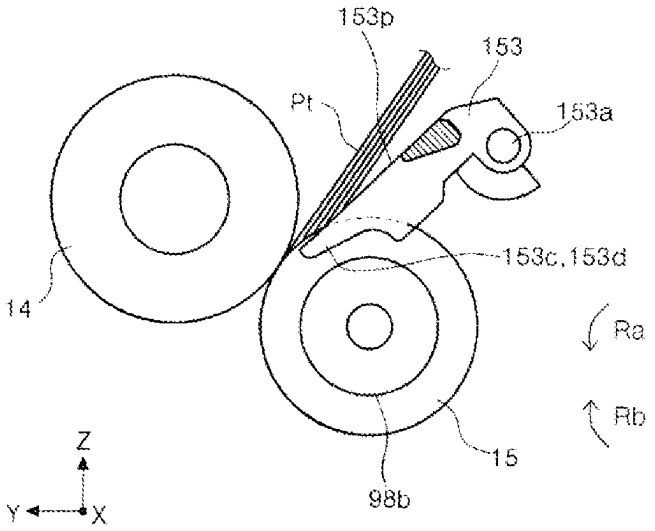


FIG. 19A

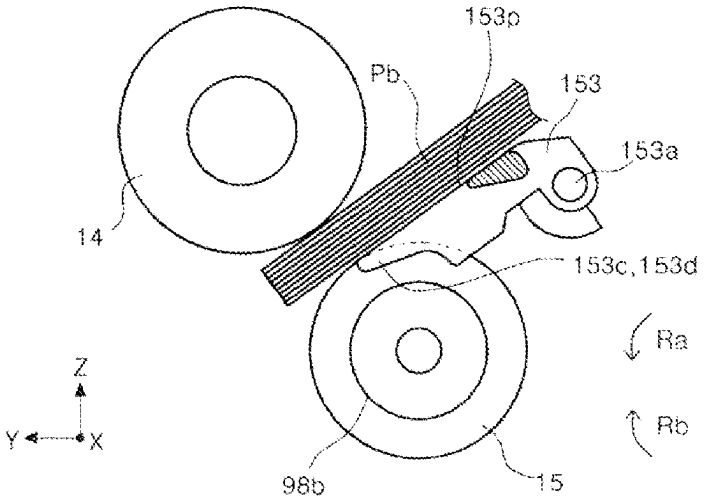


FIG. 19B

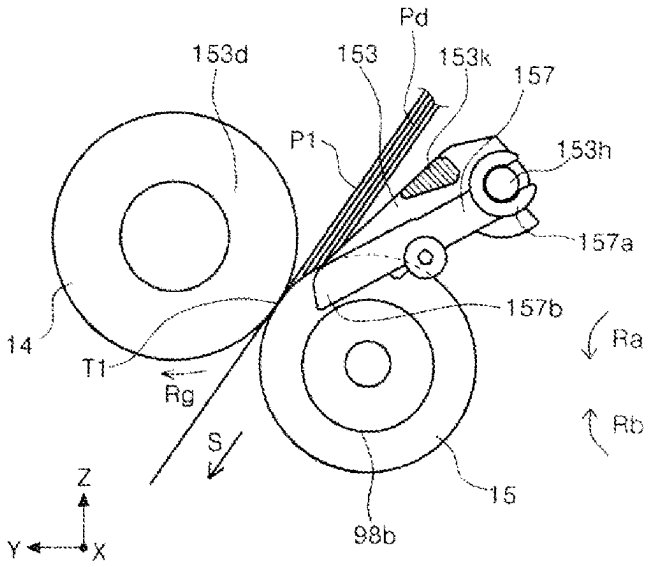


FIG. 20A

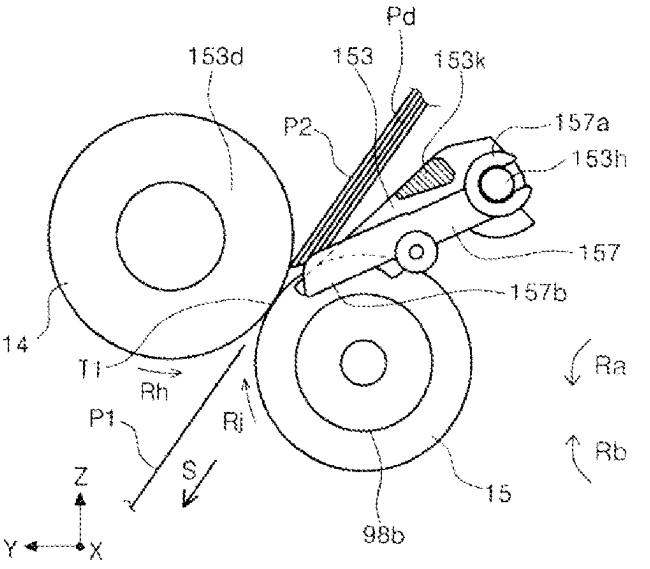
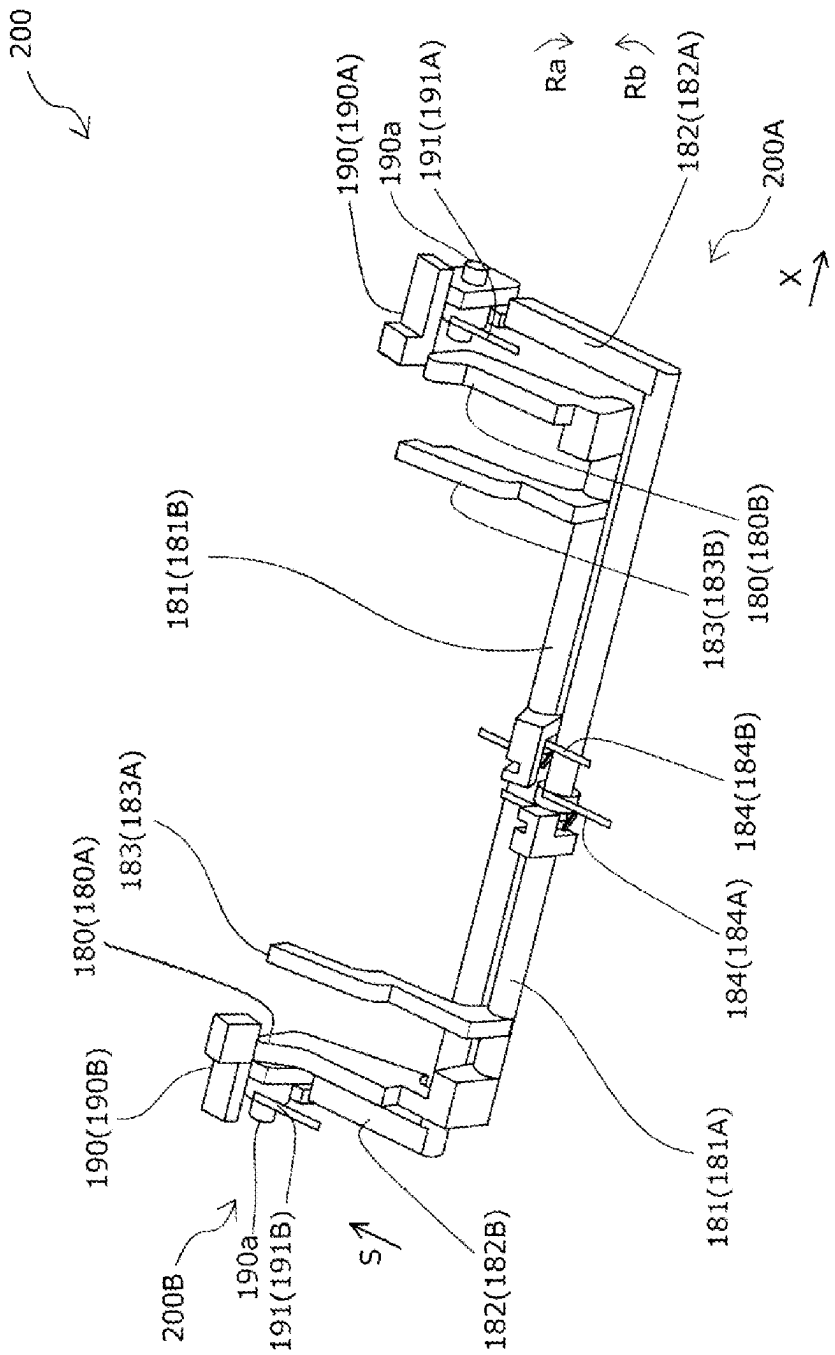


FIG. 20B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190(190A)
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Ra
Rb
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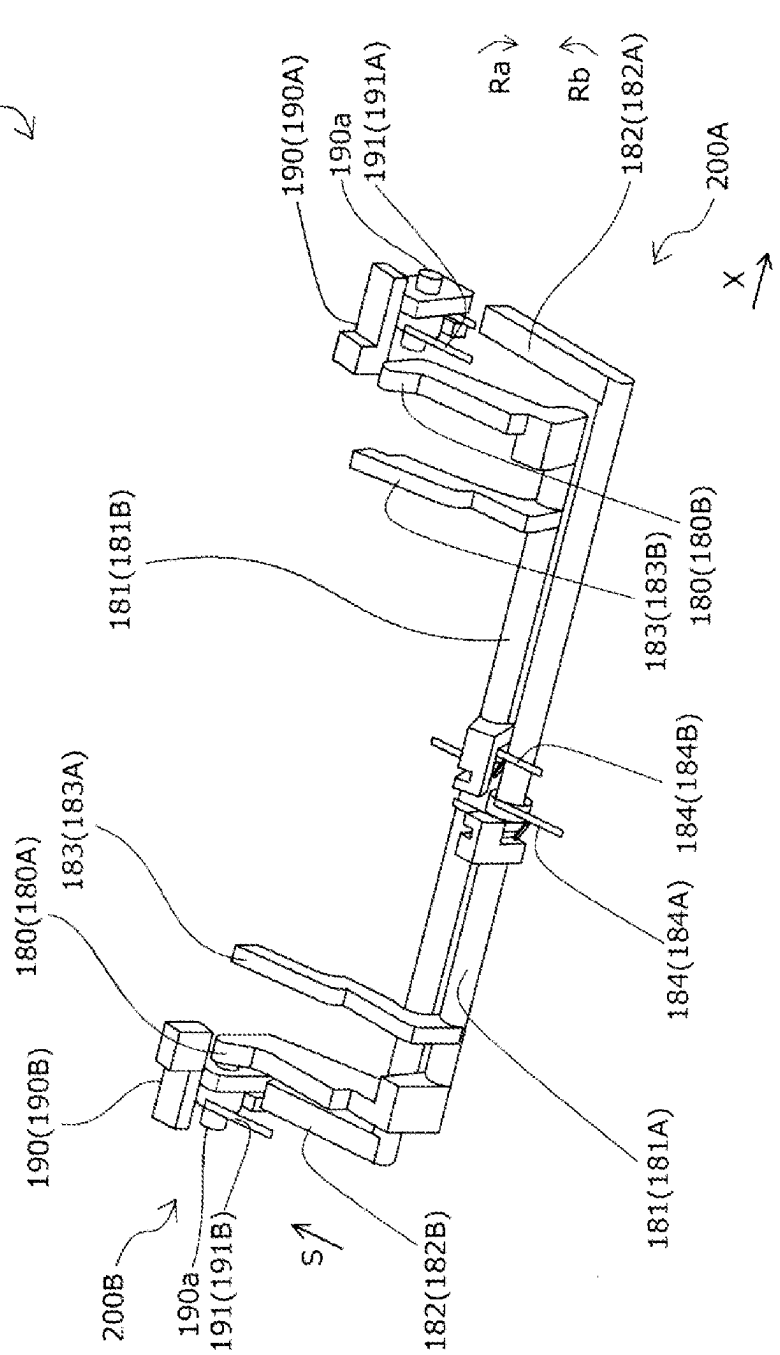
X
181(181B)
183(183B)
180(180B)
184(184B)
180(180A)
183(183A)
184(184A)
190(190B)
181(181A)
200B
190a
191(191B)
S
182(182B)

FIG. 21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190(190A)
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191(191A)
Ra
Rb
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200A
X
181(181B)
183(183B)
180(180B)
184(184B)
184(184A)
180(180A)
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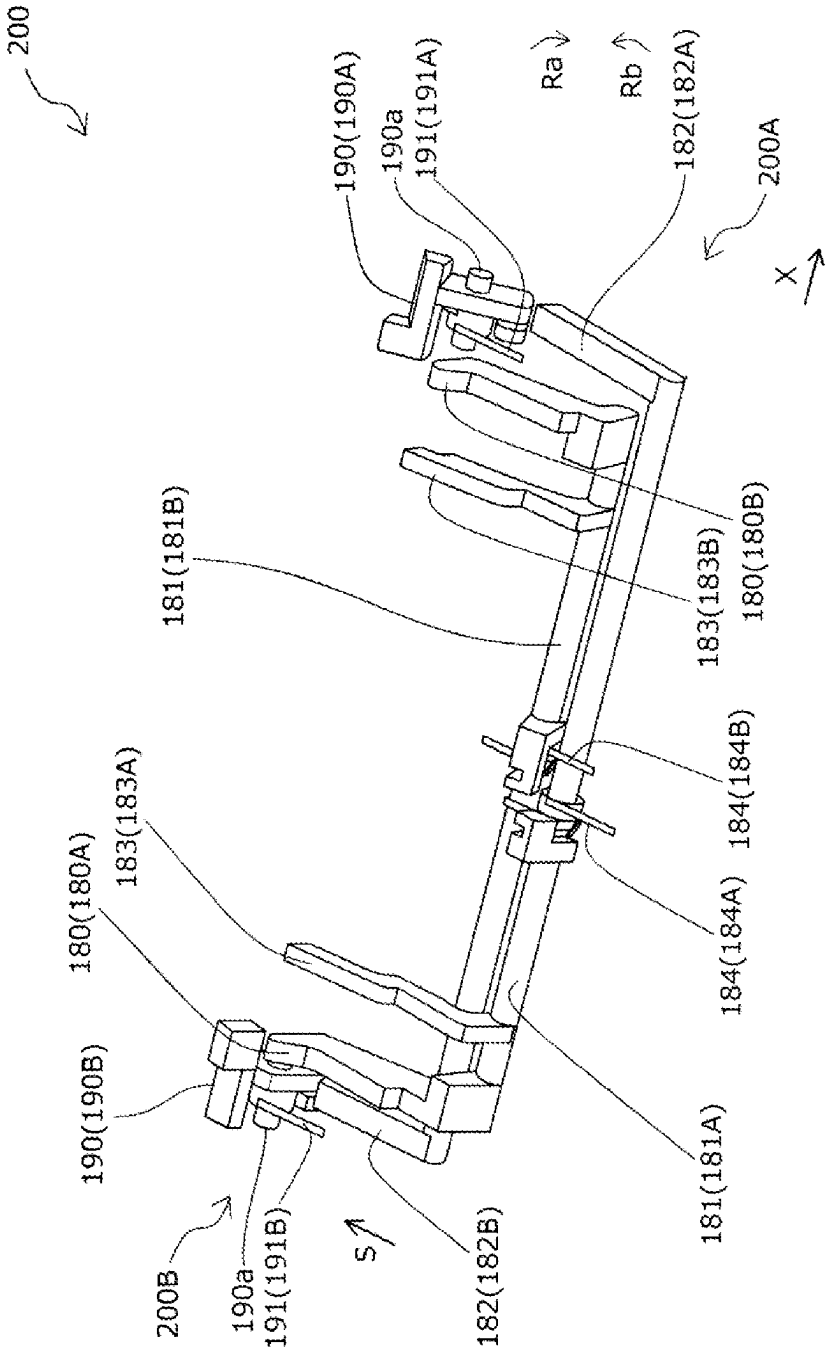
190(190B)
181(181A)
200B
190a
191(191B)
S
182(182B)

FIG. 22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184(184B)
184(184A)
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200B
190a
191(191B)
S
182(182B)

FIG. 23

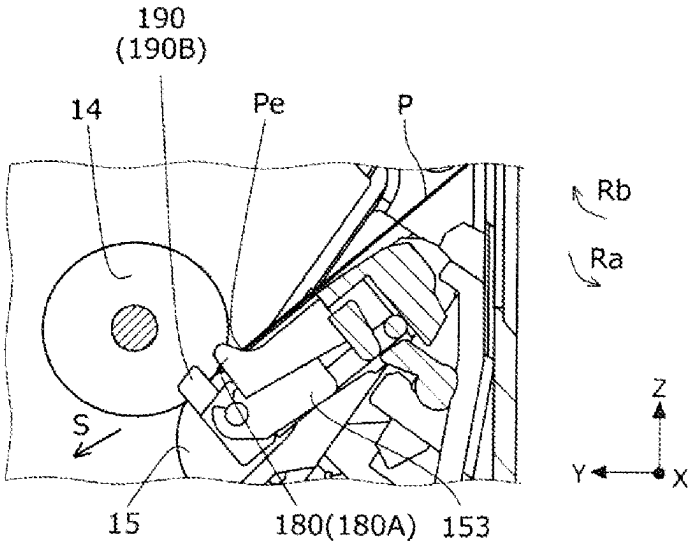

FIG. 24A

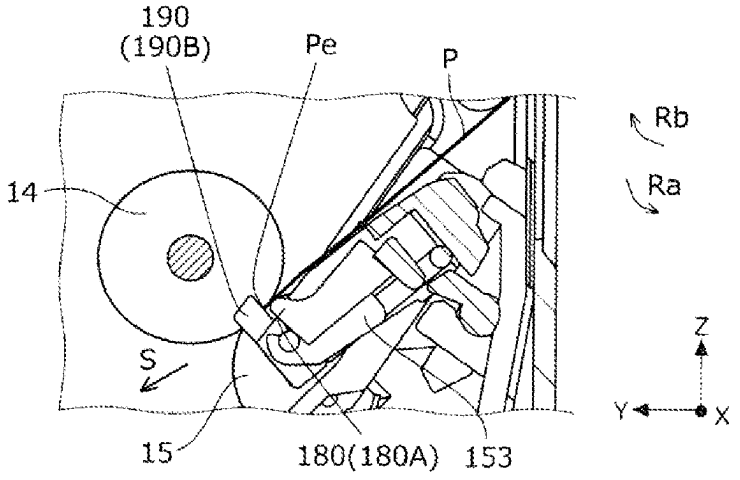

FIG. 24B

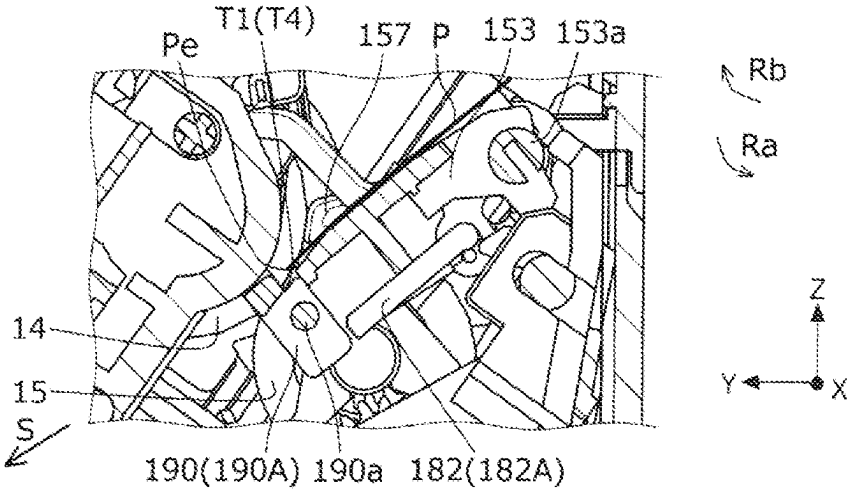

FIG. 25A

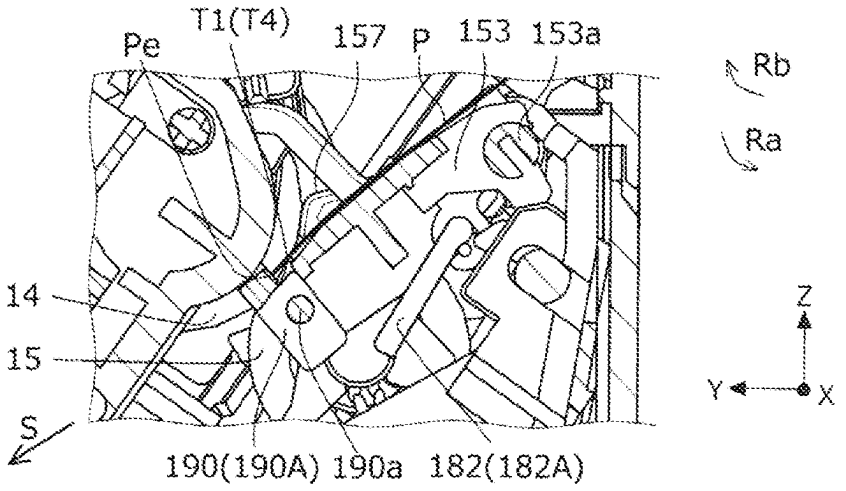

FIG. 25B

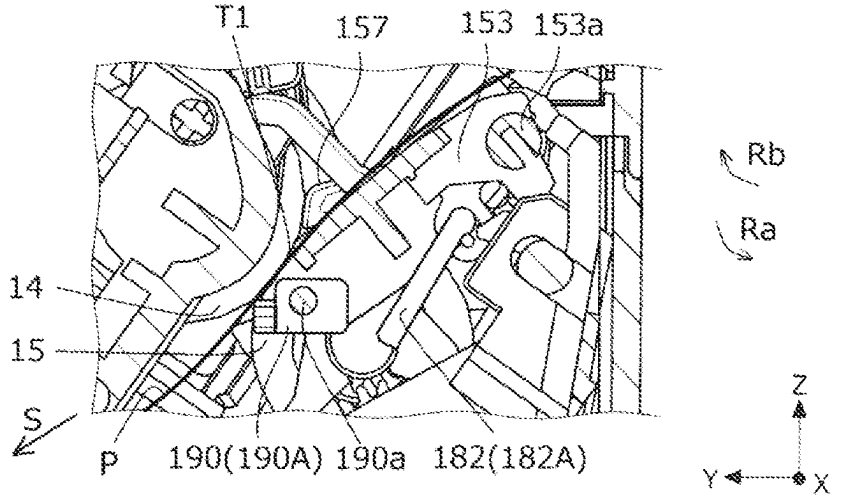

FIG. 25C

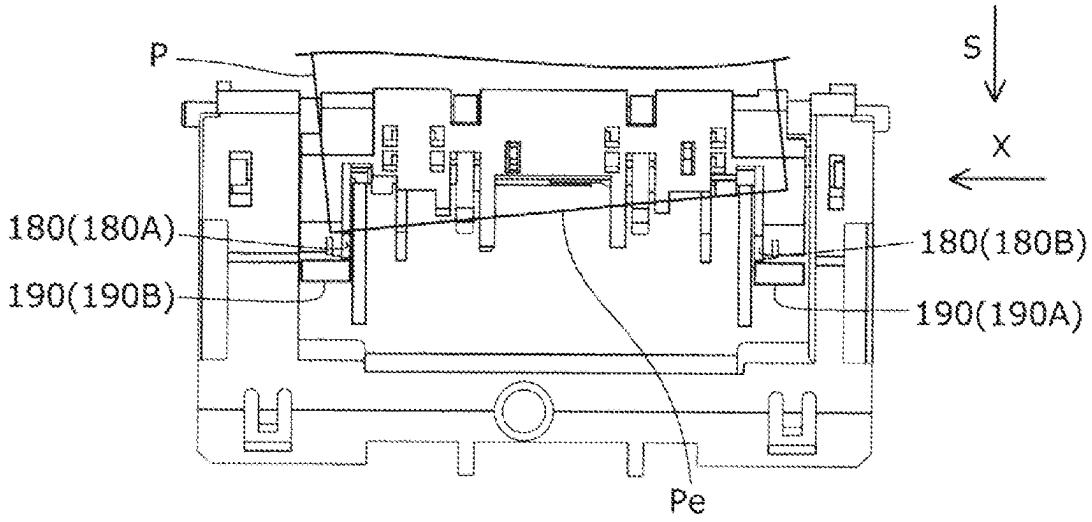

FIG. 26A

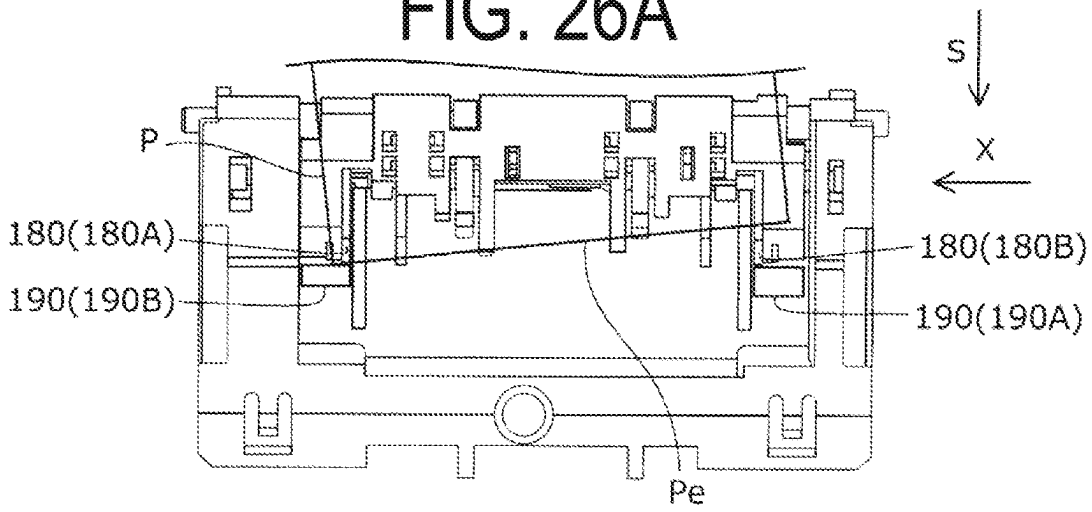

FIG. 26B

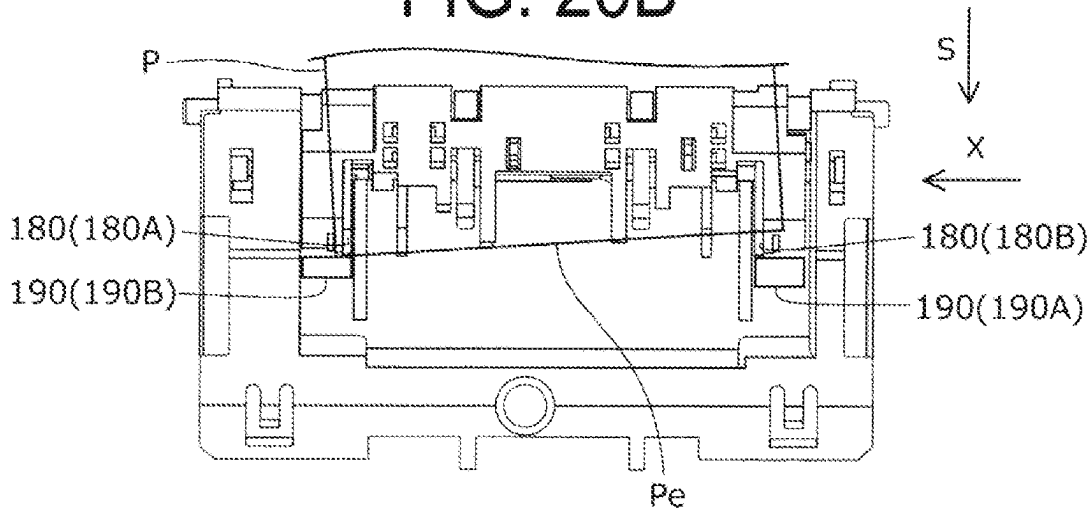

FIG. 26C

MEDIUM FEEDING DEVICE AND IMAGE READING APPARATUS

The present application is based on, and claims priority from JP Application Serial Number 2022-114810, filed Jul. 19, 2022, the disclosure of which is hereby incorporated by reference herein in its entirety.

BACKGROUND

1. Technical Field

The present disclosure relates to a medium feeding device and an image reading apparatus.

2. Related Art

In the related art, various medium feeding devices have been used. Among them, there is a medium transport device including a skew correction mechanism that corrects skew of a medium that is transported. For example, JP-A-2020-37478 discloses a medium transport device including a skew correction mechanism having a first stopper, a second stopper, a first lever, and a second lever in a transport path of a medium.

However, in the skew correction mechanism included in the medium transport device disclosed in JP-A-2020-37478, for example, when a medium having low stiffness such as a thin medium is used, there is a case in which skew correction accuracy is lowered. This is because the stiffness of the medium is lowered as a distance from a nipping position or the like of the medium by a medium transport unit increases, and in a skew correction mechanism or the like that corrects skew by causing a leading end of the medium in the transport direction to collide, as the distance increases, the medium is more likely to bend and the skew correction accuracy tends to decrease. For this reason, in the known medium transport device including the skew correction mechanism, it is a problem to improve the skew correction accuracy.

SUMMARY

In order to solve the above problem, a medium feeding device of the present disclosure includes a placement unit at which a medium is placed, a transport path along which the medium is transported, a feeding roller that feeds the medium placed at the placement unit, and a skew correction mechanism that corrects skew of the medium being fed, wherein the skew correction mechanism includes a first lever member and a second lever member that are displaceable between an advanced position at which the first lever member and the second lever member come into contact with the medium and are advanced into the transport path and a retracted position at which the first lever member and the second lever member are retracted from the transport path by the medium passing therethrough in contact therewith, and a first load member and a second load member that are provided downstream of the first lever member and the second lever member in a feeding direction of the medium and are displaceable between a blocking position at which a part of the transport path in a width direction that intersects the feeding direction is blocked and an opening position at which the transport path is open without being blocked, the feeding roller is provided between the first load member and the second load member in the width direction, the first load member and the second load member, when located at the blocking position, overlap at least a part of the feeding roller when seen in the width direction, the first load member is configured to be located at the blocking position when the first lever member is located at the advanced position and to be displaceable from the blocking position to the opening position when the first lever member is located at the retracted position, and the second load member is configured to be located at the blocking position when the second lever member is located at the advanced position and to be displaceable from the blocking position to the opening position when the second lever member is located at the retracted position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front perspective view of a scanner in which a device main body is in a normal reading posture;

FIG. **2** is a rear perspective view of the scanner in which the device main body is in the normal reading posture;

FIG. **3** is a front perspective view of the scanner in which the device main body is in the normal reading posture and a third unit is open;

FIG. **4** is a plan view of a first unit seen from above when the device main body is in the normal reading posture;

FIG. **5** is a cross-sectional view of the scanner in which the device main body is in the normal reading posture and a second unit is open with respect to the first unit when seen in a width direction;

FIG. **6** is a cross-sectional view of a document transport path of the scanner in which the device main body is in the normal reading posture when seen in a width direction;

FIG. **7** is a cross-sectional view of the document transport path of the scanner in which the device main body is in a booklet reading posture when seen in the width direction;

FIG. **8** is a rear perspective view of the scanner in which a rear cover of the first unit is removed;

FIG. **9** is a block diagram illustrating a control system of the scanner;

FIG. **10** is a flowchart illustrating control when the posture of the device main body is switched;

FIG. **11** is a diagram illustrating a surrounding configuration of a separation roller when seen from above;

FIG. **12** is a diagram illustrating a peripheral configuration of a guide member and a set guide when seen from above;

FIG. **13** is a diagram illustrating a peripheral configuration of a guide member and a set guide when seen from below;

FIG. **14** is a perspective view illustrating the peripheral configuration of the guide member and the set guide;

FIG. **15** is a side view of the peripheral configuration of the guide member and the set guide;

FIG. **16** is a perspective view illustrating a set flap and a part of a mechanism for driving the set flap;

FIG. **17** is a side cross-sectional view illustrating a peripheral configuration of the separation roller;

FIG. **18** is a diagram illustrating an operation of the set guide, in which FIG. **18**A is a diagram illustrating a feeding standby state and FIG. **18**B is a diagram illustrating a state in which a separation roller is displaced;

FIG. **19** is a diagram illustrating an operation of a set guide, in which FIG. **19**A is a diagram illustrating a state in which a plurality of sheet-like documents are fed, and FIG. **19**B is a diagram illustrating a state in which a booklet-like document is fed;

FIG. **20** is a diagram illustrating an operation of a pressing lever, in which FIG. **20**A is a diagram illustrating a state in which a document is being fed, and FIG. **20**B is a diagram

illustrating a state in which a trailing end of a document to be fed is out of a contact position between a feeding roller and a separation roller;

FIG. **21** is a diagram for describing a skew correction mechanism, and is a perspective view illustrating a state before a medium collides with a first lever member and a second lever member;

FIG. **22** is a diagram for describing the skew correction mechanism, and is a perspective view illustrating a state in which the medium has collided with the first lever member from the state illustrated in FIG. **21** and a first contact portion is separated from a first load member;

FIG. **23** is a diagram for describing the skew correction mechanism, and is a perspective view illustrating a state in which the first load member is displaced from a blocking position illustrated in FIG. **22** to an opening position by the first contact portion being separated from the first load member;

FIG. **24** is a diagram for describing the skew correction mechanism, in which FIG. **24**A is a side view corresponding to FIG. **21** and illustrating a state in which the first lever member is located at an advanced position before the medium collides, and FIG. **24**B is a side view corresponding to FIG. **22** and illustrating a state in which the first lever member is located at a retracted position by the medium colliding with the first lever member;

FIG. **25** is a diagram for describing the skew correction mechanism, in which FIG. **25**A is a side view corresponding to FIG. **21** and illustrating a state in which the first load member is located at the blocking position before the medium collides, FIG. **25**B is a side view corresponding to FIG. **22** and illustrating a state in which the first contact portion is separated from the first load member by the medium colliding with the first lever member, and FIG. **25**C is a side view corresponding to FIG. **23** and illustrating a state in which the first load member is displaced from the blocking position to the opening position by the first contact portion being separated from the first load member; and

FIG. **26** is a diagram for describing the skew correction mechanism, in which FIG. **26**A is a side view illustrating a moment at which the medium collides with the first lever member, FIG. **26**B is a side view illustrating a state in which the first load member is displaced from the blocking position to the opening position by the medium colliding with the first lever member, and FIG. **26**C is a side view illustrating a moment at which the medium collides with a second lever member.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

The present disclosure will be schematically described below.

A medium feeding device according to a first aspect of the present disclosure includes a placement unit at which a medium is placed, a transport path along which the medium is transported, a feeding roller that feeds the medium placed at the placement unit, and a skew correction mechanism that corrects skew of the medium being fed, wherein the skew correction mechanism includes a first lever member and a second lever member that are displaceable between an advanced position at which the first lever member and the second lever member come into contact with the medium and are advanced into the transport path and a retracted position at which the first lever member and the second lever member are retracted from the transport path by the medium passing therethrough in contact therewith, and a first load member and a second load member that are provided downstream of the first lever member and the second lever member in a feeding direction of the medium and are displaceable between a blocking position at which a part of the transport path in a width direction that intersects the feeding direction is blocked and an opening position at which the transport path is opened without being blocked, the feeding roller is provided between the first load member and the second load member in the width direction, the first load member and the second load member, when located at the blocking position, overlap at least a part of the feeding roller when seen in the width direction, the first load member is configured to be located at the blocking position when the first lever member is located at the advanced position and to be displaceable from the blocking position to the opening position when the first lever member is located at the retracted position, and the second load member is configured to be located at the blocking position when the second lever member is located at the advanced position and to be displaceable from the blocking position to the opening position when the second lever member is located at the retracted position.

According to the aspect, the first load member and the second load member, when located at the blocking position, overlap at least a part of the feeding roller when seen in the width direction. In other words, the skew correction mechanism is provided at a position not separated from the feeding roller in the feeding direction of the medium. Therefore, even when a medium having low stiffness such as a thin medium is used, the skew correction can be performed at a position at which the stiffness of the medium does not become low, and thus the skew correction can be performed while bending of the medium is curbed, and skew correction accuracy can be improved.

According to a second aspect of the present disclosure, in the medium feeding device according to the first aspect, a separation unit that is disposed to face the feeding roller and nips, when a plurality of the media are placed on top of each other at the placement unit, the media together with the feeding roller to separate the media is provided, wherein a contact position at which the first load member and the second load member located at the blocking position come into contact with the medium being transported and a nipping position between the feeding roller and the separation unit overlap each other when seen in the width direction.

According to the aspect, the separation unit that nips the medium together with the feeding roller and separates the medium is provided. Additionally, the contact position at which the first load member and the second load member located at the blocking position come into contact with the medium being transported and the nipping position between the feeding roller and the separation unit overlap each other when seen in the width direction. The stiffness of the medium increases as a distance from the nipping position between the feeding roller and the separation unit increases, and with such a configuration, the contact position and the nipping position are close to each other, and thus it is possible to perform the skew correction at a position at which the stiffness of the medium has not decreased. Therefore, it is possible to perform the skew correction while the bending of the medium is curbed, and it is possible to improve the skew correction accuracy.

According to a third aspect of the present disclosure, in the medium feeding device according to the first or second aspect, the first lever member and the second lever member,

when located at the advanced position, overlap at least a part of the feeding roller when seen in the width direction.

According to the aspect, the first lever member and the second lever member, when located at the advanced position, overlap at least a part of the transport roller when seen in the width direction. That is, the first lever member and the second lever member can be disposed close to the first load member and the second load member in the transport direction. With such a configuration, it is possible to correct skew with high accuracy.

According to a fourth aspect of the present disclosure, in the medium feeding device according to the third aspect, the skew correction mechanism includes a first skew correction unit and a second skew correction unit in the width direction, the first skew correction unit includes the first lever member, a first contact portion displaceable between a first restriction position at which displacement of the first load member from the blocking position to the opening position is restricted and a first non-restriction position at which the restriction is released, and a first rotating shaft having one end provided with the first lever member and the other end provided with the first contact portion, the second skew correction unit includes a second contact portion displaceable between a second restriction position at which displacement of the second load member from the blocking position to the opening position is restricted and a second non-restriction position at which the restriction is released, and a second rotating shaft having one end provided with the second lever member and the other end provided with the second contact portion, the first contact portion is located at the first restriction position when the first lever member is located at the advanced position, and is located at the first non-restriction position when the first lever member is located at the retracted position, and the second contact portion is located at the second restriction position when the second lever member is located at the advanced position, and is located at the second non-restriction position when the second lever member is located at the retracted position.

According to the aspect, the first contact portion located at the first restriction position when the first lever member is located at the advanced position and located at the first non-restriction position when the first lever member is located at the retracted position, and the second contact portion located at the second restriction position when the second lever member is located at the advanced position and located at the second non-restriction position when the second lever member is located at the retracted position are provided. In this way, since a configuration in which movements of the lever member and the load member are not directly but indirectly interlocked with each other is adopted, it is possible to simply configure the skew correction mechanism.

According to a fifth aspect of the present disclosure, in the medium feeding device of the fourth aspect, the feeding roller is provided between the first lever member and the second load member, and the second lever member and the first load member in the width direction.

According to the aspect, the feeding roller is provided between the first lever member and the second load member and the second lever member and the first load member in the width direction. As described above, it is possible to effectively curb the skew becoming larger than a predetermined angle by linking the first lever member and the first load member and linking the second lever member and the second load member, which are separated from each other in the width direction. In addition, it is possible to effectively correct skew even with respect to a medium having a narrow width by adopting a configuration in which a link destination of the load member with respect to the lever member straddles the feeding roller.

According to a sixth aspect of the present disclosure, in the medium feeding device of the fifth aspect, the first lever member is provided at a position overlapping at least a part of the second load member in the feeding direction, and the second lever member is provided at a position overlapping at least a part of the first load member in the feeding direction.

According to the aspect, the first lever member is provided at a position overlapping at least a part of the second load member in the feeding direction, and the second lever member is provided at a position overlapping at least a part of the first load member in the feeding direction. With such a configuration, it is possible to shorten a distance between the lever member and the load member in the width direction, and for example, it is possible to particularly effectively correct skew for a medium having a narrow width, for example.

According to a seventh aspect of the present disclosure, in the medium feeding device of the fourth aspect, the feeding roller is provided between the first lever member and the first load member, and the second lever member and the second load member in the width direction.

According to the aspect, the feeding roller is provided between the first lever member and the first load member and the second lever member and the second load member in the width direction. In this way, it is possible to reduce a size of a link mechanism between the lever member and the load member by linking the first lever member and the first load member and linking the second lever member and the second load member, which are close to each other in the width direction.

According to an eighth aspect of the present disclosure, in the medium feeding device according to the first aspect, the medium feeding device further includes a separation unit that is disposed to face the feeding roller and nips, when a plurality of the media are placed on top of each other at the placement unit, the media together with the feeding roller to separate the media, and a set guide that guides a leading end of the medium placed at the placement unit to a nipping position between the feeding roller and the separation unit, wherein the set guide is capable of adjusting a distance between the separation unit and the feeding roller according to a thickness of the medium, and the skew correction mechanism is provided in the set guide.

According to the aspect, the set guide capable of adjusting the distance between the separation unit and the feeding roller according to the thickness of the medium is provided. Since the distance between the separation unit and the feeding roller is adjusted according to the thickness of the medium, for example, it is possible to curb a situation in which a medium having a thickness exceeding a predetermined thickness collides with the separation unit and cannot be fed. Further, the skew correction mechanism is provided in the set guide. Since the set guide and the skew correction mechanism are integrated as described above, it is possible to reduce a size of a medium transport device.

According to a ninth aspect of the present disclosure, in the medium feeding device of the eighth aspect, the set guide includes a pressing lever disposed upstream of the nipping position in the feeding direction, provided at both ends of the feeding roller in the width direction at positions closer to the feeding roller than the skew correction mechanism, and capable of switching between a first position for pressing on the feeding roller and a second position for separating from

the feeding roller by advancing and retracting with respect to the feeding roller, and the pressing lever is configured to, after a trailing end in the feeding direction of a preceding medium separated by the separation unit and fed in advance among the plurality of media placed on top of each other at the second position passes through the nipping position, press a following medium other than the preceding medium among the plurality of media placed on top of each other at the first position against the feeding roller.

According to the aspect, the medium feeding device further includes the pressing lever configured to be capable of pressing a following medium other than a preceding medium among the plurality of media placed on top of each other at the first position, at which the pressing lever presses the feeding roller, against the feeding roller after the trailing end in the feeding direction of the preceding medium separated by the separation unit and fed in advance among the plurality of media placed on top of each other at the second position separated from the feeding roller passes through the nipping position. Thus, it is possible to curb the following medium being strongly returned toward the upstream side in the feeding direction after the preceding medium is fed.

According to a tenth aspect of the present disclosure, in the medium feeding device according to the eighth or ninth aspect, the medium feeding device further includes a path member that is disposed in at least a part of a periphery of the separation unit to be openable and closable, is provided so that the separation unit is detachable when the path member is in an open state, and forms at least a part of the transport path when the path member is in a closed state, and the set guide is provided at the path member.

According to the aspect, the path member is provided so that the separation unit is detachable when the path member is in the open state, and forms at least a part of the transport path when the path member is in the closed state. Thus, it is possible to easily replace the separation unit or the like by bringing the path member into the open state.

An image reading apparatus according to an eleventh aspect includes the medium feeding device according to any one of the first to tenth aspects, and a reading unit configured to read an image on the medium transported on the transport path.

According to the aspect, in the image reading apparatus, the effect of any one of the first to tenth aspects described above can be obtained.

The present disclosure will be specifically described below.

Hereinafter, as an example of the image reading apparatus, a scanner **1** capable of reading at least one surface of a first surface and a second surface opposite to the first surface of a document will be described. The scanner **1** is a so-called sheet-feed type scanner that reads a document while the document is moved with respect to a reading unit described below. In this specification, the document includes not only a sheet-like document but also a card-like document and a booklet-like document. A document is an example of a medium.

In an XYZ coordinate system illustrated in each of drawings, an X-axis direction is a width direction of a device and a width direction of a document. A Y-axis direction is a depth direction of the device, and a Z-axis direction is a direction along a vertical direction. In the embodiment, a +Y direction is a direction from a rear surface to a front surface of the device, and a −Y direction is a direction from the front surface to the rear surface of the device. Also, a left direction when seen from the front surface of the device is a +X direction, and a right direction is a −X direction. Also, hereinafter, a direction in which the document is transported may be referred to as "downstream", and a direction opposite thereto may be referred to as "upstream".

The scanner **1** of the embodiment includes a document feeding device **150** which is an example of a medium feeding device. In the embodiment, the document feeding device **150** has a configuration in which a first reading unit **32** and a second reading unit **33** described below are removed from the scanner **1**. However, from the viewpoint of feeding the document in the scanner **1**, the entire scanner **1** including the first reading unit **32** and the second reading unit **33** may be the document feeding device **150**. In addition, the scanner **1** can be regarded as a medium transport device because the scanner **1** transports a document therein. The scanner **1** according to the embodiment includes a device main body **2** and a main body support unit **6** that rotatably supports the device main body **2**. The device main body **2** includes a first unit **3**, a second unit **4**, and a third unit **5**.

The second unit **4** and the third unit **5** are provided to be rotatable about a frame rotating shaft **64***a* (refer to FIG. **3**). The frame rotating shaft **64***a* is a rotating shaft having a rotation axis center parallel to the X-axis direction. The second unit **4** and the third unit **5** can integrally rotate about the frame rotating shaft **64***a* with respect to the first unit **3** (refer to FIG. **5**). A part of a document transport path (a transport path of the document P) can be exposed by rotating the second unit **4** and the third unit **5** with respect to the first unit **3**, as illustrated in FIG. **5**. In particular, a document feeding path R**1** and a reading transport path R**2** which will be described below can be exposed. A user can unlock the second unit **4** from the first unit **3** by sliding an unlocking unit **8***a* in the −X direction and thus can open the second unit **4**.

Further, the third unit **5** can rotate about the frame rotating shaft **64***a* with respect to the first unit **3** and the second unit **4** (refer to FIG. **3**). A part of the document transport path can be exposed by rotating the third unit **5** with respect to the first unit **3** and the second unit **4**, as illustrated in FIG. **3**. In particular, a reverse transport path R**3** which will be described below can be exposed.

The device main body **2** is rotatable about a main body rotating shaft **6***c* (refer to FIG. **8**) with respect to the main body support unit **6**, and in the embodiment, the device main body **2** can hold two postures by rotating. The two postures of the device main body **2** are illustrated in FIGS. **6** and **7**, and hereinafter, the posture illustrated in FIG. **6** is referred to as a normal reading posture and the posture illustrated in FIG. **7** is referred to as a booklet reading posture. The normal reading posture is an example of a first posture of the device main body **2**, and the booklet reading posture is an example of a second posture of the device main body **2**. FIGS. **6** and **7** are cross-sectional views taken at the same position in the X-axis direction, but FIG. **5** is a cross-sectional view taken at a different position in the X-axis direction from FIGS. **6** and **7**.

An angle $\alpha 1$ illustrated in FIG. **6** and an angle $\alpha 2$ illustrated in FIG. **7** are angles formed by an extension line L of a reading transport path R**2** and a placement surface G of the device which will be described below. The angle $\alpha 2$ in the booklet reading posture is smaller than the angle $\alpha 1$ in the normal reading posture. In the normal reading posture, a projection area of the device main body **2** on the placement surface G on which the scanner **1** is placed is minimized, that is, a footprint of the device main body **2** is minimized. The footprint in this specification is an area occupied by the

device main body **2** in an X-Y plane when the device main body **2** is seen from above. The normal reading posture is suitable for reading a sheet-like document, that is, a document which has low rigidity and is easily bent. The booklet reading posture is suitable for reading a document such as a plastic card or a booklet which has high rigidity and is not easily bent.

An operation unit **7** including a plurality of operation buttons including a power button is provided on the front surface of the device. As illustrated in FIG. **2**, a first coupling unit **71**, a second coupling unit **72**, and a third coupling unit **73** are provided on a side surface in the +X direction among side surfaces constituting the periphery of the device. The first coupling unit **71** is a coupling unit to which a plug of a USB Type-A (not illustrated) which is an example of a coupling target is coupled. The second coupling unit **72** is a coupling unit to which a plug of a USB Type-C (not illustrated) which is an example of a coupling target is coupled. The third coupling unit **73** is a coupling unit to which a power supply plug (not illustrated) for supplying power to the device main body **2** is coupled. USB is an abbreviation of Universal Serial Bus, and each of the Type-A and the Type-C is one of a plurality of types defined in the USB standard.

An external device can be coupled via a USB cable (not illustrated), and a storage medium, for example, a USB memory (not illustrated) can be coupled to the first coupling unit **71**. A control unit **80** (refer to FIG. **9**) can store read data in the storage medium coupled to the first coupling unit **71**. Further, an external device can be coupled to the second coupling unit **72** via a USB cable (not illustrated). The first coupling unit **71**, the second coupling unit **72**, and the third coupling unit **73** are provided on a circuit board **79** (refer to FIG. **8**) located on the rear surface side of the device. In the embodiment, the device main body **2** is configured to be able to receive power supply from an external device coupled to the second coupling unit **72**.

Next, a configuration of the document transport path in the scanner **1** will be described with reference to FIGS. **6** and **7**. A fed document is supported in an inclined posture by a document support unit **11**. A reference character P denotes a document to be supported. When a plurality of documents are supported by the document support unit **11**, the uppermost document is fed downstream by a feeding roller **14**. The feeding roller **14** comes into contact with an upper surface of the document supported by the document support unit **11**. The document support unit **11** is formed in an upper opening and closing unit **10**. The upper opening and closing unit **10** is rotatable about a rotating shaft (not illustrated), and rotates to open and close a feeding port **13**. FIG. **1** illustrates a state in which the upper opening and closing unit **10** is closed, and FIG. **2** illustrates a state in which the upper opening and closing unit **10** is open. The upper opening and closing unit **10** constitutes the first unit **3**.

As illustrated in FIGS. **3** and **4**, a pair of edge guides **12***a* and **12***b* for guiding side edges of the document are provided at the document support unit **11**. The pair of edge guides **12***a* and **12***b* are provided to be slidable in a width direction (the X-axis direction) of the document. The pair of edge guides **12***a* and **12***b* are interlocked by a rack and pinion mechanism (not illustrated) to be spaced apart from each other or to approach each other while a center position in the width direction of the document is sandwiched therebetween. That is, the scanner **1** adopts a so-called center feeding system.

The feeding roller **14** is provided in the second unit **4**. When the second unit **4** is closed with respect to the first unit **3**, the feeding roller **14** comes into contact with a separation roller **15** described below. When the second unit **4** is opened with respect to the first unit **3**, the feeding roller **14** is spaced apart from the separation roller **15**. The feeding roller **14** rotates by obtaining power from a transport motor **50** described below. The separation roller **15** is provided at a position facing the feeding roller **14** in the first unit **3**. A rotational torque is applied to the separation roller **15** by a torque limiter (not illustrated), and the separation roller **15** curbs double feeding of the documents. A separation pad may be employed instead of the separation roller **15**. The separation roller **15** is provided at a center position in the width direction of the document (refer to FIG. **4**). In addition, the feeding roller **14** provided at a position facing the separation roller **15** is also provided at the center position in the width direction of the document.

The separation roller **15** which is an example of a separation unit disposed to face the feeding roller **14** is capable of advancing and retracting with respect to the feeding roller **14**, and is capable of taking a separation state in which a rotational torque is generated by an action of a torque limiter (not illustrated) and separation of the document can be performed and a non-separation state in which the action of the torque limiter is not generated and the separation of the document is not performed. When the device main body **2** is in the normal reading posture, the separation roller **15** is in the separation state, and when the device main body **2** is in the booklet reading posture, the separation roller **15** is in the non-separation state.

A first transport roller pair **16** is provided downstream of the feeding roller **14** and the separation roller **15**. The first transport roller pair **16** includes a first lower roller **17** provided in the first unit **3** and a first upper roller **18** provided in the second unit **4**. The first upper roller **18** is provided to advance and retract with respect to the first lower roller **17**, and is pressed toward the first lower roller **17** by a pressing member (not illustrated), for example, a coil spring. Both the first lower roller **17** and the first upper roller **18** rotate by obtaining power from a transport motor **50** described below. Two first lower rollers **17** and two first upper rollers **18** are provided to sandwich the center position in the width direction of the document (refer to FIG. **4**). When the second unit **4** is closed with respect to the first unit **3**, the first lower roller **17** and the first upper roller **18** come into contact with each other. When the second unit **4** is opened with respect to the first unit **3**, the first upper roller **18** is spaced apart from the first lower roller **17** (refer to FIG. **5**).

A first reading unit **32** and a second reading unit **33** are disposed downstream of the first transport roller pair **16** to face each other. The first reading unit **32** is provided in the first unit **3**, and the second reading unit **33** is provided in the second unit **4**. The first reading unit **32** reads a lower surface (a first surface) of the document supported by the document support unit **11**, and the second reading unit **33** reads an upper surface (a second surface) of the document supported by the document support unit **11**. The second reading unit **33** is provided to advance and retract with respect to the first reading unit **32**, and is pressed toward the first reading unit **32** by a pressing member (not illustrated), for example, a coil spring. In the embodiment, the first reading unit **32** and the second reading unit **33** are each configured of a contact image sensor module (CISM). A reference numeral **32***a* denotes a contact glass constituting the first reading unit **32**, and a reference numeral **33***a* denotes a contact glass constituting the second reading unit **33**.

A second transport roller pair **20** is provided downstream of the first reading unit **32** and the second reading unit **33**. The second transport roller pair **20** includes a second lower

roller **21** provided in the first unit **3** and a second upper roller **22** provided in the second unit **4**. The second upper roller **22** is provided to be capable of advancing and retracting with respect to the second lower roller **21**, and is pressed toward the second lower roller **21** by a pressing member (not illustrated), for example, a coil spring. Both the second lower roller **21** and the second upper roller **22** rotate by obtaining power from the transport motor **50** described below. Two second lower rollers **21** and two second upper rollers **22** are provided to sandwich the center position in the width direction of the document (refer to FIG. **4**). When the second unit **4** is closed with respect to the first unit **3**, the second lower roller **21** and the second upper roller **22** come into contact with each other. When the second unit **4** is opened with respect to the first unit **3**, the second upper roller **22** is spaced apart from the second lower roller **21** (refer to FIG. **5**).

In FIGS. **6** and **7**, an alternate long and short dash line indicated by a reference numeral R**1** is a document feeding path, and the document feeding path R**1** extends from a nipping position between the feeding roller **14** and the separation roller **15** to a nipping position of the first transport roller pair **16**. Further, in FIGS. **6** and **7**, a broken line indicated by a reference numeral R**2** is a reading transport path, and the reading transport path R**2** extends from a nipping position of the first transport roller pair **16** to a nipping position of the second transport roller pair **20**. The reading transport path R**2** is a document transport path facing the first reading unit **32** and the second reading unit **33**.

When the device main body **2** is in the normal reading posture illustrated in FIG. **6**, a reverse transport path R**3** for reversing the read document upward and discharging the document is formed downstream of the reading transport path R**2**. The reverse transport path R**3** is a document transport path located downstream of the nipping position of the second transport roller pair **20**, and is a document transport path for bending and reversing a document transported obliquely downward as indicated by a two dot chain line in FIG. **6** and discharging the document obliquely upward from a first discharge port **37**. When the device main body **2** is in the booklet reading posture illustrated in FIG. **7**, a non-reverse transport path R**4** for discharging a read document without reversing the document is formed downstream of the reading transport path R**2**. The non-reverse transport path R**4** is a document transport path located downstream of the nipping position of the second transport roller pair **20**, and is a document transport path for discharging a document transported obliquely downward in the reading transport path R**2** as indicated by a two dot chain line in FIG. **7** obliquely downward from a second discharge port **38** without bending and reversing the document. The second transport roller pair **20** functions as a discharge roller pair that discharges the document from the non-reverse transport path R**4**.

Switching between the reverse transport path R**3** and the non-reverse transport path R**4** is performed by a flap **35** as a flap member constituting a transport path switching unit. The flap **35** is rotatable about a flap rotating shaft **35***a*, and when the flap **35** rotates, the reverse transport path R**3** is coupled to the reading transport path R**2** or the non-reverse transport path R**4** is coupled to the reading transport path R**2**. Coupling the reverse transport path R**3** to the reading transport path R**2** means making the reverse transport path R**3** available and also means making the non-reverse transport path R**4** unavailable. Similarly, coupling the non-reverse transport path R**4** to the reading transport path R**2** means making the non-reverse transport path R**4** available and also means making the reverse transport path R**3** unavailable.

In the embodiment, the flap **35** is configured to rotate in conjunction with switching of the posture of the device main body **2**. In the embodiment, a first solenoid **86** (refer to FIG. **9**) is employed as a configuration for rotating the flap **35** in conjunction with switching of the posture of the device main body **2**. A control unit **80** (refer to FIG. **9**) that performs various controls detects the posture of the device main body **2** based on a detection signal of a first posture detection sensor **87** or a second posture detection sensor **88** which will be described below, and drives the first solenoid **86** based on the detected posture to rotate the flap **35**. A means for rotating the flap **35** is not limited to the first solenoid **86**, but may be another actuator such as a motor. Alternatively, the flap **35** may be configured to mechanically rotate in conjunction with the posture of the device main body **2**.

A third transport roller pair **24** and a fourth transport roller pair **28** are provided on the reverse transport path R**3**. The third transport roller pair **24** includes a third driving roller **25** provided in the third unit **5** and a third driven roller **26** provided in the second unit **4**. The third driven roller **26** is provided to be capable of advancing and retracting with respect to the third driving roller **25**, and is pressed toward the third driving roller **25** by a pressing member (not illustrated), for example, a coil spring. The third driving roller **25** is driven by the transport motor **50**. The third driven roller **26** is a roller that is driven to rotate.

The fourth transport roller pair **28** includes a fourth driving roller **29** provided in the third unit **5** and a fourth driven roller **30** provided in the second unit **4**. The fourth driven roller **30** is provided to be capable of advancing and retracting with respect to the fourth driving roller **29**, and is pressed toward the fourth driving roller **29** by a pressing member (not illustrated), for example, a coil spring. The fourth driving roller **29** is driven by the transport motor **50**. The fourth driven roller **30** is a roller that is driven to rotate.

Two third driving rollers **25**, two third driven rollers **26**, two fourth driving rollers **29**, and two fourth driven rollers **30** are provided to sandwich the center position in the width direction of the document (refer to FIG. **3**). When the third unit **5** is closed with respect to the second unit **4**, the third driving roller **25** and the third driven roller **26** come into contact with each other, and the fourth driving roller **29** and the fourth driven roller **30** also come into contact with each other. When the third unit **5** is opened with respect to the second unit **4**, the third driving roller **25** and the third driven roller **26** are spaced apart from each other, and the fourth driving roller **29** and the fourth driven roller **30** are also spaced apart from each other.

The document transported on the reverse transport path R**3** is discharged obliquely upward including a −Y direction component by the fourth transport roller pair **28**, and is supported in an inclined posture by an upper surface **4***a* of the second unit **4**.

In the embodiment, the device main body **2** is rotated by the power of a posture switching motor **40** (refer to FIG. **8**) under the control of the control unit **80**, and switches the posture. The control unit **80** controls the posture switching motor **40** based on input information from an external device **500** coupled to the scanner **1**. FIG. **8** illustrates a state in which a back cover **66** (refer to FIG. **2**) constituting an exterior of the back of the device is removed. A reference numeral **41** denotes a rotation conversion unit that converts rotation of the posture switching motor **40** into rotation of the device main body **2**. The posture switching motor **40** and

the rotation conversion unit **41** are provided close to a side surface in the −X direction in the width direction of the device. Being closer to the side surface in the −X direction in the width direction of the device means being located in the −X direction from the center position of the device in the X-axis direction.

Two supported units **63***b* are provided in a first frame **63** constituting a base body of the first unit **3** to be spaced apart from each other in the X-axis direction. Two main body rotating shafts **6***c* are provided in the main body support unit **6** to be spaced apart from each other in the X-axis direction. The first frame **63**, that is, the device main body **2** is rotatable about the main body rotating shaft **6***c* by the main body rotating shaft **6***c* passing through the supported unit **63***b*. The main body rotating shaft **6***c* is a rotating shaft having a rotation axis center parallel to the X-axis direction.

The posture switching motor **40** is provided on the first frame **63**. The first frame **63** has a shape along the reading transport path R**2**. The posture switching motor **40** is provided on the back surface side of the first frame **63** provided in an inclined posture. The rotation conversion unit **41** includes a gear **47***b* rotatably provided in the first unit **3** and rotated by the power of the posture switching motor **40**, and a standing wall portion **6***a* fixed to the main body support unit **6** and having a tooth portion meshing with the gear **47***b*. The tooth portion is formed around the main body rotating shaft **6***c* of the standing wall portion **6***a*.

The configuration of the posture switching motor **40** and the above-described rotation conversion unit **41** except for the tooth portion of the standing wall portion **6***a* is provided in the first unit **3**, that is, the device main body **2**. Therefore, when the gear **47***b* is rotated by the power of the posture switching motor **40**, the device main body **2** is rotated and the posture is switched.

The control unit **80** (refer to FIG. **9**) can detect the posture of the device main body **2** based on a rotation direction of the posture switching motor **40** or the like. However, in the embodiment, since a first posture detection sensor **87** and a second posture detection sensor **88** which will be described below are provided, the control unit **80** can also detect the posture of the device main body **2** based on detection signals of the sensors. The normal reading posture and the booklet reading posture of the device main body **2** are held by supplying electric power to the posture switching motor **40** which is stopped and bringing the posture switching motor **40** into a hold state.

In the above-described embodiment, although the posture of the device main body **2** is switched by the power of the posture switching motor **40**, instead thereof or in addition thereto, a configuration in which the posture of the device main body **2** is switched by the user applying a force to the device main body **2** may be adopted.

Next, a control system in the scanner **1** will be described with reference to FIG. **9**. The control unit **80** performs various types of control of the scanner **1**, including document feeding, transport, discharge control, and reading control. A signal from the operation unit **7** is input to the control unit **80**.

The control unit **80** controls the transport motor **50** and the posture switching motor **40**. In the embodiment, each of the motors is a DC motor. Read data from the first reading unit **32** and the second reading unit **33** is input to the control unit **80**, and a signal for controlling each of the reading units is transmitted from the control unit **80** to each of the reading units. Signals from detection unit including a placement detection unit **92** (refer to FIG. **5**), a double feed detection unit **91**, a first document detection unit **93**, a second document detection unit **94**, a first posture detection sensor **87**, a second posture detection sensor **88**, a first rotation detection unit **89**, and a second rotation detection unit **90** are also input to the control unit **80**.

As illustrated in FIG. **8**, the first rotation detection unit **89** is a detection unit provided at an end portion of the device main body **2** in the −X direction. The control unit **80** can grasp an amount of rotation of each of the rollers provided in the document transport path by detecting an amount of rotation of the transport motor **50** with the first rotation detection unit **89**. The first rotation detection unit **89** is a rotary encoder including a rotary disk **89***a* and a detection unit **89***b*. Further, the second rotation detection unit **90** is a rotary encoder including a rotary disk provided on a rotating shaft **40***a* of the posture switching motor **40** and a detection unit. The control unit **80** can grasp the rotation direction and the amount of rotation of the posture switching motor **40** by detecting the amount of rotation of the posture switching motor **40** with the second rotation detection unit **90**.

The control unit **80** includes a CPU **81**, a flash ROM **82**, and a RAM **83**. The CPU **81** performs various types of operation processing according to a program stored in the flash ROM **82**, and controls an operation of the entire scanner **1**. The flash ROM **82** which is an example of a storage unit is a readable and writable non-volatile memory. The RAM **83** which is an example of a storage unit temporarily stores various types of information. An interface **84** included in the control unit **80** includes the first coupling unit **71** and the second coupling unit **72** described with reference to FIG. **2**. The control unit **80** transmits and receives data to and from an external device **500** via the interface **84**.

Next, other detection units will be described. The placement detection unit **92** is a detection unit provided upstream of the feeding roller **14**. The control unit **80** can detect the presence or absence of a document on the document support unit **11** based on a signal transmitted from the placement detection unit **92**. The first document detection unit **93** is a detection unit provided between the feeding roller **14** and the first transport roller pair **16**. The control unit **80** can detect passage of the leading end or the trailing end of the document at a detection position based on a signal transmitted from the first document detection unit **93**.

The double feed detection unit **91** is a detection unit provided between the feeding roller **14** and the first transport roller pair **16**, and includes an ultrasonic transmitting unit and an ultrasonic receiving unit which are disposed to face each other across the document feeding path R**1**. The control unit **80** can detect the double feed of the document by a signal transmitted from the double feed detection unit **91**. The second document detection unit **94** is a detection unit provided between the first transport roller pair **16** and the first reading unit **32** and the second reading unit **33**, and the control unit **80** can detect the passage of the leading end or the trailing end of the document at the detection position by a signal transmitted from the second document detection unit **94**.

Next, an example of processing performed by the control unit **80** will be described with reference to FIG. **10**. FIG. **10** is a flowchart illustrating processing performed by the control unit **80** when the posture of the device main body **2** is switched. In FIG. **10**, when a document reading instruction is received (Y: Yes in Step S**101**), the control unit **80** determines whether or not it is necessary to switch the posture of the device main body **2** (Step S**102**). It is assumed here that the document reading instruction is received from the external device **500** (refer to FIG. **9**) as an example. In the external device **500**, the type of the document to be read

can be set, and when the type of the document to be read is a card-like document or a booklet-like document, the control unit **80** sets the posture of the device main body **2** to the booklet reading posture, and when the type of the document to be read is a sheet-like document, the control unit **80** sets the posture of the device main body **2** to the normal reading posture.

In Step S**102**, an acquired document type and a current posture of the device main body **2** are compared with each other to determine whether or not it is necessary to switch the posture of the device main body **2**. As a result, when the posture switching is not necessary (N:No in Step S**102**), the document is read without performing the posture switching control (Step S**106**). When the posture switching is necessary (Y:Yes in Step S**102**), the control unit **80** switches the posture of the device main body **2** to the booklet reading posture (Step S**103**) when a target posture is the booklet reading posture based on the target posture (Step S**104**), and also switches the document transport path to the non-reverse transport path R**4** (Step S**105**). Steps S**104** and S**105** may be performed at the same time. Then, the document is read (Step S**106**).

In addition, when the target posture is the normal reading posture, the control unit **80** switches the posture of the device main body **2** to the normal reading posture (Step S**107**) based on the target posture (Step S**103**), and also switches the document transport path to the reverse transport path R**3** (Step S**108**). Steps S**107** and S**108** may be performed at the same time. Then, the document is read (Step S**106**). When the device main body **2** is in the normal reading posture, detection information of the double feed detection unit **91** is validated, and when the device main body **2** is in the booklet reading posture, the detection information of the double feed detection unit **91** is invalidated.

As described above, the scanner **1** includes the main body support unit **6** placed at the placement surface G of the device and the device main body **2** supported by the main body support unit **6**. The device main body **2** includes the reading transport path R**2** which is a document transport path that transports a document and faces the first reading unit **32** and the second reading unit **33** that read the document, the reverse transport path R**3** which is a document transport path located downstream of the reading transport path R**2**, reverses the read document upward and discharges the document, and the non-reverse transport path R**4** which is a document transport path located downstream of the reading transport path R**2** and discharges the read document without reversing the document. In addition, the flap **35** is provided for switching the document transport path coupled to the reading transport path R**2** to any one of the reverse transport path R**3** and the non-reverse transport path R**4**.

The device main body **2** is mounted to be rotatable with respect to the main body support unit **6**, and can be switched between the normal reading posture (FIG. **6**) and the booklet reading posture (FIG. **7**) in which an angle formed by the reading transport path R**2** and the placement surface G is smaller than that in the normal reading posture by rotation. The flap **35** couples the reading transport path R**2** to the reverse transport path R**3** when the device main body **2** is in the normal reading posture, and couples the reading transport path R**2** to the non-reverse transport path R**4** when the device main body **2** is in the booklet reading posture.

The scanner **1** can satisfactorily transport a document that is not easily bent using the non-reverse transport path R**4**. The document that is not easily bent includes a booklet and a card. The flap **35** couples the reading transport path R**2** to the reverse transport path R**3** when the device main body **2** is in the normal reading posture, and couples the reading transport path R**2** to the non-reverse transport path R**4** when the device main body **2** is in the booklet reading posture. Thus, it is possible to set a discharge direction of the document to a direction along the placement surface G rather than discharging the document using the non-reverse transport path R**4** when the normal reading posture is taken. As a result, it is possible to discharge a document having a larger size than that in a configuration in which a document is discharged using the non-reverse transport path R**4** when the normal reading posture is taken. Further, the angle formed by the reading transport path R**2** and the placement surface G can be made larger than that in the booklet reading posture by setting the device main body **2** in the normal reading posture, and the footprint of the device main body **2** can be curbed.

Further, the posture of the device main body **2** may be switched by a button included in the operation unit **7**. For example, one of the buttons constituting the operation unit **7** is assigned to a posture switching button, and when the posture switching button is pressed by the user while the current posture is the normal reading posture, the control unit **80** performs Steps S**104** and S**105**. Further, when the user presses the posture switching button while the current posture is the booklet reading posture, the control unit **80** controls the posture switching motor **40** to perform Steps S**107** and S**108**.

Next, a peripheral configuration of the feeding roller **14** and the separation roller **15** will be described in detail with reference to FIG. **11** and subsequent drawings and other drawings as necessary. Here, an arrow S in FIG. **11** and subsequent drawings corresponds to the feeding direction. As illustrated in FIG. **11**, a guide member **151**, a set guide **153**, a set flap **155**, a pressing lever **157**, and a skew correction mechanism **200** are provided around the separation roller **15**. Details of the skew correction mechanism **200** will be described below.

As illustrated in FIG. **4**, the guide member **151** is provided on the first frame **63**. As illustrated in FIGS. **12** to **15**, the set guide **153**, the set flap **155**, the pressing lever **157**, and the skew correction mechanism **200** are provided in the guide member **151**. The guide member **151** is a frame-like member, and the separation roller **15**, the set guide **153**, the set flap **155**, the pressing lever **157**, and the skew correction mechanism **200** are disposed inside the guide member **151**. In FIG. **13**, the set flap **155** is omitted. The guide member **151** is provided to be attachable to and detachable from the first frame **63** by a snap fit structure (not illustrated), and forms a part of the transport path of the document P in a state in which the guide member is mounted.

As illustrated in FIGS. **11** to **15**, the set guide **153** has a rotating shaft **153***a* on both sides in the X-axis direction. As illustrated in FIG. **14**, bearing units **151***a* are formed at both sides of the guide member **151** in the X-axis direction, and the rotating shaft **153***a* of the set guide **153** is rotatably supported by the bearing units **151***a*. The first frame **63** has a restriction structure (not illustrated) formed at both sides in the X-axis direction, and when the guide member **151** is mounted on the first frame **63**, movement of the rotating shaft **153***a* of the set guide **153** in the feeding direction is restricted by the restriction structure.

Torsion coil springs (not illustrated) are provided on both sides of the set guide **153** in the X-axis direction and generate a pressing force between the guide member **151** and the set guide **153**. The set guide **153** is pressed by the torsion coil spring in a rotation direction (a rotation direction

Rb in FIG. **14**) in which the downstream side in the feeding direction S is directed to the feeding roller **14** around the rotating shaft **153***a*.

As illustrated in FIG. **13**, contact portions **153***j* are formed at both side surfaces of the set guide **153** in the X-axis direction, and the contact portions **153***j* come into contact with the lower side of the guide member **151** to restrict the rotation (in the rotation direction Rb) of the set guide **153**. As illustrated in FIG. **5**, in a state in which the second unit **4** is open respect to the first unit **3**, the contact portions **153***j* come into contact with the lower side of the guide member **151**. When the second unit **4** is closed with respect to the first unit **3** from this state, the feeding roller **14** comes into contact with long ribs **153***c* and **153***d* of the set guide **153**, and thus the set guide **153** rotates by a predetermined amount in the rotation direction Ra in FIG. **14**. In this state, the contact portions **153***j* are spaced apart from the lower side of the guide member **151**.

A plurality of ribs extending in the document feeding direction are formed at the set guide **153** at predetermined intervals in the X-axis direction. The plurality of ribs include long ribs **153***c* and **153***d*, and short ribs **153***e* and **153***f* that are shorter than the long ribs in the feeding direction S. Here, the plurality of ribs are disposed to be line-symmetric with respect to a straight line passing through a center of the document P in the X-axis direction. Specifically, the long rib **153***c* and the long rib **153***d* are disposed to be symmetrical in the X-axis direction with respect to the straight line passing through the center of the document P, and the short rib **153***e* and the short rib **153***f* are disposed to be symmetrical in the X-axis direction with respect to the straight line passing through the center of the document P. However, the ribs may not necessarily be disposed to be symmetrical in the X-axis direction with respect to the straight line passing through the center of the document P.

As illustrated in FIG. **11**, the long rib **153***c* and the long rib **153***d* are formed at positions capable of coming into contact with a cylindrical portion **98***b* forming the outer periphery of the torque limiter, and are configured such that the long ribs **153***c* and **153***d* can come into contact with the cylindrical portion **98***b* when the set guide **153** rotates in the rotation direction Ra.

As illustrated in FIG. **12**, two shaft portions **153***h* are formed in the set guide **153**, and the pressing lever **157** is pivotally supported by the shaft portions **153***h* as illustrated in FIG. **12** and the like. A reference numeral **157***a* is a shaft fitting portion of the pressing lever **157** that is fitted to the shaft portion **153***h*. In the embodiment, a rotation center position of the pressing lever **157** and a rotation center position of the set guide **153** coincide with each other. The rotation center position of the pressing lever **157** and the rotation center position of the set guide **153** may be different from each other. A torsion coil spring (not illustrated) is provided at a position adjacent to the pressing lever **157** to generate a pressing force between the pressing lever **157** and the set guide **153**. The pressing lever **157** is pressed by the coil spring in a rotation direction (the rotation direction Ra) in which the downstream side of the feeding direction S is directed to the feeding roller **14** about the shaft portion **153***h*. That is, the pressing lever **157** is pressed by the coil spring in a direction in which a tip end portion **157***b* is directed to the feeding roller **14**.

As illustrated in FIGS. **11**, **14**, and **17**, a contact portion **153***k* is formed at the set guide **153**, and when the pressing lever **157** comes into contact with the contact portion **153***k*, the rotation (in the rotation direction Rb) of the pressing lever **157** is restricted. As illustrated in FIG. **5**, in a state in which the second unit **4** is open with respect to the first unit **3**, the pressing lever **157** comes into contact with the contact portion **153***k*. When the second unit **4** is closed with respect to the first unit **3** from this state, the feeding roller **14** comes into contact with the pressing lever **157**, and thus the pressing lever **157** rotates by a predetermined amount in the rotation direction Ra. Since rotation limit of the pressing lever **157** in the state in which the second unit **4** is open is restricted by the contact portion **153***k*, the pressing lever **157** can appropriately rotate when the second unit **4** is closed. In this state, the pressing lever **157** is slightly separated from the contact portion **153***k*.

As illustrated in FIGS. **11** to **14**, one of the two pressing levers **157** protrudes toward the transport path of the document P from between the long rib **153***c* and the short rib **153***e* located in the +X direction with respect to the long rib **153***c* in the set guide **153**. Further, the other one of the two pressing levers **157** protrudes toward the transport path of the document P from between the long rib **153***f* and the short rib **153***d* located in the −X direction with respect to the long rib **153***d* in the set guide **153**. Further, the two pressing levers **157** are disposed at positions symmetrical in the X-axis direction with respect to the straight line passing through the center of the document P. Furthermore, the two pressing levers **157** are rotatable independently of each other. In addition, the two pressing levers **157** are within a region of the feeding roller **14** in the X-axis direction and are located at both end portions of the feeding roller **14**.

As illustrated in FIGS. **11** and **12**, two set flaps **155** are provided. As illustrated in FIG. **16**, the two set flaps **155** are provided on a substantially shaft-like base portion **155***a* extending in the X-axis direction, and rotate integrally. Shaft portions **155***b* are formed at both sides of the base portion **155***a* in the X-axis direction, and each of the shaft portions **155***b* serves as a rotating shaft of the set flap **155**. The shaft portions **155***b* are rotatably supported by the first frame **63**.

In FIG. **16**, a cam follower portion **155***c* is formed in the +X direction with respect to the shaft portion **155***b* in the +X direction. A set flap cam **163** is provided to be able to come into contact with the cam follower portion **155***c*. The set flap cam **163** is fixed to an end portion of a shaft **165** in the −X direction, and a gear **166** is provided at an end portion of the shaft **165** in the +X direction via a one way clutch **167**. A driving force of the transport motor **50** is transmitted to the gear **166**, and the gear **166** rotates in accordance with the rotation of the transport motor **50**. The power of the transport motor **50** is transmitted to the shaft **165** via the gear **166** and the one way clutch **167**.

The set flap cam **163** is provided with a spring **164**. The spring **164** applies a pressing force to a first spring hook portion (not illustrated) and the set flap cam **163**, and thus a pressing force in the rotation direction Rb acts on the set flap cam **163**, that is, the shaft **165**. FIG. **16** illustrates a feeding standby state in which the cam follower portion **155***c* is in contact with the set flap cam **163** and the set flap **155** blocks the document feeding path. In this state, the leading end of the document P to be set comes into contact with the set flap **155**, and entry between the feeding roller **14** and the separation roller **15** is restricted. In this state, rotation of the set flap cam **163**, that is, the shaft **165** in the rotation direction Rb is restricted by the action of the one way clutch **167**. In addition, the gear **166** is stopped due to a load in a power transmission path between the gear **166** and the transport motor **50**.

When the transport motor **50** rotates forward from this state and the gear **166** rotates in the rotation direction Rb, the shaft **165** rotates in the rotation direction Rb due to a

pressing force of the spring **164**, that is, the set flap cam **163** rotates in the rotation direction Rb. Thus, the set flap cam **163** is disengaged from the cam follower portion **155***c*, the set flap **155** rotates in the rotation direction Ra, and the set flap **155** is retracted from the document feeding path R**1**. When the set flap **155** is retracted from the document feeding path R**1**, the set document P can be directed to between the feeding roller **14** and the separation roller **15**. Due to the forward rotation of the transport motor **50**, each of the rollers provided in the transport path of the document P rotates in a direction in which the document P is transported downstream. At this time, the gear **166** in FIG. **16** continues to rotate in the rotation direction Rb, but the torque of the transport motor **50** is not transmitted to the shaft **165** by the action of the one way clutch **167**.

When the transport motor **50** rotates reversely in a state in which the set flap **155** is retracted from the document feeding path R**1**, the gear **166** rotates in the rotation direction Ra in FIG. **16**. When the gear **166** rotates in the rotation direction Ra, the torque in the rotation direction Ra is transmitted to the shaft **165** by the action of the one way clutch **167**. Thus, the shaft **165**, that is, the set flap cam **163** rotates in the rotation direction Ra against the pressing force of the spring **164** to push up the cam follower portion **155***c*, and the set flap **155** rotates in the rotation direction Rb to return to the state illustrated in FIG. **16**.

The configuration around the separation roller **15** has been described above, and the set guide **153** will be further described below. As described above, FIG. **17** illustrates a state immediately before the feeding of the document P is started (a feeding start state). A reference numeral T**1** denotes a contact position (a nipping position) between the feeding roller **14** and the separation roller **15**, and is a contact position when it is assumed that both rollers are not elastically deformed. A reference numeral T**2** denotes a contact position between the set guide **153** and the feeding roller **14**, and a reference numeral T**3** denotes a contact position between the tip end portion **157***b* of the pressing lever **157** and the feeding roller **14**. As illustrated in the drawing, the contact position T**2** is located upstream of the contact position T**1** in the feeding direction, and the contact position T**3** is located upstream of the contact position T**2** in the feeding direction. A reference numeral Sa is a path forming surface formed by the upper surface of the first frame **63** .

In FIGS. **18** and **19**, the set flap **155** and the pressing lever **157** are omitted in order to avoid complication of the drawings. FIG. **18**A is a view corresponding to FIG. **17**, and in the feeding start state, unless a thick medium such as a booklet-like document is used, a gap d is formed between the long ribs **153***c* and **153***d* and the cylindrical portion **98***b* of the set guide **153**. In addition, since the set guide **153** is advanced with respect to the feeding roller **14**, the document feeding path R**1** toward the contact position T**1** is narrowed. The set guide **153** eliminates the gap d when a thickness of the document to be set exceeds a predetermined thickness, and as illustrated in FIG. **18**B, the cylindrical portion **98***b*, that is, the separation roller **15** is pushed down by the long rib **153***d*. Thus, the separation roller **15** is separated from the feeding roller **14**. The relationship between the set guide **153** and the separation roller **15** has been described above.

FIG. **19**A illustrates the feeding start state when a plurality of sheet-like documents Pt are placed, and in this state, the long ribs **153***c* and **153***d* are separated from the cylindrical portion **98***b* and the separation roller **15** is not pressed down. As an example, when a thickness of a document bundle of the sheet-like documents Pt is less than 2 mm, the long ribs **153***c* and **153***d* do not come into contact with the cylindrical portion **98***b*. In this state, an upper surface **153***p* of the set guide **153** applies a preliminary separating action to the leading end of the document Pt. The upper surface **153***p* of the set guide **153** is formed by the upper surface of the entire set guide **153** including the long ribs **153***c* and **153***d* and the short ribs **153***e* and **153***f* described above.

FIG. **19**B illustrates a state in which a booklet-like document Pb is fed after being placed. In the process of reaching this state, the set guide **153** is pushed down by the booklet-like document Pb, the long ribs **153***c* and **153***d* come into contact with the cylindrical portion **98***b*, the separation roller **15** is pushed down, and a gap is formed between the feeding roller **14** and the separation roller **15**. For example, when a thickness of the booklet-like document Pb is 2 mm or more, the long ribs **153***c* and **153***d* come into contact with the cylindrical portion **98***b*. When the booklet-like document Pb is transported by the feeding roller **14**, the separation roller **15** is pushed down by the booklet-like document Pb. When the booklet-like document Pb is nipped and transported by the feeding roller **14** and the separation roller **15**, it is preferable that the long ribs **153***c* and **153***d* are separated from the cylindrical portion **98***b* as illustrated in FIG. **19**B Since the separation roller **15** is not pushed down by the set guide **153**, it is possible to stably nip the booklet-like document Pb between the separation roller **15** and the feeding roller **14**.

As described above, the scanner **1** or the document feeding device **150** includes the set guide **153** upstream of the contact position T**1** between the feeding roller **14** and the separation roller **15** in the document feeding direction. The set guide **153** is capable of advancing and retracting with respect to the feeding roller **14** in accordance with the thicknesses of the document, and narrows the document feeding path R**1** toward the contact position T**1** by advancing with respect to the feeding roller **14**. The set guide **153** is capable of engaging with the separation roller **15** and displaces the separation roller **15** in a direction away from the feeding roller **14** when it is pushed down in a direction away from the feeding roller **14** by the document P having a thickness exceeding a predetermined thickness. In this way, when the document P having a thickness exceeding a predetermined thickness is fed, the separation roller **15** is separated from the feeding roller **14** in advance before the document P enters between the separation roller **15** and the feeding roller **14**, and thus it is possible to curb a situation in which the document P having the thickness exceeding the predetermined thickness collides with the separation roller **15** and cannot be fed.

Further, as illustrated in FIG. **19**A, when a plurality of sheet-like documents Pt are supported by the document support unit **11**, the upper surface of the set guide **153** applies a separating action to the leading ends of the documents Pt. Thus, the separation by the set guide **153** is performed prior to the separation of the documents Pt by the feeding roller **14** and the separation roller **15**, and thus it is possible to more reliably separate the documents Pt.

In addition, the set guide **153** includes a plurality of ribs (the long rib **153***c*, the long rib **153***d*, the short rib **153***e*, and the short rib **153***f*) extending in the feeding direction S of the document P, and the plurality of ribs are disposed to be symmetrical in the X-axis direction with respect to a straight line passing through the center of the document P in the width direction (the X-axis direction) which is a direction intersecting the feeding direction S. Thus, a frictional force applied to the document P by the set guide **153** becomes equal on the left and right sides in the width direction, and thus the skew of the document P can be curbed.

In addition, the straight line passing through the center of the document P in the width direction passes through the center position of the feeding roller **14** and the center position of the separation roller **15**, and the long ribs **153***c* and **153***d* which are two ribs close to the straight line among the plurality of ribs are located with the separation roller **15** interposed therebetween in the width direction and are located in the region of the feeding roller **14**. Thus, the document feeding path toward the contact position T**1** can be appropriately narrowed, and the number of documents toward the contact position T**1** can be appropriately restricted. As a result, the separating action by the separation roller **15** can be appropriately obtained.

In addition, in the embodiment, the separation unit disposed to face the feeding roller **14** is configured of the rotatable separation roller **15**, and the set guide **153** is configured to engage with the separation roller **15** by coming into contact with the cylindrical portion **98***b* centered on a rotation center of the separation roller **15**. As described with reference to FIG. **18**, when the thickness of the document is thinner than or equal to a predetermined thickness, there is the gap d between the set guide **153** and the cylindrical portion **98***b*, and when the thickness of the document exceeds the predetermined thickness, the set guide **153** comes into contact with the cylindrical portion **98***b* and displaces the separation roller **15** in a direction away from the feeding roller **14**. Thus, it is possible to reliably separate the separation roller **15** from the feeding roller **14**. Although the set guide **153** pushes down the cylindrical portion **98***b* constituting the outer periphery of the torque limiter in the embodiment, the set guide **153** may push down the rotating shaft of the separation roller **15**. In any case, the set guide **153** indirectly pushes down the separation roller **15** via another member, but the set guide **153** may directly push down the separation roller **15**.

Next, the movement of the pressing lever **157** will be described with reference to FIG. **20**. In FIG. **20**, the set flap **155** is not illustrated. In FIG. **20**, a reference numeral P**1** denotes a document to be fed, a reference numeral Pd denotes a document bundle below the document P**1**, and a reference numeral P**2** denotes a document which is the uppermost medium of the document bundle Pd and is to be fed following the document P**1**. FIG. **20**A illustrates a state in which the document P**1** is being fed, and in this state, the feeding roller **14** applies a feeding force to the document P**1** toward the downstream side in the feeding direction S by the forward rotation (a direction of an arrow Rg) of the feeding roller **14**, and thus the document bundle Pd also tends to move toward the downstream side in the feeding direction S. Therefore, the document bundle Pd presses down the pressing lever **157** against the spring force of the coil spring (not illustrated), and the pressing lever **157** does not protrude upward from the set guide **153**.

In this state, the pressing lever **157** is not in contact with the cylindrical portion **98***b*, and the pressing lever **157** does not press down the separation roller **15**. Thus, it is possible to prevent a timing at which the separation roller **15** is separated from the feeding roller **14** from being inappropriate.

Next, when a trailing end of the document P**1** passes through the contact position T**1** between the feeding roller **14** and the separation roller **15** from the state illustrated in FIG. **20**A, spring back of the torque limiter that applies a rotational load to the separation roller **15** occurs, and the separation roller **15** rotates reversely (a direction of an arrow Rj). In the embodiment, since the one way clutch is not provided in the feeding roller **14**, the feeding roller **14** is also reversely rotated (a direction of an arrow Rh) in accordance with the reverse rotation of the separation roller **15**.

Here, when the feeding roller **14** is freely rotatable reversely, the document bundle Pd including the document P**2** is strongly returned to the upstream side in the feeding direction S by the reverse rotation of the feeding roller **14**, and thus there is a concern that remarkable skew feeding or non-feeding occurs. However, the pressing lever **157** is provided, and after the trailing end of the fed document P**1** passes through the contact position T**1**, the document bundle Pd is pressed toward the feeding roller **14** by the tip end portion **157***b* of the pressing lever **157**. Thus, the phenomenon in which the document bundle Pd is strongly returned to the upstream side in the feeding direction S is curbed, and it is possible to curb paper feeding failure such as skew or non-feeding. In particular, in the embodiment, since the document is fed from the uppermost document among the documents supported by the document support unit **11**, the uppermost document P**2** to be returned to the upstream side in the feeding direction S by the reverse rotation of the feeding roller **14** is likely to be skewed and is likely to be returned to the upstream side in the feeding direction S. However, due to the action of the pressing lever **157** described above, it is possible to curb the phenomenon in which the document P**2** is strongly returned to the upstream side in the feeding direction S, and it is possible to curb a feeding failure such as skew or non-feeding.

In addition, in the embodiment, the pressing lever **157** rotates about the shaft portion **153***h* serving as the rotating shaft so that the tip end portion **157***b* advances and retracts with respect to the feeding roller **14**, and the shaft portion **153***h* is located on the upstream side in the feeding direction S with respect to the tip end portion **157***b*. Here, when the document P is about to be returned to the upstream side in the feeding direction S by the reverse rotation of the feeding roller **14**, if the pressing lever **157** which comes into contact with the document P is easily rotated in the rotation direction Rb, the document P is easily returned to the upstream side in the feeding direction S. However, since the shaft portion **153***h* is located on the upstream side in the feeding direction S with respect to the tip end portion **157***b*, the pressing lever **157** which comes into contact with the document P is configured to be difficult to rotate, and it is possible to effectively curb the phenomenon in which the document P is returned to the upstream side by the reverse rotation of the feeding roller **14**.

In addition, the set guide **153** is provided with a contact portion **153***k* that restricts a rotation limit of the pressing lever **157** in a direction in which the tip end portion **157***b* of the pressing lever **157** advances to the feeding roller **14**. Thus, the rotation of the pressing lever **157** in the rotation direction Rb is more reliably curbed, and it is possible to effectively curb the phenomenon in which the document P is returned to the upstream side by the reverse rotation of the feeding roller **14**.

In addition, in the embodiment, the pressing lever **157** is provided within a region of the feeding roller **14** in the X-axis direction, that is, the width direction which is a direction intersecting the feeding direction S. Thus, the document can be reliably pressed against the feeding roller **14** by the pressing lever **157**, and the phenomenon in which the medium is returned to the upstream side by the reverse rotation of the feeding roller **14** can be more reliably curbed.

In the embodiment, the pressing lever **157** is provided at both end portions in the width direction with respect to one feeding roller **14**. Thus, it is possible to curb skew when the document P is about to be returned to the upstream side by

the reverse rotation of the feeding roller **14**. When a plurality of feeding rollers **14** are provided in the X-axis direction, it is preferable that the pressing levers **157** are provided at both end portions with respect to the entirety of the plurality of feeding rollers **14**. Thus, it is possible to curb skew when the document P is about to be returned to the upstream side. Further, instead of the configuration in which the plurality of pressing levers **157** are provided, for example, one pressing lever may be provided at a center position in the X-axis direction.

In addition, in the embodiment, the plurality of pressing levers **157** can independently advance and retract with respect to the feeding roller **14**. Here, when the plurality of pressing levers **157** are configured to integrally advance and retract, a difference in a pressing state of the document P by each of the plurality of pressing levers **157** occurs, and there is a concern that skew of the document P occurs. For example, when one of the pressing levers **157** is in contact with the document and the other pressing lever **157** is not in contact with the document P, skew of the document P occurs. However, in the embodiment, since the plurality of pressing levers **157** can independently advance and retract with respect to the feeding roller **14**, each of the plurality of pressing levers **157** appropriately presses the document P, and the above-described skew can be curbed.

In the embodiment, as described with reference to FIG. **17**, since the contact position T**3** at which the pressing lever **157** comes into contact with the feeding roller **14** is upstream of the contact position T**2** at which the set guide **153** comes into contact with the feeding roller **14**, when the document P is about to be returned to the upstream side by the reverse rotation of the feeding roller **14**, the document P can be pressed for a longer period, and the phenomenon in which the document P is returned to the upstream side by the reverse rotation of the feeding roller **14** can be more reliably curbed.

Further, the pressing force with which the coil spring (not illustrated) presses the pressing lever **157** is smaller than the pressing force with which the coil spring (not illustrated) presses the set guide **153**. For this reason, when the document P is fed, the pressing lever **157** is easily retracted from the document feeding path R**1**, and it is possible to curb the pressing lever **157** hindering feeding of the document P.

As described above, the scanner **1** according to the embodiment includes the document support unit **11** that is a placement portion on which the document P that is a medium is placed, the document feeding path R**1**, the reading transport path R**2**, the reverse transport path R**3**, and the non-reverse transport path R**4** that are transport paths along which the document P is transported, and the feeding roller **14** that is one of the transport rollers for transporting the document P along the transport path, and further includes the skew correction mechanism **200** that corrects skew of the document P to be transported. Next, the skew correction mechanism **200** will be described in detail. FIGS. **21** to **23** illustrate the skew correction mechanism **200** according to the embodiment. The skew correction mechanism **200** illustrated in FIGS. **21** to **23** is mounted on the set guide **153** as illustrated in FIG. **13**.

The skew correction mechanism **200** according to the embodiment includes a lever member **180** which is provided upstream of the contact position T**1** which is a nipping position between the feeding roller **14** and the separation roller **15** in the feeding direction S and is capable of detecting the document P being transported, and a load member **190** which is capable of preventing the transport of the document P at a partial position in the width direction.

As illustrated in FIGS. **21** to **23**, the skew correction mechanism **200** according to the embodiment includes a first skew correction unit **200**A including a first lever member **180**A of the lever member **180** and a first load member **190**A of the load member **190**, and a second skew correction unit **200**B including a second lever member **180**B of the lever member **180** and a second load member **190**B of the load member **190**.

Here, the first lever member **180**A and the second lever member **180**B can be displaced between an advanced position at which the first lever member **180**A and the second lever member **180**B can come into contact with the document P and are advanced to the transport path of the document P and a retracted position at which the first lever member **180**A and the second lever member **180**B are retracted from the transport path of the document P when the document P comes into contact with and passes through the first lever member **180**A and the second lever member **180**B. Here, FIG. **21** illustrates a state in which both the first lever member **180**A and the second lever member **180**B are at the advanced position. FIG. **24**A corresponding to FIG. **21** illustrates a state in which the first lever member **180**A is at the advanced position. As illustrated in FIGS. **14** and **24**A, the first lever member **180**A and the second lever member **180**B at the advanced position are positioned by being in contact with the set guide **153**. On the other hand, FIG. **22** illustrates a state in which the leading end Pe (refer to FIG. **24**) of the skewed and document P being transported comes into contact with only the first lever member **180**A of the first lever member **180**A and the second lever member **180**A and the first lever member **180**B is displaced from the advanced position to the retracted position. FIG. **26**A illustrates a moment when the leading end Pe of the document P comes into contact with the first lever member **180**A. Further, following the state of FIG. **26**A, the first lever member **180**A is displaced from the advanced position to the retracted position according to the transport of the document P, and the transport of the document P is continued as illustrated in FIG. **26**B. In FIG. **26**B, the first lever member **180**A is located at the retracted position. FIG. **24**B corresponding to FIG. **22** illustrates a state in which the first lever member **180**A is at the retracted position.

The first load member **190**A and the second load member **190**B are provided downstream of the first lever member **180**A and the second lever member **180**B in the feeding direction S, and can be displaced between a blocking position at which a part of the transport path in the width direction intersecting the feeding direction S is blocked and an opening position at which the transport path is opened without blocked. Here, FIGS. **21** and **22** illustrate a state in which both the first load member **190**A and the second load member **190**B are at the blocking position. FIG. **25**A corresponding to FIG. **21** and FIG. **25**B corresponding to FIG. **22** illustrates a state in which the first load member **190**A is at the blocking position. As illustrated in FIGS. **14** and **25**A, the first load member **190**A and the second load member **190**B at the blocking position are positioned by being in contact with the set guide **153**. On the other hand, FIG. **23** illustrates a state in which the leading end Pe of the skewed and document P being transported comes into contact with the first lever member **180**A and the first lever member **180**A is displaced from the advanced position to the retracted position and a state in which the first load member **190**A is displaced from the blocking position to the opening position. FIG. **25**C corresponding to FIG. **23** illustrates a state in which the first load member **190**A is at the opening position.

The operation of the lever member **180** and the load member **190** described above with reference to FIGS. **21** to **25** is a case in which the document P is transported in a skewing direction in which the leading end Pe of the skewed and transported document P comes into contact with only the first lever member **180**A of the first lever member **180**A and the second lever member **180**B, that is, a case of skew transport in which the leading end Pe on the first lever member **180**A side precedes the leading end Pe on the second lever member **180**B side in the width direction of the document. On the other hand, in a case of the skew transport in which the leading end Pe on the second lever member **180**B side precedes the leading end Pe on the first lever member **180**A side in the width direction of the document, the operation of the lever member **180** and the load member **190** can be described by setting the first lever member **180**A and the second lever member **180**B reversely and setting the first load member **190**A and the second load member **190**B reversely in the above description.

Here, the feeding roller **14** is provided between the first load member **190**A and the second load member **190**B in the width direction, and as illustrated in FIGS. **24** and **25**, when the first load member **190**A and the second load member **190**B are located at the blocking position, the first load member **190**A and the second load member **190**B overlap a part of the feeding roller **14** when seen in the width direction. As described above, the first load member **190**A is configured to be located at the blocking position when the first lever member **180**A is located at the advanced position, and to be displaceable from the blocking position to the opening position when the first lever member **180**A is displaced from the advanced position and located at the retracted position. Further, the second load member **190**B is configured to be located at the blocking position when the second lever member **180**B is located at the advanced position, and to be displaceable from the blocking position to the opening position when the second lever member **180**B is displaced from the advanced position and located at the retracted position.

As described above, it is preferable that the first load member **190**A and the second load member **190**B are configured to overlap at least a part of the feeding roller **14** when seen in the width direction when the first load member **190**A and the second load member **190**B are located at the blocking position. In other words, it is preferable to provide the skew correction mechanism **200** at a position that is not separated from the feeding roller **14** in the feeding direction S. With such a configuration, even when a medium having low stiffness such as a thin medium is used, skew correction can be performed at a position at which the stiffness of the medium does not become low (a position close to the feeding roller **14**), and thus skew correction can be performed while bending of the medium is curbed, and skew correction accuracy can be improved.

Further, as described above, the scanner **1** according to the embodiment includes the feeding roller **14** that feeds the document P placed at the document support unit **11** as the transport roller, and the separation roller **15** that is disposed to face the feeding roller **14** and nips, when a plurality of documents P are placed on top of each other at the document support unit **11**, the documents P together with the feeding roller **14** to separate the documents P. As illustrated in FIG. **25**A and FIG. **25**B, a contact position T**4** at which the first load member **190**A and the second load member **190**B located at the blocking position come into contact with the document P to be transported overlaps the contact position T**1** which is the nipping position between the feeding roller **14** and the separation roller **15** when seen in the width direction. The medium such as the document P has higher stiffness as it is closer to the nipping position between the feeding roller **14** and the separation roller **15**, and with such a configuration, due to the contact position T**4** and the contact position T**1** being close to each other, it is possible to perform the skew correction at a position at which the stiffness of the medium is not reduced. Therefore, the scanner **1** of the embodiment can perform the skew correction while the bending of the medium is curbed, and can improve the skew correction accuracy.

Further, as illustrated in FIG. **24**A, when the first lever member **180**A and the second lever member **180**B are located at the advanced position, the first lever member **180**A and the second lever member **180**B overlap a part of the feeding roller **14** when seen in the width direction. As described above, it is preferable that the first lever member **180**A and the second lever member **180**B overlap at least a part of the transport roller such as the feeding roller **14** when seen in the width direction when the first lever member **180**A and the second lever member **180**B are located at the advanced position. With such a configuration, it is possible to arrange the first lever member **180**A and the second lever member **180**B close to the first load member **190**A and the second load member **190**B in the feeding direction, and it is possible to correct skew with high accuracy.

As illustrated in FIGS. **21** to **23**, the skew correction mechanism **200** according to the embodiment includes a first skew correction unit **200**A and a second skew correction unit **200**B in the width direction. Here, the first skew correction unit **200**A includes the first lever member **180**A, a first contact portion **182**A, and a first rotating shaft **181**A having one end provided with the first lever member **180**A and the other end provided with the first contact portion **182**A. The first contact portion **182**A is displaceable between a first restriction position at which displacement of the first load member **190**A from the blocking position to the opening position is restricted and a first non-restriction position at which the restriction is released. In addition, the second skew correction unit **200**B includes the second lever member **180**B, a second contact portion **182**B, and a second rotating shaft **181**B having one end provided with the second lever member **180**B and the other end provided with the second contact portion **182**B. The second contact portion **182**B is displaceable between a second restriction position at which displacement of the second load member **190**B from the blocking position to the opening position is restricted and a second non-restriction position at which the restriction is released. As illustrated in FIG. **25**A, when the first lever member **180**A is located at the advanced position, a gap is provided between the first contact portion **182**A located at the first restriction position and the first load member **190**A located at the blocking position. When the document P being transported presses the first load member **190**A, the first load member and the first contact portion **182**A come into contact with each other. When the first lever member **180**A is located at the retracted position as illustrated in FIGS. **22** and **23**, the first contact portion **182**A is located at the first non-restriction position. Thus, the first load member **190**A becomes displaceable from the blocking position to the opening position, and the leading end Pe of the document P being transported pushes the first load member **190**A, whereby the first load member **190**A is displaced from the blocking position to the opening position (refer to FIG. **25**B and FIG. **25**C). Similarly, when the second lever member **180**B is located at the advanced position, a gap is provided between the second contact portion located at the second restriction

position and the second load member. When the document P being transported presses the second load member **190**B, the second load member and the second contact portion **182**B come into contact with each other. The second contact portion **182**B is located at the second non-restriction position when the second lever member **180**B is located at the retracted position. Thus, the second load member **190**B becomes displaceable from the blocking position to the opening position, and the leading end of the document P being transported pushes the second load member, whereby the second load member is displaced from the blocking position to the opening position.

As in the skew correction mechanism **200** of the embodiment, it is possible to simply configure the skew correction mechanism **200** by adopting a configuration in which the movements of the lever member **180** and the load member **190** are not directly but indirectly interlocked with each other. In the skew correction mechanism **200** according to the embodiment, since the contact portion **182** (the first contact portion **182**A and the second contact portion **182**B) is provided, the movements of the lever member **180** (the first lever member **180**A and the second lever member **180**B) and the load member **190** (the first load member **190**A and the second load member **190**B) are not directly interlocked with each other. However, a configuration may be adopted in which the load member **190** is also displaced from the blocking position to the opening position in direct conjunction with the displacement of the lever member **180** from the advanced position to the retracted position. That is, the load member **190** (the first load member **190**A and the second load member **190**B) may be configured to be capable of being displaced from the blocking position to the opening position in accordance with the displacement of the lever member **180** (the first lever member **180**A and the second lever member **180**B) from the advanced position to the retracted position.

Here, in more detail with reference to FIGS. **21** to **23**, the skew correction mechanism **200** according to the embodiment includes the lever member **180**, the rotating shaft **181** (the first rotating shaft **181**A and the second rotating shaft **181**B), the contact portion **182**, and the load member **190** in each of the first skew correction unit **200**A and the second skew correction unit **200**B. Additionally, a guide portion **183** (a first guide portion **183**A and a second guide portion **183**B) that guides transport of the document in the transport path of the document P, a coil spring **184** (a first coil spring **184**A and a second coil spring **184**B) that biases the rotating shaft **181** in the rotation direction Rb, and a coil spring **191** (a first coil spring **191**A and a second coil spring **191**B) that biases the load member **190** in the rotation direction Rb are further provided. Here, as illustrated in FIG. **25**B and FIG. **25**C, the load member **190** has a rotating shaft **190***a*, and is configured to rotate in the rotation direction Ra by being pressed by the leading end of the document P being transported after the contact portion **182** is displaced from the restriction position to the non-restriction position by the lever member **180** being displaced from the advanced position to the retracted position. Further, the load member **190** is configured to rotate in the rotation direction Rb by a spring force of the coil spring **191** after the trailing end of the document P passes through the load member **190**. Since a gap is provided between the contact portion **182** located at the restriction position and the load member **190** located at the blocking position, the contact portion **182** and the load member **190** easily return to the restriction position and the blocking position after the trailing end of the transported document P passes through the load member **190** and the lever member **180**.

When the spring force of the coil spring **184** is weak, and the document P is transported and the lever member **180** is pressed by the leading end of the document P, the rotating shaft **181** rotates in the rotation direction Ra. When the rotating shaft **181** rotates in the rotation direction Ra, the contact portion **182** is displaced from the restriction position to the non-restriction position as illustrated in FIG. **25**B, and thus the load member **190** is rotates in the rotation direction Ra by being pressed by the leading end Pe of the document P being transported as illustrated in FIG. **25**C. Also, after the trailing end of the document P passes the load member **190**, the load member **190** rotates in the rotation direction Rb by the spring force of the coil spring **191**.

That is, in the skew correction mechanism **200** of the embodiment, when the document P is transported, the leading end Pe of the document P on the leading side in the width direction of the document is detected by the lever member **180**, further transport of the document P on the leading side in the width direction of the document is curbed by the load member **190**, transport of the document P on the trailing side in the width direction of the document is allowed, and thus the degree of skew is improved. When the leading end Pe of the document P on the trailing side in the width direction of the document is detected by the lever member **180**, the transport of the document P is allowed on both sides in the width direction of the device. For example, referring to FIG. **26**, the leading end Pe of the document P on the leading side in the width direction of the document is detected by the first lever member **180**A. Then, the first load member **190**A on the trailing side in the width direction of the document is displaced from the blocking position to the opening position as illustrated in FIG. **26**B, and the transport of the document P is continued until the leading end Pe of the document P on the trailing side in the width direction of the document is detected by the second lever member **180**B as illustrated in FIG. **26**C. At this time, since the second load member **190**B on the leading side in the width direction of the document is located at the blocking position, the degree of skew feeding is improved. Then, when the leading end Pe of the document P on the trailing side is detected by the second lever member **180**B, the second load member **190**B is displaced from the blocking position to the opening position, and the entire document P is transported without being blocked. The outline of the skew correction operation of the skew correction mechanism **200** according to the present embodiment has been described above.

In the scanner **1** of the embodiment, the feeding roller **14** is provided between the first lever member **180**A and the second load member **190**B and between the second lever member **180**B and the first load member **190**A in the width direction. That is, the first lever member **180**A and the first load member **190**A which are separated from each other in the width direction are linked to each other, and the second lever member **180**B and the second load member **190**B which are separated from each other in the width direction are linked to each other. With such a configuration, it is possible to effectively curb the skew becoming larger than a predetermined angle. In addition, it is possible to effectively correct skew even with respect to the document P having a narrow width by adopting a configuration in which a link destination of the load member **190** with respect to the lever member **180** straddles the feeding roller **14**.

Further, as illustrated in FIGS. **21** to **23**, the first lever member **180**A is provided at a position overlapping a part of

the second load member **190**B in the feeding direction S, and the second lever member **180**B is provided at a position overlapping a part of the first load member **190**A in the feeding direction S. In this way, it is preferable that the first lever member **180**A is provided at a position overlapping at least a part of the second load member **190**B in the feeding direction S, and the second lever member **180**B is provided at a position overlapping at least a part of the first load member **190**A in the feeding direction S. With such a configuration, it is possible to shorten a distance between the lever member **180** and the load member **190** in the width direction, and it is possible to particularly effectively correct skew even for a document P having a narrow width, for example. In the embodiment, as described above, the lever member **180** is provided at a position overlapping at least a part of the load member **190** in the feeding direction S. However, the lever member **180** may be provided at a position that does not overlap the load member **190** in the feeding direction S, in other words, the first lever member **180**A and the second lever member **180**B may be provided between the first load member **190**A and the second load member **190**B in the width direction.

Furthermore, a configuration may be adopted in which a transport roller such as the feeding roller **14** is provided between the first lever member **180**A and the first load member **190**A and between the second lever member **180**B and the second load member **190**B in the width direction. In other words, the first lever member **180**A and the first load member **190**A which are close to each other in the width direction may be linked to each other, and the second lever member **180**B and the second load member **190**B which are close to each other in the width direction may be linked each other. With such a configuration, it is possible to reduce a size of the link mechanism between the lever member **180** and the load member **190**.

The scanner **1** according to the embodiment includes the set guide **153** that guides the leading end Pe of the document P placed at the document support unit **11** to the nipping position between the feeding roller **14** and the separation roller **15**, but, as described above, the set guide **153** can adjust a distance between the feeding roller **14** and the separation roller **15** in accordance with the thickness of the document P. The skew correction mechanism **200** is provided in the set guide **153** as illustrated in FIG. **13** and the like. Since the set guide **153** capable of adjusting the distance between the feeding roller **14** and the separation roller **15** in accordance with the thickness of the document P is provided, the distance between the feeding roller **14** and the separation roller **15** is adjusted in accordance with the thickness of the document P, and thus, for example, it is possible to curb a situation in which the document P having a thickness exceeding a predetermined thickness collides with the separation roller **15** and cannot be fed. In addition, since the skew correction mechanism **200** is provided in the set guide **153** and the set guide **153** and the skew correction mechanism **200** are integrated with each other, it is possible to reduce a size of the medium transport device.

In addition, the set guide **153** is disposed on the upstream side of the contact position T**1** which is the nipping position in the feeding direction S and is provided at both ends of the feeding roller **14** in the width direction and at positions closer to the feeding roller **14** than the lever member **180** and the load member **190** of the skew correction mechanism **200**. The set guide **153** has the pressing lever **157** capable of switching between a first position (refer to FIG. **17**) at which the set guide is pressed against the feeding roller **14** and a second position (refer to FIG. **20**) at which the set guide is separated from the feeding roller **14** by advancing and retracting with respect to the feeding roller **14**. Here, as illustrated in FIG. **20**, the pressing lever **157** is configured to press the following medium (the document P**2** in FIG. **20**) other than the preceding medium among the plurality of documents P placed on top of each other at the first position against the feeding roller **14** after the trailing end in the feeding direction S of the preceding medium (the document P**1** in FIG. **20**) separated by the separation roller **15** and fed in advance among the plurality of documents P placed on top of each other at the second position passes through the contact position T**1**. For this reason, the scanner **1** of the embodiment can curb the following medium being strongly returned to the upstream side in the feeding direction S after the preceding medium is fed.

In addition, in the scanner **1** of the embodiment, the guide member **151** that also serves as a path member is disposed in at least a part of the periphery of the separation roller **15** to be opened and closed, is provided so that the separation roller **15** can be detached by being brought into an open state, and forms at least a part of the transport path by being brought into a closed state. The set guide **153** is provided at the guide member **151**. The separation roller **15** may be periodically replaced or the like due to a lifetime thereof or the like, and, in the scanner **1** of the embodiment, the separation roller **15** can be easily replaced or the like by bringing the guide member **151** into the open state.

The present disclosure is not intended to be limited to the aforementioned embodiment, and many variations are possible within the scope of the present disclosure as described in the appended claims. It goes without saying that such variations also fall within the scope of the present disclosure. For example, in the scanner **1** of the embodiment, the transport roller that is provided between the first load member **190**A and the second load member **190**B in the width direction and is provided at a position at which the first load member **190**A and the second load member **190**B overlap when seen in the width direction when the first load member **190**A and the second load member **190**B are located at the blocking position is the feeding roller **14**. However, instead of the feeding roller **14**, a transport roller or the like constituting the first transport roller pair **16**, the second transport roller pair **20**, or the like may be provided between the first load member **190**A and the second load member **190**B in the width direction, and may be provided at a position at which the first load member **190**A and the second load member **190**B overlap when seen in the width direction when the first load member **190**A and the second load member **190**B are located at the blocking position. In this case, the arrow S corresponds to the transport direction.

In addition, for example, in the scanner **1** of the embodiment, although both the lever member **180** and the load member **190** are provided on the lower side of the transport path of the document P and are configured to advance from the lower side to the upper side, at least one of the lever member **180** and the load member **190** may be provided on the upper side of the transport path of the document P and may be configured to advance from the upper side to the lower side. As in the scanner **1** of the embodiment, when the lever member **180** and the load member **190** are both provided on the lower side of the transport path of the document P and are configured to advance from the lower side to the upper side, it is possible to reduce the risk of the document P slipping through the lever member **180** located at the advanced position and the load member **190** located at the blocking position. On the other hand, when at least one of the lever member **180** and the load member **190** is

provided on the upper side of the transport path of the document P and is configured to advance from the upper side to the lower side, the risk of the document P passing through can be reduced by adopting a configuration in which the lever member **180** located at the advanced position and the load member **190** located at the blocking position are lowered to a position beyond the lower surface of the transport path.

In the above-described embodiment, the example in which the present disclosure is applied to an image reading apparatus represented by a scanner has been described, but the present disclosure can also be applied to a recording apparatus represented by a printer. That is, the same effects as those of the above-described embodiment can be obtained in the recording apparatus using the document as a recording medium and using the reading unit as a recording unit that performs recording on the recording medium in the above-described embodiment. An example of the recording apparatus may be an ink jet printer, and an example of the recording unit may be an ink jet recording head.

What is claimed is:

1. A medium feeding device comprising:

a placement unit at which a medium is placed;

a transport path along which the medium is transported;

a feeding roller configured to feed the medium placed at the placement unit; and

a skew correction mechanism configured to correct skew of the medium being fed,

wherein the skew correction mechanism includes:

a first lever member and a second lever member configured to be displaced between an advanced position at which the first lever member and the second lever member come into contact with the medium and are advanced into the transport path and a retracted position at which the first lever member and the second lever member are retracted from the transport path by the medium passing therethrough in contact therewith; and

a first load member and a second load member that are provided downstream of the first lever member and the second lever member in a feeding direction of the medium and are configured to be displaced between a blocking position at which a part of the transport path in a width direction that intersects the feeding direction is blocked and an opening position at which the transport path is opened without being blocked,

the feeding roller is provided between the first load member and the second load member in the width direction,

the first load member and the second load member, when located at the blocking position, overlap at least a part of the feeding roller when seen in the width direction,

the first load member is configured to be located at the blocking position when the first lever member is located at the advanced position and to be displaced from the blocking position to the opening position when the first lever member is located at the retracted position, and

the second load member is configured to be located at the blocking position when the second lever member is located at the advanced position and to be displaced from the blocking position to the opening position when the second lever member is located at the retracted position.

2. The medium feeding device according to claim **1**, further comprising:

a separation unit disposed to face the feeding roller and configured to, when a plurality of the media are placed on top of each other at the placement unit, nip the media together with the feeding roller to separate the media,

wherein a contact position at which the first load member and the second load member located at the blocking position come into contact with the medium being transported and a nipping position between the feeding roller and the separation unit overlap each other when seen in the width direction.

3. The medium feeding device according to claim **1**, wherein the first lever member and the second lever member, when located at the advanced position, overlap at least a part of the feeding roller when seen in the width direction.

4. The medium feeding device according to claim **3**, wherein the skew correction mechanism includes a first skew correction unit and a second skew correction unit in the width direction,

the first skew correction unit includes the first lever member, a first contact portion configured to be displaced between a first restriction position at which displacement of the first load member from the blocking position to the opening position is restricted and a first non-restriction position at which the restriction is released, and a first rotating shaft having one end provided with the first lever member and the other end provided with the first contact portion,

the second skew correction unit includes the second lever member, a second contact portion configured to be displaced between a second restriction position at which displacement of the second load member from the blocking position to the opening position is restricted and a second non-restriction position at which the restriction is released, and a second rotating shaft having one end provided with the second lever member and the other end provided with the second contact portion,

the first contact portion is located at the first restriction position when the first lever member is located at the advanced position, and is located at the first non-restriction position when the first lever member is located at the retracted position, and

the second contact portion is located at the second restriction position when the second lever member is located at the advanced position, and is located at the second non-restriction position when the second lever member is located at the retracted position.

5. The medium feeding device according to claim **4**, wherein the feeding roller is provided between the first lever member and the second load member, and the second lever member and the first load member in the width direction.

6. The medium feeding device according to claim **5**, wherein the first lever member is provided at a position overlapping at least a part of the second load member in the feeding direction, and

the second lever member is provided at a position overlapping at least a part of the first load member in the feeding direction.

7. The medium feeding device according to claim **4**, wherein the feeding roller is provided between the first lever member and the first load member, and the second lever member and the second load member in the width direction.

8. The medium feeding device according to claim **1**, further comprising:

a separation unit disposed to face the feeding roller and configured to, when a plurality of the media are placed

on top of each other at the placement unit, nip the media together with the feeding roller to separate the media; and

a set guide configured to guide a leading end of the medium placed at the placement unit to a nipping position between the feeding roller and the separation unit,

wherein the set guide is configured to adjust a distance between the separation unit and the feeding roller according to a thickness of the medium, and

the skew correction mechanism is provided in the set guide.

9. The medium feeding device according to claim **8**, wherein the set guide includes a pressing lever disposed upstream of the nipping position in the feeding direction, provided at both ends of the feeding roller in the width direction at positions closer to the feeding roller than the skew correction mechanism, and configured to switch between a first position for pressing on the feeding roller and a second position for separating from the feeding roller by advancing and retracting with respect to the feeding roller, and

the pressing lever is configured to, after a trailing end in the feeding direction of a preceding medium separated by the separation unit and fed in advance among the plurality of media placed on top of each other at the second position passes through the nipping position, press a following medium other than the preceding medium among the plurality of media placed on top of each other at the first position against the feeding roller.

10. The medium feeding device according to claim **8**, further comprising

a path member openably and closably disposed in at least a part of a periphery of the separation unit is provided so that the separation unit is configured to be detached when the path member is in an open state, and forms at least a part of the transport path when the path member is in a closed state,

wherein the set guide is provided at the path member.

11. The medium feeding device according to claim **9**, further comprising:

a path member openably and closably disposed in at least a part of a periphery of the separation unit is provided so that the separation unit is configured to be detached when the path member is in an open state, and forms at least a part of the transport path when the path member is in a closed state,

wherein the set guide is provided at the path member.

12. An image reading apparatus comprising

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

a reading unit configured to read an image on the medium transported on the transport path.

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