US011782380B1

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

(10) **Patent No.: US 11,782,380 B1**
(45) **Date of Patent: Oct. 10, 2023**

(54) **DOCUMENT READING DEVICE AND IMAGE FORMING APPARATUS**

(71) Applicant: **FUJIFILM Business Innovation Corp.**, Tokyo (JP)

(72) Inventors: **Nobuyoshi Hattori**, Kanagawa (JP); **Tomonori Sato**, Kanagawa (JP); **Miho Morita**, Kanagawa (JP); **Tsuyoshi Mabara**, Kanagawa (JP); **Isamu Adachi**, Kanagawa (JP); **Tomomi Ishida**, Kanagawa (JP)

(73) Assignee: **FUJIFILM Business Innovation Corp.**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **17/970,902**

(22) Filed: **Oct. 21, 2022**

(30) **Foreign Application Priority Data**

Jun. 15, 2022 (JP) 2022-096847

(51) **Int. Cl.**
G03G 21/00 (2006.01)
G03G 21/16 (2006.01)

(52) **U.S. Cl.**
CPC ***G03G 21/1633*** (2013.01); ***G03G 21/1638*** (2013.01); *G03G 2215/0078* (2013.01)

(58) **Field of Classification Search**
CPC G03G 21/1623; G03G 21/1633; G03G 21/1638; G03G 2215/0078
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2021/0250460 A1* 8/2021 Mabara H04N 1/0066
2022/0194084 A1* 6/2022 Nakahata B41J 29/38

FOREIGN PATENT DOCUMENTS

JP 2002-297001 A 10/2002

* cited by examiner

Primary Examiner — Hoang X Ngo
(74) *Attorney, Agent, or Firm* — Oliff PLC

(57) **ABSTRACT**

A document reading device includes: a device body; a transport path that is provided in the device body and through which a document is transported; a reading unit that is provided in the device body, has a reading surface, and reads an image of a document transported through the transport path; a moving part that is provided in the device body and is capable of being moved to a covering position at which the moving part covers the reading surface and to an exposing position at which the moving part exposes the reading surface; a first opening and closing part that is provided on the device body so as to be opened and closed and opens the transport path, at a first opening position; and a second opening and closing part that is provided beside the device body so as to be opened and closed or so as to be removable and mountable and exposes the moving part, at a second opening position or a removal position.

20 Claims, 8 Drawing Sheets

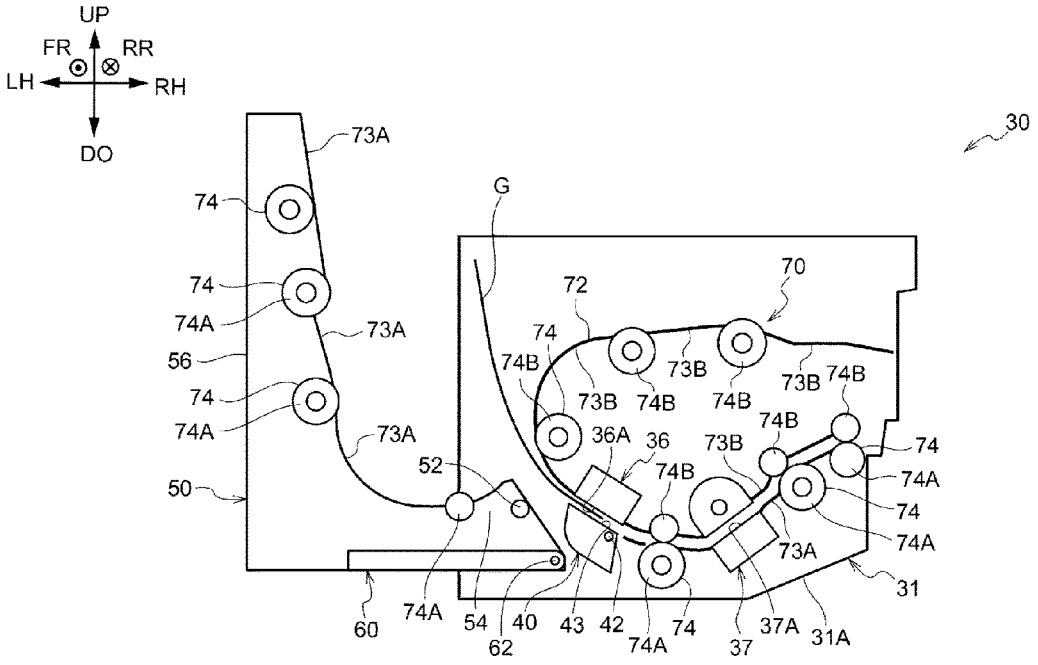


FIG. 1

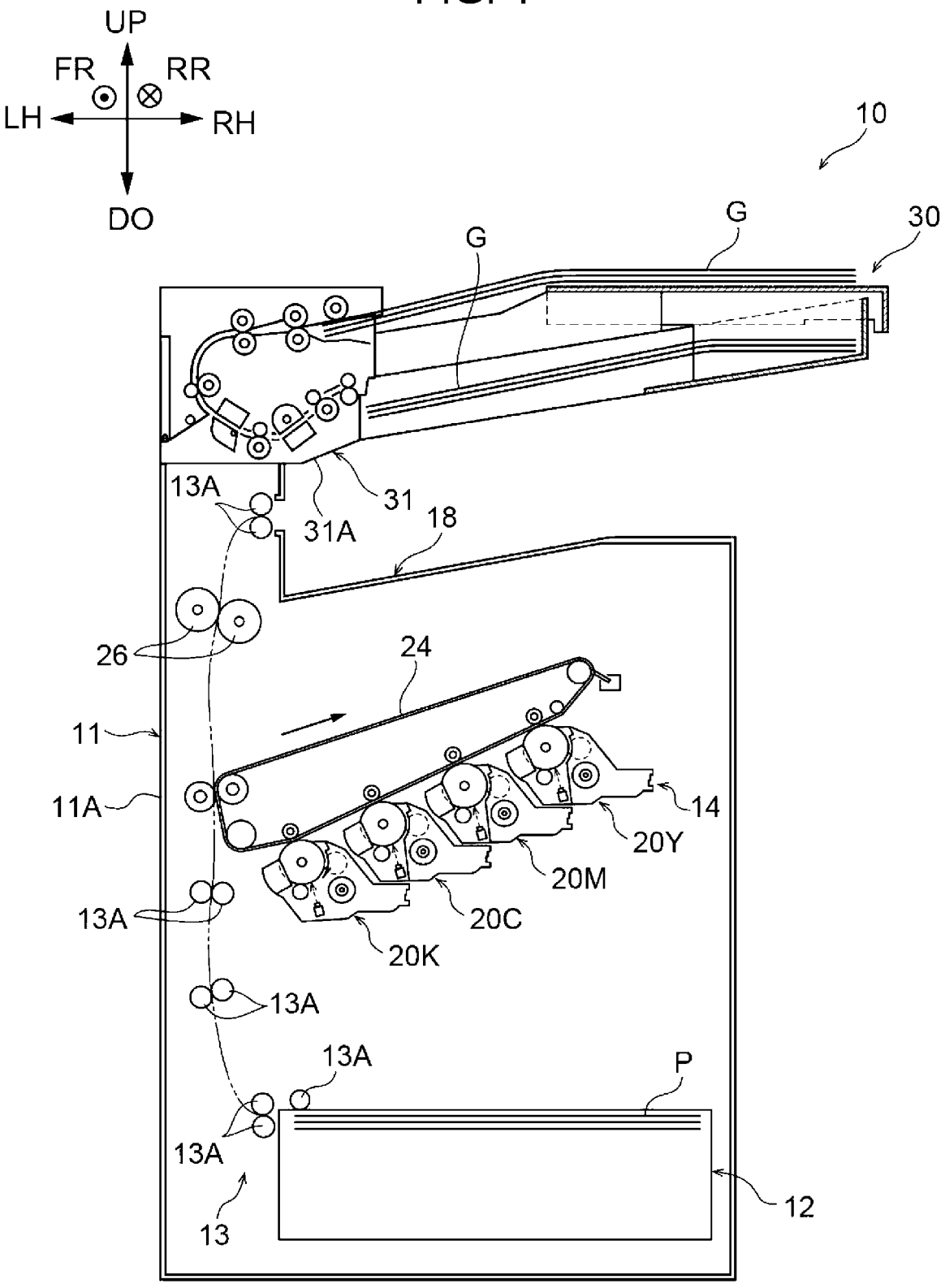

UP
FR
RR
LH
RH
DO
10
G
G
30
13A
31A
31
18
26
24
11
11A
14
20Y
20M
20C
20K
13A
13A
13A
13A
P
12
13

FIG. 2

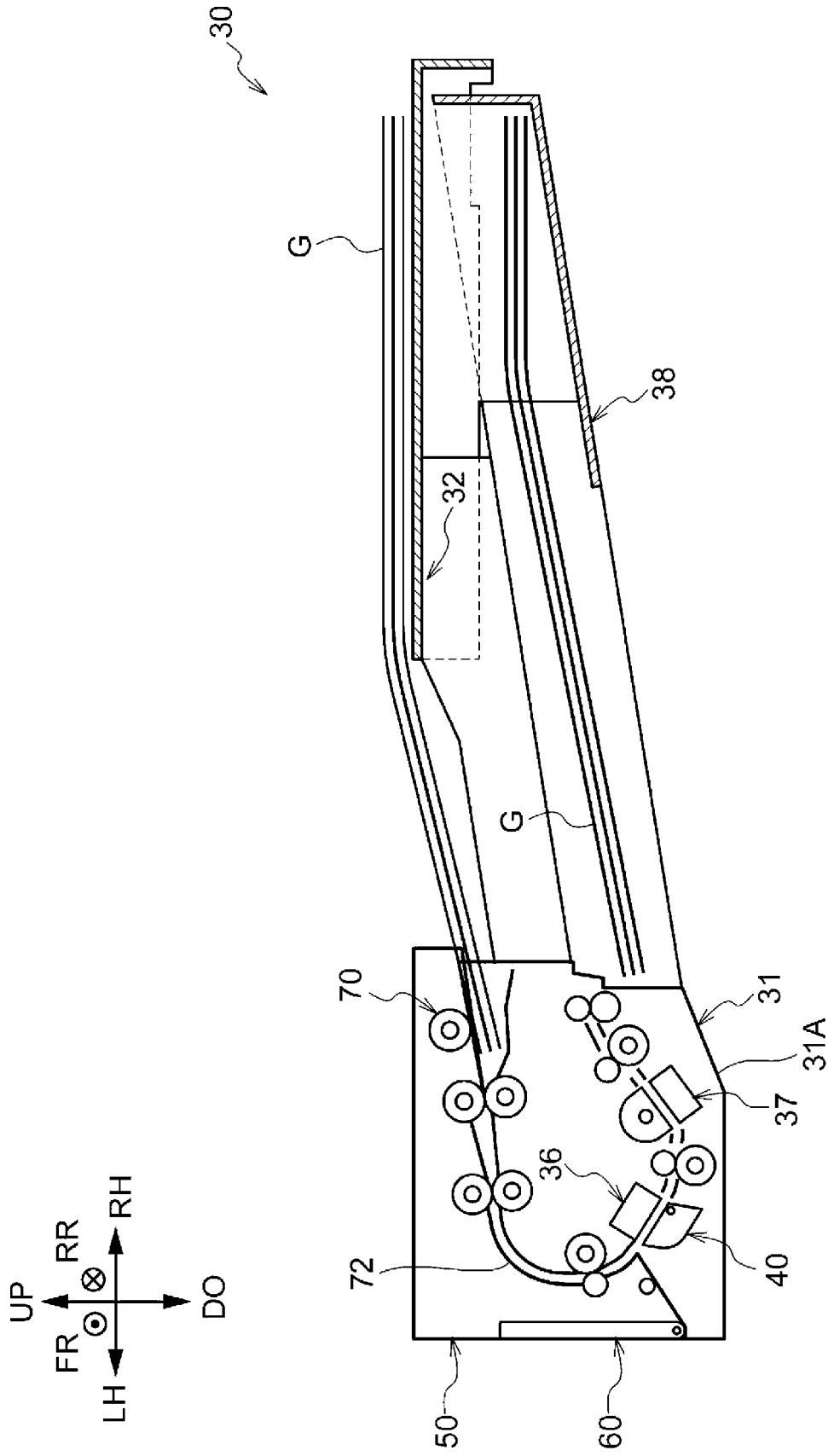


FIG. 3

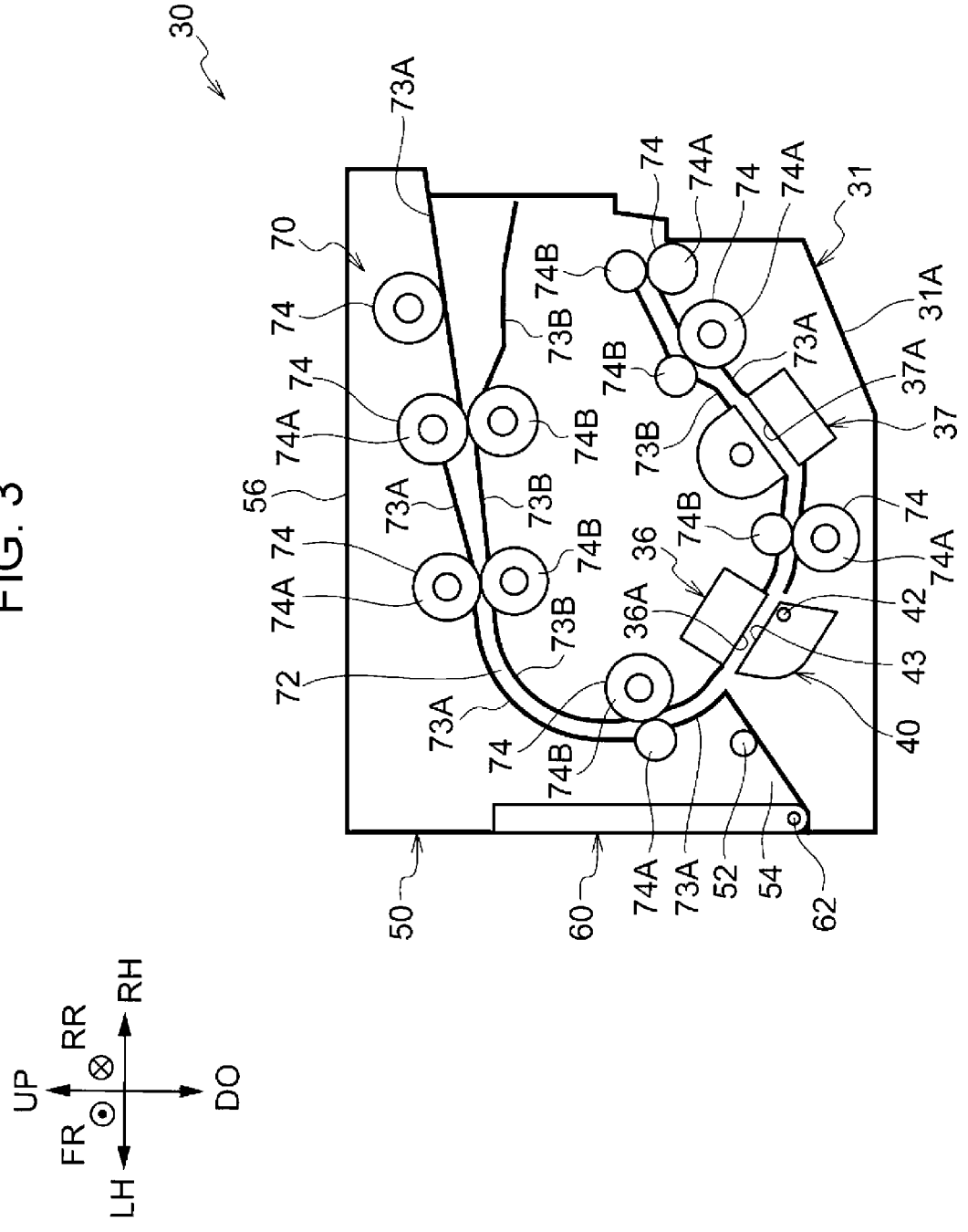

30
73A
70
74
74A
74
74A
31
74B
73B
74B
73A
31A
37A
37
74
74A
74B
73B
56
73A
73B
74B
74
74A
74
74B
36
74B
74A
36A
42
72
73B
43
73A
74
74B
40
74A
73A
52
54
62
50
60
UP
RR
RH
FR
LH
DO

FIG. 4

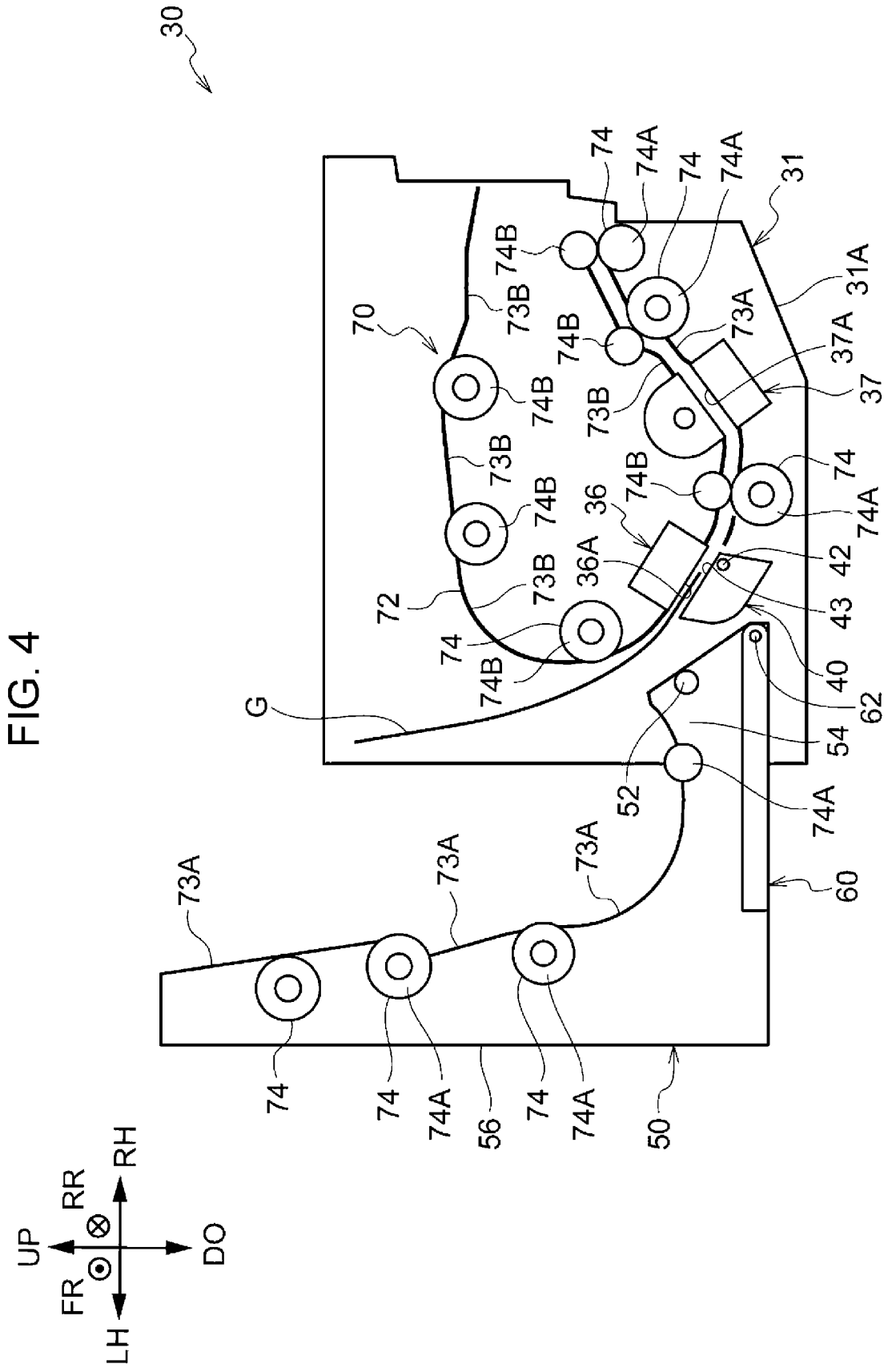

30
31
31A
37
37A
40
42
43
50
52
54
56
60
62
70
72
73A
73B
74
74A
74B
36
36A
G
UP
DO
FR
RR
LH
RH

FIG. 5

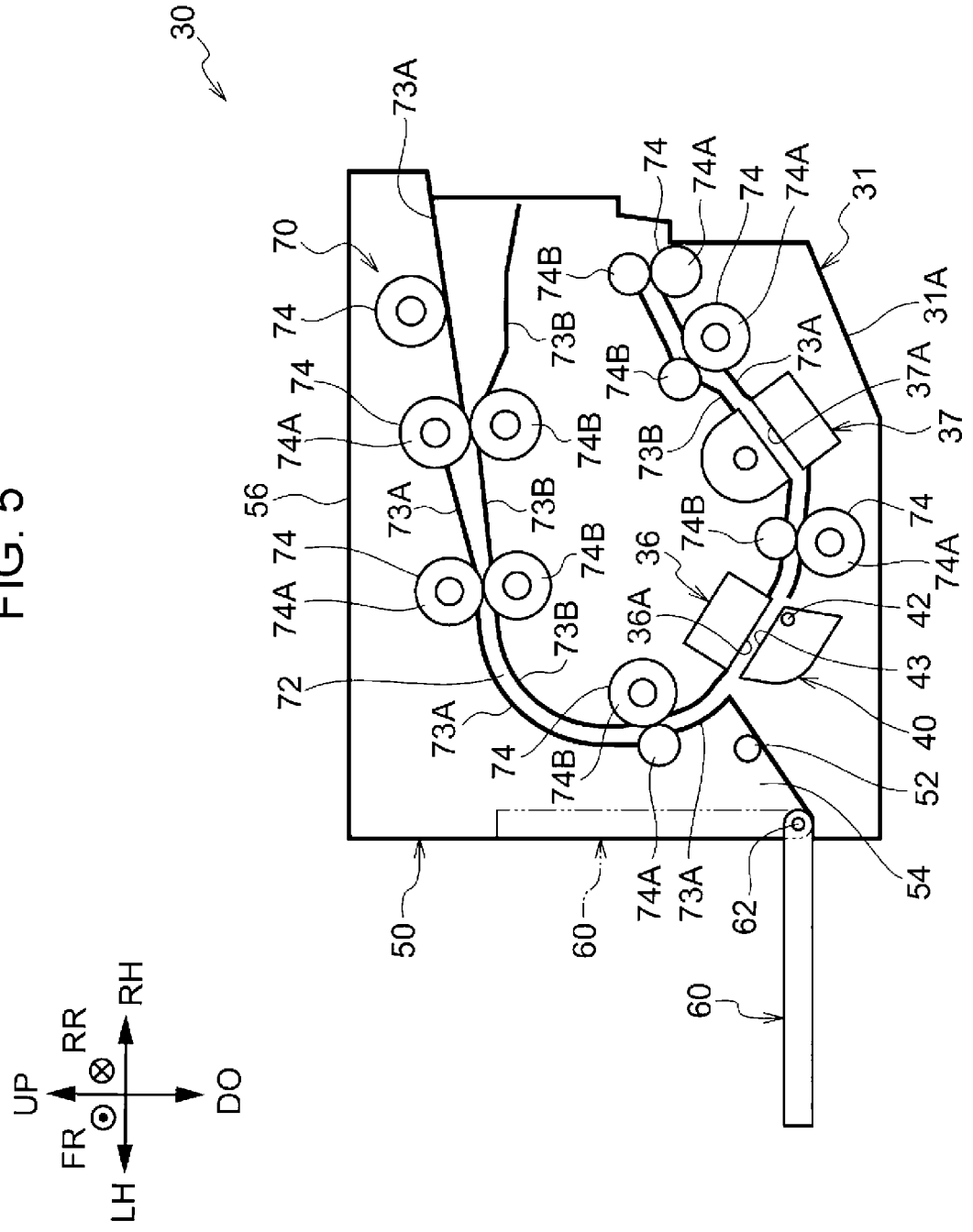

30
73A
70
74
74A
74B
73B
31
31A
37
37A
56
72
36
36A
42
43
40
52
54
50
60
62
UP
DO
FR
RR
LH
RH

FIG. 6

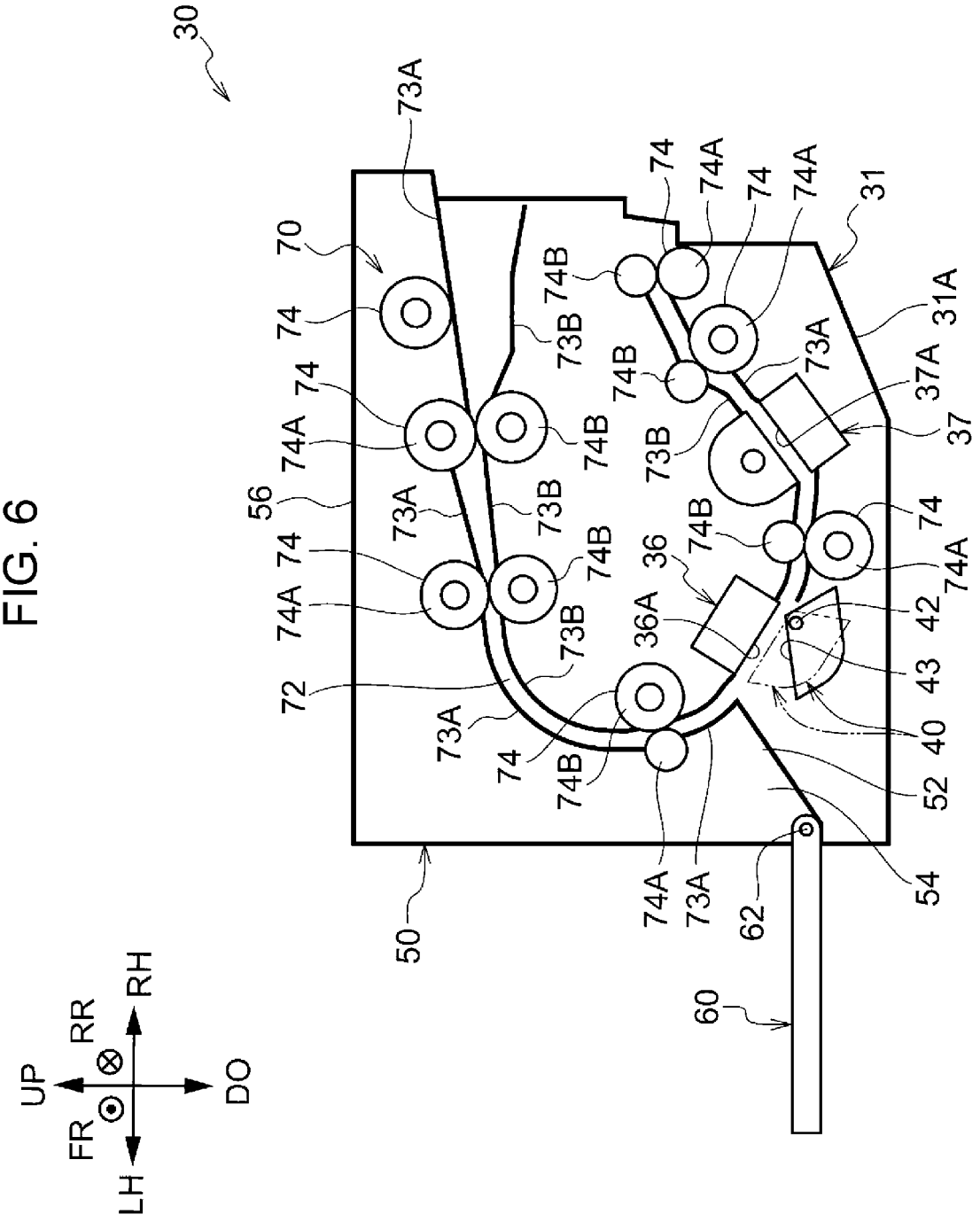

30
73A
70
74
74A
74
74A
31
74B
73B
31A
74
74B
73A
37A
74A
74B
73B
37
56
73A
73B
74B
74
74
74A
74B
36
74A
72
73B
36A
42
43
73A
74
74B
40
52
74A
73A
62
54
50
60
UP
RR
RH
DO
FR
LH

FIG. 7

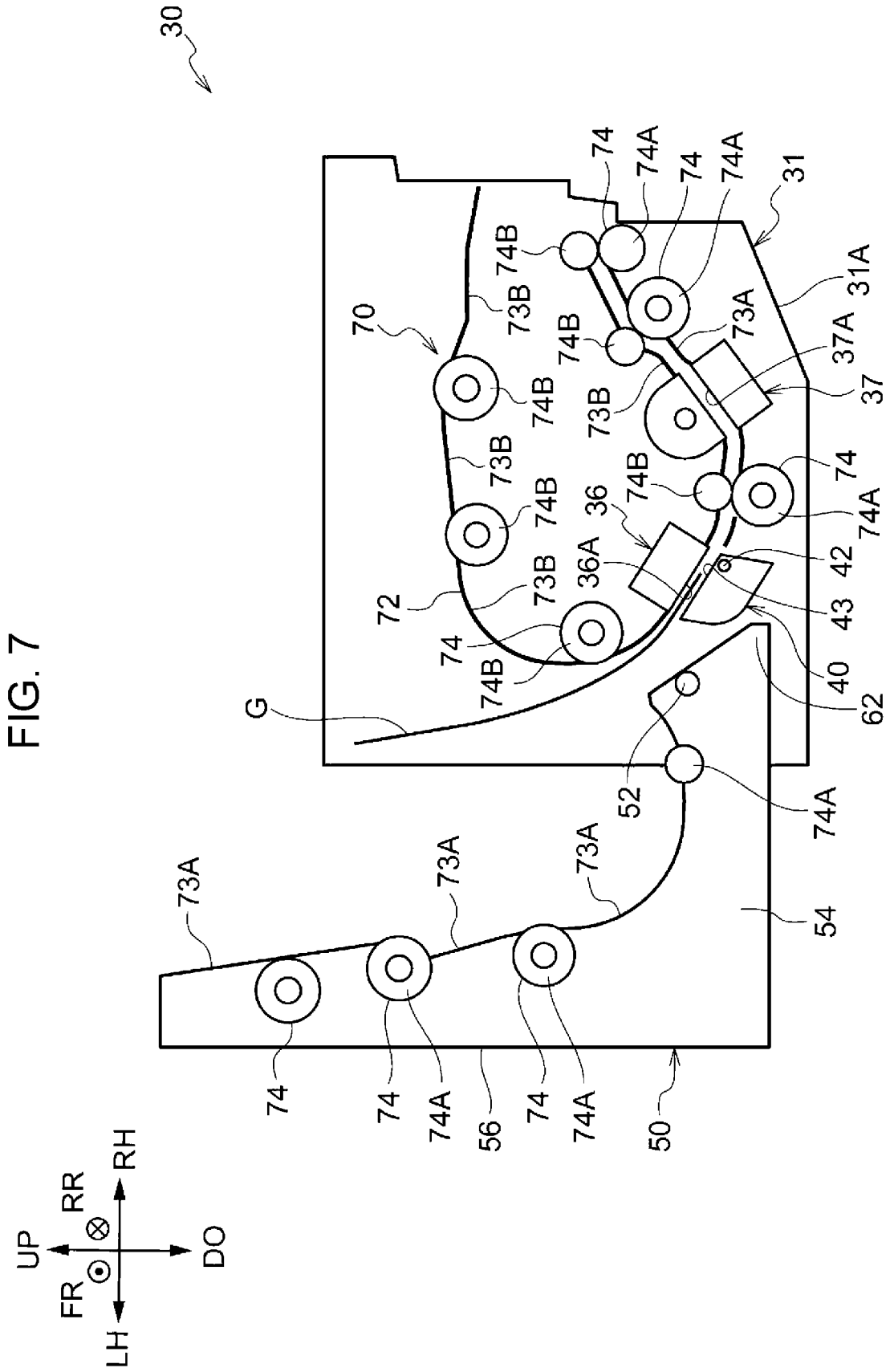
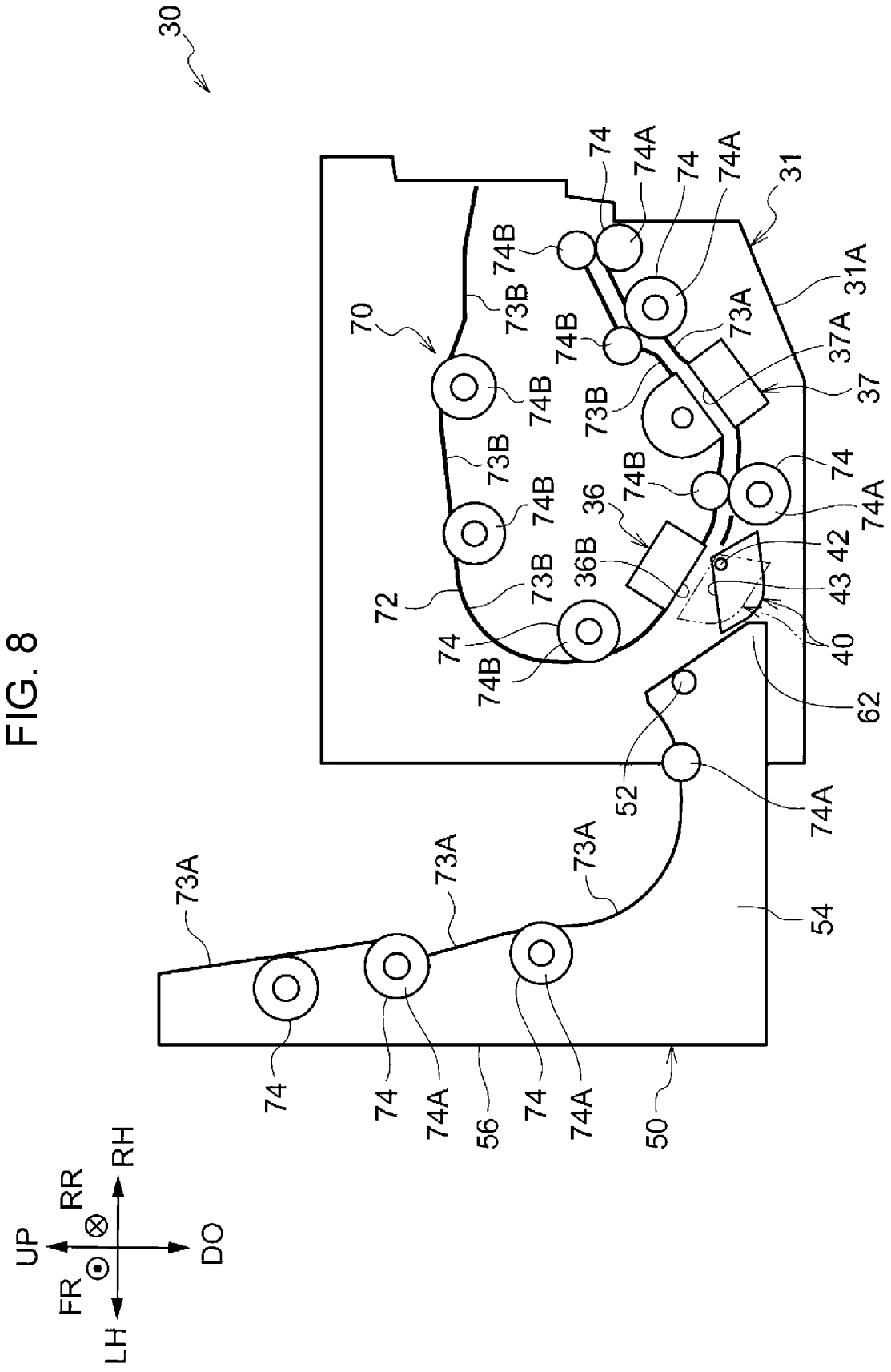

30
31
31A
37
37A
70
72
73A
73B
74
74A
74B
36
36A
40
42
43
50
52
54
56
62
G
UP
DO
FR
RR
LH
RH

FIG. 8


30
31
31A
37
37A
40
42
43
50
52
54
56
62
70
72
73A
73B
74
74A
74B
36
36B
UP
DO
FR
RR
LH
RH

DOCUMENT READING DEVICE AND IMAGE FORMING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based on and claims priority under 35 USC 119 from Japanese Patent Application No. 2022-096847 filed Jun. 15, 2022.

BACKGROUND

(i) Technical Field

The present disclosure relates to a document reading device and an image forming apparatus.

(ii) Related Art

Japanese Unexamined Patent Application Publication No. 2002-297001 discloses an image forming apparatus having an exterior covering part constituting a part of a housing and an opening and closing covering part mounted on the exterior covering part so as to be opened and closed. With the image forming apparatus, it is possible to maintain the inside of the housing by the exterior covering part being removed from the housing. The image forming apparatus includes: a fan that is held by the exterior covering part and sucks air outside the housing into the housing; a drive control unit that controls the drive of the fan; an opening and closing detection switch whose states are switched according to the opening and closing of the opening and closing cover; a notification unit that performs notification of the state of the opening and closing covering part whether open or closed based on the switched state of the opening and closing detection switch; a connector that electrically connects between the fan and the drive control unit and between the opening and closing detection switch and the notification unit and is pulled out when the exterior covering part is removed from the housing.

SUMMARY

It is conceivable to provide a document reading device including: a transport path that is provided in a device body and through which a document is transported; a reading unit that is provided in the device body and reads an image of a document transported through the transport path; a moving part that is provided in the device body and is capable of being moved to a covering position at which the moving part covers a reading surface of the reading unit and to an exposing position at which the moving part exposes the reading surface; and an opening and closing part that is provided on the device body so as to open, at an opening position, the transport path.

When a document jam is caused on a transport path, it is possible to unjam the document reading device by the opening and closing part being opened to open the transport path.

In the configuration, of the document reading device, in which the moving part is exposed only by the opening and closing part is opened, when the reading surface of the reading unit is cleaned, the opening and closing part is opened, and it is then required to move the moving part to the exposing position to clean the reading surface. Because there is no need to move the moving part in the document reading device when a document jam is caused, the opening and closing part may be closed with the moving part remaining at the exposing position, when the cleaning operation is confused with the operation for document jam during the cleaning of the reading surface.

Aspects of non-limiting embodiments of the present disclosure relate to suppressing an opening and closing part from being closed with a moving part remaining at an exposing position, compared with when the moving part is exposed only by the opening and closing part, which opens a transport path when at an opening position, being opened.

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

According to an aspect of the present disclosure, there is provided a document reading device including: a device body; a transport path that is provided in the device body and through which a document is transported; a reading unit that is provided in the device body, has a reading surface, and reads an image of a document transported through the transport path; a moving part that is provided in the device body and is capable of being moved to a covering position at which the moving part covers the reading surface and to an exposing position at which the moving part exposes the reading surface; a first opening and closing part that is provided on the device body so as to be opened and closed and opens the transport path, at a first opening position; and a second opening and closing part that is provided beside the device body so as to be opened and closed or so as to be removable and mountable and exposes the moving part, at a second opening position or a removal position.

BRIEF DESCRIPTION OF THE DRAWINGS

An Exemplary embodiment of the present disclosure will be described in detail based on the following figures, wherein:

FIG. **1** is a schematic view of an image forming apparatus according to the present exemplary embodiment;

FIG. **2** is a schematic view of a document reading device according to the present exemplary embodiment;

FIG. **3** is a schematic partial view of the document reading device according to the present exemplary embodiment;

FIG. **4** is a schematic view of the document reading device in FIG. **3** with a first opening and closing covering part being open;

FIG. **5** is a schematic view of the document reading device in FIG. **3** with a second opening and closing covering part being open;

FIG. **6** is a schematic view of the document reading device in FIG. **5** with a reading unit covering part being open;

FIG. **7** is a schematic view of a document reading device according to a comparative example; and

FIG. **8** is a schematic view of the document reading device in FIG. **7** with a reading unit covering part being open.

DETAILED DESCRIPTION

Hereinafter, one exemplary embodiment according to the present disclosure will be described based on the figures.

(Image Forming Apparatus **10**)

The configuration of an image forming apparatus **10** according to the present exemplary embodiment will be described. FIG. **1** is a schematic view of the configuration of the image forming apparatus **10** according to the present exemplary embodiment.

Note that, in the figures, arrow UP indicates the upper side of the apparatus (specifically, the upper side in the vertical direction), and arrow DO indicates the lower side of the apparatus (specifically, the lower side in the vertical direction). In the figures, arrow LH indicates the left side of the apparatus, and arrow RH indicates the right side of the apparatus. In the figures, arrow FR indicates the front side of the apparatus, and arrow RR indicates the rear side of the apparatus. The above-described directions are defined for convenience of description and thus does not limit the apparatus configuration. Note that, when each of the directions regarding the apparatus is used, the term "apparatus" is sometimes omitted. For example, the "upper side of the apparatus" is sometimes simply given as the "upper side".

In addition, in the following description, the "up-and-down direction" is used as "both directions toward the upper side and the lower side" or "one of the directions toward the upper side and the lower side". The "right-and-left direction" is used as "both directions toward the right side and the left side" or "one of the directions toward the right side and the left side". Note that the "right-and-left direction" may alternatively be expressed by terms such as beside, the lateral direction, and the horizontal direction. The "front-and-rear direction" is used as "both directions toward the front side and the rear side" or "one of the directions toward the front side and the rear side". Note that the "front-and-rear direction" may alternatively be expressed by terms such as beside, the lateral direction, and the horizontal direction. Moreover, the up-and-down direction, the right-and-left direction, and the front-and-rear direction intersect one another (specifically, orthogonal to one another).

In the figures, a symbol of an encircled cross represents an arrow directed from the near side toward the far side of the plane of the paper sheet of each figure. In the figures, a symbol of an encircled solid filled circle represents an arrow directed from the far side toward the near side of the plane of the paper sheet of each figure.

The image forming apparatus **10** in FIG. **1** forms an image. Specifically, as FIG. **1** illustrates, the image forming apparatus **10** has an image forming apparatus body **11**, a medium storage unit **12**, a medium discharge part **18**, a transport unit **13**, an image forming section **14**, and a document reading device **30**. Hereinafter, each of the elements of the image forming apparatus **10** will be described.

(Image Forming Apparatus Body **11**)

The image forming apparatus body **11** in FIG. **1** includes the image forming section **14**. Specifically, the image forming apparatus body **11** is provided with each of the constituting elements of the image forming apparatus **10** including the image forming section **14** and has a housing **11**A in which the constituting elements of the image forming apparatus **10** are accommodated.

In the present exemplary embodiment, the medium storage unit **12**, the transport unit **13**, and the image forming section **14** are disposed inside the image forming apparatus body **11** (specifically, the housing **11**A). In addition, the medium discharge part **18** and the document reading device **30** are disposed on the upper side relative to the image forming apparatus body **11** (specifically, the housing **11**A).

(Medium Storage Unit **12**)

In the image forming apparatus **10**, the medium storage unit **12** in FIG. **1** stores a recording medium P. The recording medium P stored in the medium storage unit **12** is transported to the image forming section **14**. The recording medium P to be stored in the medium storage unit **12** is a subject on which an image is formed by the image forming section **14**. Examples of the recording medium P include a paper sheet and a film. Examples of such a film include a resin film and a metal film. Note that the recording medium P is not limited to the above-described materials, and various types of recording mediums may be used.

(Medium Discharge Part **18**)

The medium discharge part **18** in FIG. **1** is a part onto which the recording medium P having an image formed by the image forming section **14** is discharged. The medium discharge part **18** is positioned in an upper region of the image forming apparatus body **11** (the housing **11**A) and on the lower side relative to the document reading device **30**. Specifically, the medium discharge part **18** is constituted by an upper surface of the housing **11**A.

(Transport Unit **13**)

In the image forming apparatus **10**, the transport unit **13** in FIG. **1** transports a recording medium P. Specifically, the transport unit **13** transports the recording medium P stored in the medium storage unit **12** to the medium discharge part **18**. In the present exemplary embodiment, as FIG. **1** illustrates, the transport unit **13** has transport members **13**A including plural transport rollers or other members and transports the recording medium P by using the transport members **13**A. Note that, examples of the transport member **13**A may include a transport belt and a transport drum, and various transport members may be used.

(Image Forming Section **14**)

The image forming section **14** in FIG. **1** is capable of forming the image that has been read by the document reading device **30**, on a recording medium. Specifically, the image forming section **14** forms, by an electrophotographic system, a toner image (an example of an image) on the recording medium P transported by the transport unit **13** (specifically, the transport members **13**A). More specifically, as FIG. **1** illustrates, the image forming section **14** is provided with toner image forming units **20**Y, **20**M, **20**C, and **20**K (hereinafter, referred to as **20**Y to **20**K), a transfer body **24**, and a fixing part **26**.

In the image forming section **14**, the toner image forming units **20**Y to **20**K perform charging, exposure, development, and transfer processes to form toner images of the colors: yellow (Y), magenta (M), cyan (C), and black (K) on the transfer body **24**. Moreover, the image forming section **14** transfers the toner images of the four colors that have been formed on the transfer body **24**, onto the recording medium P and fixes the toner images to the recording medium P at the fixing part **26**. As described above, the image forming section **14** employs an intermediate transfer system by which an image is transferred onto a recording medium P by using the transfer body **24**.

Note that an example of the image forming section is not limited to the above-described image forming section **14**. For such an example of the image forming section, there may be employed a direct transfer system by which the toner image forming units **20**Y to **20**K form toner images directly on a recording medium P without the transfer body **24**. Another example of the image forming section may be an image forming section that forms an image while ejecting ink onto a recording medium P. That is, any image forming section having a function of forming an image on a recording medium P may be used.

(Document Reading Device **30**)

The document reading device **30** in FIG. **1** reads an image of a document G. Specifically, as FIG. **2** illustrates, the document reading device **30** has a document reading device body **31**, a document storage part **32**, a document discharge part **38**, a transport mechanism **70**, reading units **36** and **37**, a reading unit covering part **40**, a first opening and closing covering part **50**, and a second opening and closing covering part **60**. Hereinafter, each of the elements of the document reading device **30** will be described.

(Document Reading Device Body **31**)

The document reading device body **31** in FIG. **2** and FIG. **3** is an example of a device body. The document reading device body **31** is provided with each of the constituting elements of the document reading device **30** and has a housing **31**A in which the constituting elements of the document reading device **30** are accommodated.

As FIG. **1** illustrates, the document reading device body **31** is disposed on the upper side relative to and fixed relative to the image forming apparatus body **11**. Specifically, on the left side relative to the medium discharge part **18**, a lower end portion of the document reading device body **31** is fixed to an upper end portion of the image forming apparatus body **11**. That is, the document reading device body **31** does not perform a relative movement such as rotation relative to the image forming apparatus body **11**.

In the present exemplary embodiment, as FIG. **2** and FIG. **3** illustrate, the transport mechanism **70**, the reading units **36** and **37**, and the reading unit covering part **40** are disposed inside the document reading device body **31** (specifically, the housing **31**A). As FIG. **2** illustrates, the document storage part **32** and the document discharge part **38** are disposed on the right side relative to the document reading device body **31** (specifically, the housing **31**A). In addition, the first opening and closing covering part **50** is disposed on the left side and on the upper side relative to the document reading device body **31** (specifically, the housing **31**A). The second opening and closing covering part **60** is also disposed on the left side relative to the document reading device body **31** (specifically, the housing **31**A). That is, the second opening and closing covering part **60** is disposed on the side opposite to the document storage part **32** and the document discharge part **38**, with the document reading device body **31** (specifically, the housing **31**A) therebetween.

(Document Storage Part **32**)

In the document reading device **30**, the document storage part **32** in FIG. **2** stores a document G. As FIG. **2** illustrates, the document storage part **32** extends diagonally to the upper right side from the document reading device body **31** and stores a document G by holding the document G thereon. The document G stored on the document storage part **32** is transported to the reading units **36** and **37**. The document G to be stored on the document storage part **32** is a subject to be read by the reading units **36** and **37**. Examples of the document G include a paper sheet and a film. Examples of such a film include a resin film and a metal film. Note that the document G is not limited to the above-described materials, various types of documents may be used.

(Document Discharge Part **38**)

The document discharge part **38** in FIG. **2** is a part onto which the document G whose image has been read by the reading units **36** and **37** is discharged. As FIG. **2** illustrates, the document discharge part **38** on the lower side relative to the document storage part **32** extends diagonally to the upper right side from the document reading device body **31** and stores the document G that has been discharged from the document reading device body **31**, by holding the document G thereon.

(Transport Mechanism **70**)

In the document reading device **30**, the transport mechanism **70** in FIG. **2** and FIG. **3** transports a document G. Specifically, as FIG. **3** illustrates, the transport mechanism **70** is provided in the document reading device body **31** and has a document transport path **72** and plural transport members **74**.

The document transport path **72** that is an example of a transport path is a transport path through which a document G is transported. As FIG. **2** illustrates, the document transport path **72** extends from the document storage part **32** toward the document discharge part **38** to have a C shape when viewed in the front-and-rear direction. Such a situation of being viewed in the front-and-rear direction is the situation of being viewed from one side of the front and the rear toward the other side.

As FIG. **3** illustrates, specifically, the document transport path **72** is constituted by transport path surfaces **73**A and **73**B that face one another and are provided in the document reading device body **31**.

Each of the transport members **74** is constituted by a pair of transport rollers **74**A and **74**B and transports the document G stored on the document storage part **32**, along the document transport path **72**, to the document discharge part **38**. Note that, examples of the transport member **74** may include a transport belt and transport drum, and various transport members may be used.

(Reading Units **36** and **37**)

Each of the reading units **36** and **37** in FIG. **2** and FIG. **3** is provided in the document reading device body **31** and reads an image of the document G transported through the document transport path **72**.

As FIG. **3** illustrates, the reading unit **36** is positioned in the middle of the document transport path **72** and on the inner circumferential side of the C-shaped document transport path **72**. The reading unit **36** has a reading surface **36**A through which an image is read. The reading surface **36**A faces one side of the document G transported through the document transport path **72**, and, through the reading surface **36**A, the reading unit **36** reads an image of the one side of the document G transported through the document transport path **72**. Note that the reading surface **36**A also functions as a guide surface (that is, a transport path surface) for guiding the document G.

As FIG. **3** illustrates, the reading unit **37** is positioned, in the document transport path **72**, downstream of the reading unit **36** in the transport direction and positioned on the outer circumferential side of the C-shaped document transport path **72**. The reading unit **37** has a reading surface **37**A through which an image is read. The reading surface **37**A faces the other side of the document G transported through the document transport path **72**, and, through the reading surface **37**A, the reading unit **37** reads an image of the other side of the document G transported through the document transport path **72**. Note that the reading surface **37**A also functions as a guide surface (that is, a transport path surface) for guiding the document G.

An example of each of the reading units **36** and **37** is a close contact-type image sensor called a Contact Image Sensor (CIS). Note that each of the reading units **36** and **37** is not limited to such a close contact-type image sensor, may be another type of image sensor, and may be any constituting element being capable of reading an image of a document G.

(Reading Unit Covering Part **40**)

The reading unit covering part **40** in FIG. **2** and FIG. **3** is an example of a moving part and is provided in the document reading device body **31**. Specifically, as FIG. **3** illustrates, the reading unit covering part **40** is at a position so as to face the reading surface **36**A of the reading unit **36** (specifically, at a position on the lower side relative to the reading unit **36**).

The reading unit covering part **40** is capable of being moved to a covering position at which the reading unit covering part **40** covers the reading surface **36**A of the reading unit **36** (the position represented by the chain double-dashed line in FIG. **6**) and to an exposing position at which the reading unit covering part **40** exposes the reading surface **36**A of the reading unit **36** (the position represented by the solid line in FIG. **6**).

Specifically, the reading unit covering part **40** has a rotating shaft **42** at a position downstream in the transport direction (specifically, on the right side) and on the reading surface **36**A side (specifically, on the upper side). By being rotated around the rotating shaft **42**, the reading unit covering part **40** is moved between the covering position (represented by the chain double-dashed line in FIG. **6**) and the exposing position (represented by the solid line in FIG. **6**).

The reading unit covering part **40** has a facing surface **43** that faces the reading surface **36**A of the reading unit **36** when the reading unit covering part **40** is at the covering position. With the reading unit covering part **40** being at the covering position, the facing surface **43** serves as a guide surface (that is, a transport path surface) for guiding the document G while facing the other side of the document G. That is, the facing surface **43**, with the reading surface **36**A, forms a transport path. In this way, the reading unit covering part **40**, when being at the covering position, functions as a guide part that guides a document G.

(First Opening and Closing Covering Part **50**)

The first opening and closing covering part **50** in FIG. **2** and FIG. **3** is an example of a first opening and closing part. The first opening and closing covering part **50** is provided on the document reading device body **31** so as to be opened and closed and, when at an opening position, opens the document transport path **72**.

As FIG. **3** illustrates, the first opening and closing covering part **50** has a covering part body **54** disposed beside (specifically, on the left side relative to) the document reading device body **31** and has an upper part **56** disposed on the upper side relative to the document reading device body **31**.

As FIG. **3** illustrates, the covering part body **54** is provided, while extending in the up-and-down direction, beside (specifically, on the left side relative to) the document reading device body **31**. Specifically, the covering part body **54** beside (specifically, on the left side relative to) the document reading device body **31** extends from a lower part to an upper part of the document reading device body **31**. Moreover, the covering part body **54** constitutes a side part of the document reading device **30**, and a side surface of the covering part body **54** (specifically, the left side surface) constitutes a side surface (specifically, the left side surface) of the document reading device **30**. In the present exemplary embodiment, the covering part body **54** is disposed beside (specifically, on the left side relative to) the reading unit **36** and the reading unit covering part **40**.

As FIG. **3** illustrates, the upper part **56** is provided, while extending in the right-and-left direction, on the upper side relative to the document reading device body **31**. Specifically, the upper part **56** positioned on the upper side relative to the document reading device body **31** extends rightward from an upper part of the covering part body **54**. The upper part **56** constitutes an upper part of the document reading device **30**, and an upper surface of the upper part **56** constitutes an upper surface of the document reading device **30**. Due to such an arrangement of the upper part **56** and the covering part body **54**, the first opening and closing covering part **50** has an L shape when viewed in the front-and-rear direction.

Moreover, the first opening and closing covering part **50** has a rotating shaft **52** provided in a lower part and is supported by the document reading device body **31** so as to be opened and closed around the rotating shaft **52**. Specifically, the rotating shaft **52** is provided, in the covering part body **54**, in a part on the lower side and on the reading unit covering part **40** side (specifically, on the right side).

The first opening and closing covering part **50** is opened and closed between an opening position (given in FIG. **4**) and a closing position (given in FIG. **3**) by the upper part thereof being rotated about the rotating shaft **52**. Specifically, the first opening and closing covering part **50** is rotated from the closing position to the opening position by being inclined leftward, from the closing position, at approximately 90 degrees. Note that the opening position is a position at which the first opening and closing covering part **50** is opened relative to the document reading device body **31**, and the closing position is a position at which the first opening and closing covering part **50** is closed relative to the document reading device body **31**.

In the present exemplary embodiment, the first opening and closing covering part **50** supports the second opening and closing covering part **60** and is opened and closed with the second opening and closing covering part **60** in an integrated manner. Thus, as FIG. **4** illustrates, when the first opening and closing covering part **50** is rotated to the opening position, the second opening and closing covering part **60** is also opened relative to the document reading device body **31**.

The first opening and closing covering part **50** further has the transport roller **74**A and the transport path surface **73**A and is opened and closed with the transport roller **74**A and the transport path surface **73**A in an integrated manner. Thus, as FIG. **4** illustrates, when the first opening and closing covering part **50** is rotated to the opening position, the transport roller **74**A and the transport path surface **73**A are separated from the transport roller **74**B and the transport path surface **73**B to expose the transport path surface **73**A, and a contact state (that is, a nip state) of a pair of the transport rollers **74**A and **74**B is released. In this way, the document transport path **72** is opened. That is, the first opening and closing covering part **50** opens, at the opening position, the document transport path **72**.

For example, when a jam of a document G is caused in the document transport path **72**, the first opening and closing covering part **50** is rotated to the opening position for the purpose of removing the jammed document G from the document transport path **72**. Thus, the first opening and closing covering part **50** is an opening and closing covering part specifically for unjamming.

In the present exemplary embodiment, the covering part body **54** is disposed beside (specifically, on the left side relative to) the reading unit covering part **40**. Thus, when the first opening and closing covering part **50** is rotated to the opening position, the reading unit covering part **40** is exposed. In the present exemplary embodiment, the rotating shaft **52** of the first opening and closing covering part **50** is

disposed on the upper side relative to the rotating shaft **42** of the reading unit covering part **40**. Thus, the amount by which the reading unit covering part **40** is exposed is small compared with when the rotating shaft **52** is disposed on the lower side relative to the rotating shaft **42**.

(Second Opening and Closing Covering Part **60**)

The second opening and closing covering part **60** in FIG. **2** and FIG. **3** is an example of a second opening and closing part. The second opening and closing covering part **60** is provided beside the document reading device body **31** so as to be opened and closed and exposes, at an opening position, the reading unit covering part **40**.

As FIG. **3** illustrates, the second opening and closing covering part **60** extends along the covering part body **54** of the first opening and closing covering part **50** (that is, in the up-and-down direction). Specifically, the second opening and closing covering part **60** positioned in a left side part of the covering part body **54** extends upward from a lower part of the covering part body **54**. In the up-and-down direction, the dimension of the second opening and closing covering part **60** is smaller than the dimension of the first opening and closing covering part **50**.

The second opening and closing covering part **60**, with the covering part body **54**, constitutes the side part of the document reading device **30**, and a side surface (specifically, the left side surface) of the second opening and closing covering part **60**, with a side surface (specifically, the left side surface) of the covering part body **54**, constitutes a side surface (specifically, the left side surface) of the document reading device **30**. In the present exemplary embodiment, the second opening and closing covering part **60** is disposed beside (specifically, on the left side relative to) the reading unit **36** and the reading unit covering part **40**.

Moreover, the second opening and closing covering part **60** has a rotating shaft **62** provided in a lower part and is supported by the first opening and closing covering part **50** so as to be opened and closed around the rotating shaft **62**. Specifically, the rotating shaft **62** is provided, in the covering part body **54**, in a part on the lower side and on the left side.

In addition, the rotating shaft **62** is positioned at a height lower than or equal to the height of the upper end of the reading surface **36**A of the reading unit **36**. The rotating shaft **62** is also positioned at a height lower than or equal to the height of the rotating shaft **42** of the reading unit covering part **40**. Moreover, the rotating shaft **62** is positioned at a height lower than or equal to the height of the rotating shaft **52** of the first opening and closing covering part **50**.

The second opening and closing covering part **60** is opened and closed between an opening position (represented by the solid line in FIG. **5**) and a closing position (represented by the chain double-dashed line in FIG. **5**) by the upper part thereof being rotated about the rotating shaft **62**. Specifically, as FIG. **5** illustrates, the second opening and closing covering part **60** is rotated from the closing position to the opening position by being inclined leftward, from the closing position, at approximately 90 degrees. Note that the opening position is a position at which the second opening and closing covering part **60** is opened relative to the document reading device body **31**, and the closing position is a position at which the second opening and closing covering part **60** is closed relative to the document reading device body **31**.

In the present exemplary embodiment, the second opening and closing covering part **60** is disposed beside (specifically, on the left side relative to) the reading unit covering part **40**. Thus, when the second opening and closing covering part **60** is rotated to the opening position, the reading unit covering part **40** is exposed.

For example, when the reading surface **36**A of the reading unit **36** is cleaned, as FIG. **5** illustrates, the second opening and closing covering part **60** exposes the reading unit covering part **40** by being rotated to the opening position. After that, as FIG. **6** illustrates, the reading unit covering part **40** is rotated to the exposing position, and the reading surface **36**A is cleaned. Thus, the second opening and closing covering part **60** is an opening and closing covering part specifically for cleaning the reading surface **36**A of the reading unit **36**.

Note that, unlike the first opening and closing covering part **50**, the second opening and closing covering part **60** is not provided with transport rollers **74**A and **74**B and transport path surfaces **73**A and **73**B. Thus, even when the second opening and closing covering part **60** is rotated to the opening position, the document transport path **72** is not opened.

(Actions According to Present Exemplary Embodiment)

As described above, the document reading device **30** has: the first opening and closing covering part **50** that is provided on the document reading device body **31** so as to be opened and closed and opens, at the opening position, the document transport path **72**; and the second opening and closing covering part **60** that is provided beside the document reading device body **31** so as to be opened and closed and exposes, at the opening position, the reading unit covering part **40**.

Thus, when a jam is caused in the document transport path **72**, as FIG. **4** illustrates, it is possible to remove the jammed document G from the document transport path **72** by the first opening and closing covering part **50** being rotated to the opening position.

On the other hand, when the reading surface **36**A of the reading unit **36** is cleaned, as FIG. **5** illustrates, the second opening and closing covering part **60** exposes the reading unit covering part **40** by being rotated to the opening position. After that, as FIG. **6** illustrates, the reading unit covering part **40** is rotated to the exposing position, and it is then possible to clean the reading surface **36**A.

Here, as FIG. **7** and FIG. **8** illustrate, in a form (hereinafter, referred to as Form A) in which the reading unit covering part **40** is exposed only by the first opening and closing covering part **50** being opened without the second opening and closing covering part **60** being provided, the first opening and closing covering part **50** is required to be opened in both instances of a jam caused in the document transport path **72** and the cleaning of the reading surface **36**A of the reading unit **36**.

That is, when a jam is caused in the document transport path **72**, as FIG. **7** illustrates, the jammed document G is removed from the document transport path **72** by the first opening and closing covering part **50** being rotated to the opening position. On the other hand, when the reading surface **36**A of the reading unit **36** is cleaned, as FIG. **8** illustrates, the reading unit covering part **40** is exposed by the first opening and closing covering part **50** being rotated to the opening position, the reading unit covering part **40** is subsequently rotated to the exposing position, and the reading surface **36**A is cleaned.

As described above, because there is no need to move the reading unit covering part **40** when a jam is caused in the document transport path **72**, the first opening and closing covering part **50** may be closed with the reading unit covering part **40** remaining at the exposing position, when

the cleaning operation is confused with the operation for jam during the cleaning of the reading surface **36**A of the reading unit **36**.

In contrast, in the present exemplary embodiment, the first opening and closing covering part **50** is opened and closed when a jam is caused in the document transport path **72**, and the second opening and closing covering part **60** is opened and closed when the reading surface **36**A of the reading unit **36** is cleaned. In such a way, it is possible to use different opening and closing covers for different operations. Thus, according to the present exemplary embodiment, the second opening and closing covering part **60** may be suppressed from being closed with the reading unit covering part **40** remaining at the exposing position, compared with Form A. As a result, compared with Form A, an image defect due to a failure in reading an image of a document G may be suppressed from being caused.

In addition, in the present exemplary embodiment, the second opening and closing covering part **60** is opened and closed by the upper part thereof being rotated about the rotating shaft **62** provided in the lower part of the second opening and closing covering part **60**.

Thus, the reading unit covering part **40** may be easily accessible from a position beside the document reading device body **31** and on the upper side relative to the reading unit covering part **40**, compared with when the second opening and closing covering part **60** is opened and closed by the lower part thereof being rotated about the rotating shaft **62** provided in the upper part of the second opening and closing covering part **60**.

In addition, in the present exemplary embodiment, the rotating shaft **62** of the second opening and closing covering part **60** is positioned at a height lower than or equal to the height of the upper end of the reading surface **36**A of the reading unit **36**.

Thus, the reading unit covering part **40** may be easily exposed, compared with when the rotating shaft **62** of the second opening and closing covering part **60** is positioned at a height higher than the height of the upper end of the reading surface **36**A of the reading unit **36**.

In addition, in the present exemplary embodiment, the rotating shaft **62** of the second opening and closing covering part **60** is positioned at a height lower than or equal to the height of the rotating shaft **42** of the reading unit covering part **40**.

Thus, the reading unit covering part **40** may be easily exposed, compared with when the rotating shaft **62** of the second opening and closing covering part **60** is positioned at a height higher than the height of the rotating shaft **42** of the reading unit covering part **40**.

In addition, in the present exemplary embodiment, the rotating shaft **62** of the second opening and closing covering part **60** is positioned at a height lower than or equal to the height of the rotating shaft **52** of the first opening and closing covering part **50**.

Thus, the reading unit covering part **40** may be easily exposed, compared with when the rotating shaft **62** of the second opening and closing covering part **60** is positioned at a height higher than the height of the rotating shaft **52** of the first opening and closing covering part **50**.

In addition, in the present exemplary embodiment, the first opening and closing covering part **50** is opened and closed with the second opening and closing covering part **60** in an integrated manner.

Thus, the document transport path **72** may be easily opened, compared with when the first opening and closing covering part **50** is opened and closed independently from the second opening and closing covering part **60**.

In the present exemplary embodiment, the second opening and closing covering part **60** is supported by the first opening and closing covering part **50**. Thus, the document reading device body **31** may be easily opened, compared with when the second opening and closing covering part **60** is supported by the document reading device body **31** so as to be opened and closed.

In the present exemplary embodiment, in the up-and-down direction, the dimension of the second opening and closing covering part **60** is smaller than the dimension of the first opening and closing covering part **50**.

Thus, the size of the second opening and closing covering part **60** may be reduced, compared with when, in the up-and-down direction, the dimension of the second opening and closing covering part **60** is larger than the dimension of the first opening and closing covering part **50**.

In addition, in the present exemplary embodiment, as FIG. **1** illustrates, the document reading device body **31** is disposed on the upper side relative to and fixed relative to the image forming apparatus body **11**.

Thus, while the apparatus configuration of the image forming apparatus **10** is maintained simple, the second opening and closing covering part **60** may be suppressed from being closed with the reading unit covering part **40** remaining at the exposing position, compared with when the document reading device body **31** is disposed on the upper side relative to and opened and closed relative to the image forming apparatus body **11**.

(Modification of Reading Unit Covering Part **40**)

In the present exemplary embodiment, by being rotated around the rotating shaft **42**, the reading unit covering part **40** is moved between the covering position (represented by the chain double-dashed line in FIG. **6**) and the exposing position (represented by the solid line in FIG. **6**). However, the configuration is not the only option. The reading unit covering part **40** may perform, for example, a linear movement such as sliding between the covering position and the exposing position and may be any constituting element capable of being moved to the covering position and to the exposing position.

(Modification of First Opening and Closing Covering Part **50**)

Although, in the present exemplary embodiment, the first opening and closing covering part **50** is opened and closed with the second opening and closing covering part **60** in an integrated manner, the configuration is not the only option. For example, the first opening and closing covering part **50** may be opened and closed independently from the second opening and closing covering part **60** and may be any constituting element that opens, at the opening position, the document transport path **72**.

(Modification of Second Opening and Closing Covering Part **60**)

Although, in the present exemplary embodiment, the second opening and closing covering part **60** is opened and closed by the upper part thereof being rotated about the rotating shaft **62** provided in the lower part of the second opening and closing covering part **60**, the configuration is not the only option. The second opening and closing covering part **60** may be opened and closed, for example, by the lower part thereof being rotated about the rotating shaft **62** provided in the upper part of the second opening and closing covering part **60** and may be any constituting element that exposes, at the opening position, the reading unit covering part **40**.

In addition, although, in the present exemplary embodiment, the rotating shaft **62** of the second opening and closing covering part **60** is positioned at a height lower than or equal to the height of the upper end of the reading surface **36**A of the reading unit **36**, the configuration is not the only option. For example, the rotating shaft **62** of the second opening and closing covering part **60** may be positioned at a height higher than the height of the upper end of the reading surface **36**A of the reading unit **36**.

In addition, although, in the present exemplary embodiment, the rotating shaft **62** of the second opening and closing covering part **60** is positioned at a height lower than or equal to the height of the rotating shaft **42** of the reading unit covering part **40**, the configuration is not the only option. For example, the rotating shaft **62** of the second opening and closing covering part **60** may be positioned at a height higher than the height of the rotating shaft **42** of the reading unit covering part **40**.

In addition, although, in the present exemplary embodiment, the rotating shaft **62** of the second opening and closing covering part **60** is positioned at a height lower than or equal to the height of the rotating shaft **52** of the first opening and closing covering part **50**, the configuration is not the only option. For example, the rotating shaft **62** of the second opening and closing covering part **60** may be positioned at a height higher than the height of the rotating shaft **52** of the first opening and closing covering part **50**.

Although, in the present exemplary embodiment, the second opening and closing covering part **60** is supported by the first opening and closing covering part **50**, the configuration is not the only option. For example, the second opening and closing covering part **60** may be supported by the document reading device body **31** so as to be opened and closed.

Although, in the present exemplary embodiment, in the up-and-down direction, the dimension of the second opening and closing covering part **60** is smaller than the dimension of the first opening and closing covering part **50**, the configuration is not the only option. For example, in the up-and-down direction, the dimension of the second opening and closing covering part **60** may be larger than the dimension of the first opening and closing covering part **50**.

In addition, although, in the present exemplary embodiment, the second opening and closing covering part **60** is provided beside the document reading device body **31** so as to be opened and closed, the configuration is not the only option. The second opening and closing covering part **60** may be provided beside the document reading device body **31** so as to be removed from and mounted on the first opening and closing covering part **50** or the document reading device body **31**. In such an instance, the second opening and closing covering part **60** exposes the reading unit covering part **40**, at a removal position at which the second opening and closing covering part **60** is removed from the first opening and closing covering part **50** or the document reading device body **31**.

(Modification of Document Reading Device Body **31**)

Although, in the present exemplary embodiment, as FIG. **1** illustrates, the document reading device body **31** is disposed on the upper side relative to and fixed relative to the image forming apparatus body **11**, the configuration is not the only option. For example, the document reading device body **31** may be disposed on the upper side relative to and opened and closed relative to the image forming apparatus body **11**.

The present disclosure is not limited to the above-described exemplary embodiment, and various modifications, changes, and improvements may be made without departing from the spirit of the present disclosure. For example, plural ones of the above-described modifications may be appropriately combined.

The foregoing description of the exemplary embodiments of the present disclosure has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure to the precise forms disclosed. Obviously, many modifications and variations will be apparent to practitioners skilled in the art. The embodiments were chosen and described in order to best explain the principles of the disclosure and its practical applications, thereby enabling others skilled in the art to understand the disclosure for various embodiments and with the various modifications as are suited to the particular use contemplated. It is intended that the scope of the disclosure be defined by the following claims and their equivalents.

APPENDIX

(((1)))

A document reading device comprising:

a device body;

a transport path that is provided in the device body and through which a document is transported;

a reading unit that is provided in the device body, has a reading surface, and reads an image of a document transported through the transport path;

a moving part that is provided in the device body and is capable of being moved to a covering position at which the moving part covers the reading surface and to an exposing position at which the moving part exposes the reading surface;

a first opening and closing part that is provided on the device body so as to be opened and closed and opens the transport path, at a first opening position; and

a second opening and closing part that is provided beside the device body so as to be opened and closed or so as to be removable and mountable and exposes the moving part, at a second opening position or a removal position.

(((2)))

The document reading device according to (((1))),

wherein the second opening and closing part has a second rotating shaft provided in a lower part of the second opening and closing part and is opened and closed by an upper part of the second opening and closing part being rotated about the second rotating shaft.

(((3)))

The document reading device according to (((2))),

wherein the second rotating shaft is positioned at a height lower than or equal to a height of an upper end of the reading surface.

(((4)))

The document reading device according to (((2))) or (((3))),

wherein the moving part has a moving-part rotating shaft and is moved by being rotated about the moving-part rotating shaft, and

wherein the second rotating shaft of the second opening and closing part is positioned at a height lower than or equal to a height of the moving-part rotating shaft of the moving part.

(((5)))

The document reading device according to any one of (((2))) to (((4))),

wherein the first opening and closing part has a first rotating shaft provided in a lower part of the first opening and closing part and is opened and closed by an upper part of the first opening and closing part being rotated about the first rotating shaft, and

wherein the second rotating shaft of the second opening and closing part is positioned at a height lower than or equal to a height of the first rotating shaft of the first opening and closing part.

(((6)))

The document reading device according to any one of (((1))) to (((5))),

wherein the first opening and closing part is opened and closed with the second opening and closing part in an integrated manner.

(((7)))

The document reading device according to (((6))),

wherein the second opening and closing part is supported by the first opening and closing part so as to be opened and closed or so as to be removable and mountable.

(((8)))

The document reading device according to any one of (((1))) to (((7))),

wherein, in an up-and-down direction, a dimension of the second opening and closing part is smaller than a dimension of the first opening and closing part.

(((9)))

An image forming apparatus comprising:

the document reading device according to any one of (((1))) to (((8))); and

an image forming section being capable of forming an image read by the document reading device, on a recording medium.

(((10)))

The image forming apparatus according to (((9))), further comprising:

an image forming apparatus body in which the image forming section is provided,

wherein the device body of the document reading device is disposed on an upper side relative to and fixed relative to the image forming apparatus body.

What is claimed is:

1. A document reading device comprising:

a device body;

a transport path that is provided in the device body and through which a document is transported;

a reading unit that is provided in the device body, has a reading surface, and reads an image of the document transported through the transport path;

a moving part that is provided in the device body and is capable of being moved to a covering position at which the moving part covers the reading surface and to an exposing position at which the moving part exposes the reading surface;

a first opening and closing part that is provided on the device body so as to be opened and closed and opens the transport path, at a first opening position; and

a second opening and closing part that is provided beside the device body so as to be opened and closed or so as to be removable and mountable and exposes the moving part, at a second opening position or a removal position.

2. The document reading device according to claim **1**,

wherein the second opening and closing part has a second rotating shaft provided in a lower part of the second opening and closing part and is opened and closed by an upper part of the second opening and closing part being rotated about the second rotating shaft.

3. The document reading device according to claim **2**,

wherein the second rotating shaft is positioned at a height lower than or equal to a height of an upper end of the reading surface.

4. An image forming apparatus comprising:

the document reading device according to claim **3**; and

an image forming section being capable of forming an image read by the document reading device, on a recording medium.

5. The image forming apparatus according to claim **4**, further comprising:

an image forming apparatus body in which the image forming section is provided,

wherein the device body of the document reading device is disposed on an upper side relative to and fixed relative to the image forming apparatus body.

6. The document reading device according to claim **2**,

wherein the moving part has a moving-part rotating shaft and is moved by being rotated about the moving-part rotating shaft, and

wherein the second rotating shaft of the second opening and closing part is positioned at a height lower than or equal to a height of the moving-part rotating shaft of the moving part.

7. An image forming apparatus comprising:

the document reading device according to claim **6**; and

an image forming section being capable of forming an image read by the document reading device, on a recording medium.

8. The image forming apparatus according to claim **7**, further comprising:

an image forming apparatus body in which the image forming section is provided,

wherein the device body of the document reading device is disposed on an upper side relative to and fixed relative to the image forming apparatus body.

9. The document reading device according to claim **2**,

wherein the first opening and closing part has a first rotating shaft provided in a lower part of the first opening and closing part and is opened and closed by an upper part of the first opening and closing part being rotated about the first rotating shaft, and

wherein the second rotating shaft of the second opening and closing part is positioned at a height lower than or equal to a height of the first rotating shaft of the first opening and closing part.

10. An image forming apparatus comprising:

the document reading device according to claim **9**; and

an image forming section being capable of forming an image read by the document reading device, on a recording medium.

11. An image forming apparatus comprising:

the document reading device according to claim **2**; and

an image forming section being capable of forming an image read by the document reading device, on a recording medium.

12. The image forming apparatus according to claim **11**, further comprising:

an image forming apparatus body in which the image forming section is provided,

wherein the device body of the document reading device is disposed on an upper side relative to and fixed relative to the image forming apparatus body.

13. The document reading device according to claim **1**, wherein the first opening and closing part is opened and closed with the second opening and closing part in an integrated manner.

14. The document reading device according to claim **13**, wherein the second opening and closing part is supported by the first opening and closing part so as to be opened and closed or so as to be removable and mountable.

15. An image forming apparatus comprising:

the document reading device according to claim **14**; and

an image forming section being capable of forming an image read by the document reading device, on a recording medium.

16. An image forming apparatus comprising:

the document reading device according to claim **13**; and

an image forming section being capable of forming an image read by the document reading device, on a recording medium.

17. The document reading device according to claim **1**, wherein, in an up-and-down direction, a dimension of the second opening and closing part is smaller than a dimension of the first opening and closing part.

18. An image forming apparatus comprising:

the document reading device according to claim **17**; and

an image forming section being capable of forming an image read by the document reading device, on a recording medium.

19. An image forming apparatus comprising:

the document reading device according to claim **1**; and

an image forming section being capable of forming an image read by the document reading device, on a recording medium.

20. The image forming apparatus according to claim **19**, further comprising:

an image forming apparatus body in which the image forming section is provided,

wherein the device body of the document reading device is disposed on an upper side relative to and fixed relative to the image forming apparatus body.

* * * * *