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(71) Applicant: **Fujitsu Frontech Limited**
Inagi-shi,
Tokyo 206-8555 (JP)

(72) Inventors:
- **Komaki, Yasushi**
  Inagi-shi, Tokyo 206-8555 (JP)
- **Ogawa, Mitsunobu**
  Inagi-shi, Tokyo 206-8555 (JP)
- **Watanabe, Takashi**
  Maebashi-shi, Gunma 371-0855 (JP)

(74) Representative: **Holz, Ulrike**
Haseltine Lake LLP
Lincoln House, 5th Floor
300 High Holborn
London WC1V 7JH (GB)

(54) Medium collection device and medium collecting method

(57) A medium collection device (5) includes: a collection unit (43) for collecting a medium (50); a roller (31) having a convex part (31b) provided on a contact surface with the medium and a notch (31b) provided in a rotation direction of the contact surface of the convex part, and conveying the medium by rotating in contact with the medium; a medium detection unit (27) for detecting whether or not the medium has passed a specified position; and a pressure unit (38) for pressing the medium against the roller when it is detected that the medium has passed the specified position. The rear end of the medium is pressed by the convex part when the pressure unit presses the medium against the roller, thereby collecting the medium in the collection unit.

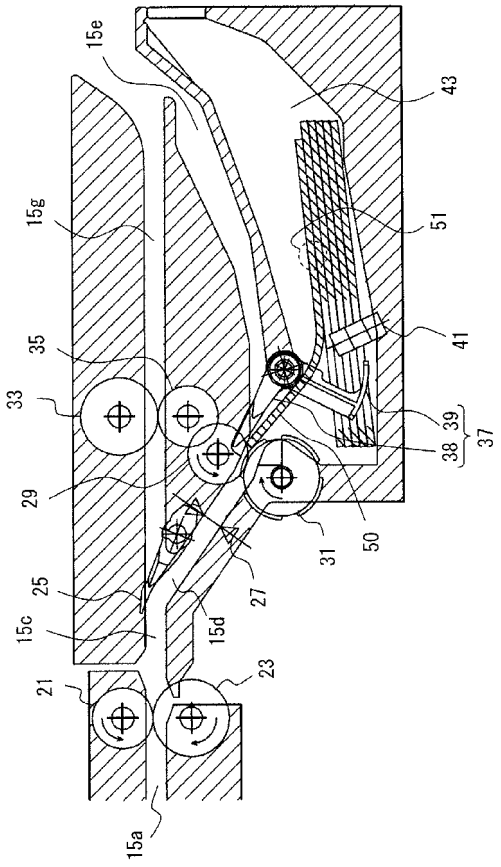

FIG. 14

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Description

Background of the Invention

Field of the Invention

[0001] The present invention relates to a medium collection device and a medium collecting method.

Description of the Related Art

[0002] An automatic teller machine (ATM) etc. is loaded with a printer for performing a printing operation on a passbook and a document. The printer is provided with a medium collection unit for collecting a medium such as a document. The medium collection unit is also used in temporarily saving a medium in case a passbook is temporarily saved when the passbook is left behind. However, when the temporarily saved medium is returned outside, a medium saved in the medium collection unit can accompany the temporarily saved medium, which is an erroneous operation result.

[0003] Therefore, for example, the Japanese Laid-open Patent Publication No. 9-235058 discloses a device for preventing a medium from getting stuck by pushing the rear end of the medium by a flick nail when the medium is collected in the medium collection unit. The Japanese Laid-open Patent Publication No. 2008-213988 feeds the rear end of a medium by a holding lever, and pushes the medium against the roller, thereby avoiding interfering with the next medium to be fed. The Japanese Laid-open Patent Publication No. 7-98777 improves the performance of the storing operation by conveying a medium after bending the medium in wave form by two arranged drive rollers, a pressure roller pushed against the drive rollers, and a wheeled roller provided on the same axis as the pressure roller.

Summary of the Invention

[0004] However, if the number of collected media becomes large when a medium is collected in a medium collection unit, the medium to be conveyed for collection is stopped halfway by a contact load with the collected media, thereby causing erroneous collection. Furthermore, when a large space is to be reserved for a printer to improve the performance of the printer, there is no space for a medium collection unit with the number of media taken into account. Accordingly, there is the possibility that an error occurs by incurring, a collection error in the medium collection unit, an error of a medium that has been collected accompanying a passbook which is ejected after temporarily saved, etc.

[0005] To solve the above-mentioned problems, the present invention provides a medium collection device and a medium collecting method capable of storing a medium in a collection unit without fail and without decreasing the possible number of classified media.

[0006] The medium collection device according to the present invention includes: a collection unit for collecting a medium; a roller having a convex part provided on a contact surface with the medium and a notch provided in the rotation direction of the contact surface of the convex part, and conveying the medium by rotating in contact with the medium; a medium detection unit for detecting whether or not the medium has passed a specified position; and a pressure unit for pressing the medium against the roller when it is detected that the medium has passed the specified position. With the above-mentioned configuration, the rear end of the medium is pressed by the convex part by the pressure unit pressing the medium against the roller, thereby collecting the medium in the collection unit.

[0007] The medium collecting method according to the present invention includes: a process of detecting whether or not a medium has passed a specified position; a process of moving the medium by a roller for conveying the medium by rotating in contact with the medium using a convex part provided on a contact surface with the medium, and a notch provided in a rotation direction of the contact surface of the convex part; a process of a pressure unit pressing the medium against the roller when it is detected that the medium has passed the specified position; and pressing the rear end by the convex part when the pressure unit presses the medium against the roller, thereby collecting the medium in the collection unit.

Brief Description of the Drawings

[0008] The present invention will be more apparent from the following detailed description when the accompanying drawings are referenced.

FIG. 1 is the outline of the configuration of the automatic transaction device according to an embodiment of the present invention;

FIG. 2 is an explanatory view of the configuration of the inside of the medium collection device according to an embodiment of the present invention;

FIG. 3A is a configuration of the outline of the contact surface of a pinch roller according to an embodiment of the present invention;

FIG. 3B is a configuration of a side view of a pinch roller according to an embodiment of the present invention;

FIG. 4 is a configuration of the gate according to an embodiment of the present invention;

FIG. 5 is an explanatory view of switching the conveyance path of the medium collection device according to an embodiment of the present invention;

FIG. 6 is an explanatory view of switching the conveyance path of the medium collection device according to an embodiment of the present invention;

FIG. 7 is an explanatory view of switching the conveyance path of the medium collection device according to an embodiment of the present invention;

FIG. 8 is an explanatory view of a medium collecting operation of the medium collection device when the number of media collected by the collection unit according to an embodiment of the present invention is sufficiently small;
FIG. 9 is an explanatory view of a medium collecting operation of the medium collection device when the number of media collected by the collection unit according to an embodiment of the present invention is sufficiently small;
FIG. 10 is an explanatory view of a medium collecting operation of the medium collection device when the number of media collected by the collection unit according to an embodiment of the present invention is sufficiently small;
FIG. 11 is an explanatory view of a medium collecting operation of the medium collection device when the number of media collected by the collection unit according to an embodiment of the present invention is sufficiently small;
FIG. 12 is an explanatory view of a medium collecting operation of the medium collection device when the number of media collected by the collection unit according to an embodiment of the present invention is sufficiently small;
FIG. 13 is an explanatory view of a medium collecting operation of the medium collection device when the number of media collected by the collection unit according to an embodiment of the present invention is sufficiency small;
FIG. 14 is a detailed explanatory view of the operation of the medium collection device according to an embodiment of the present invention;
FIG. 15 is a detailed explanatory view of the operation of the medium collection device according to an embodiment of the present invention;
FIG. 16 is a detailed explanatory view of the operation of the medium collection device according to an embodiment of the present invention;
FIG. 17 is a detailed explanatory view of the operation of the medium collection device according to an embodiment of the present invention;
FIG. 18 is a detailed explanatory view of the operation of the medium collection device according to an embodiment of the present invention;
FIG. 19 is a detailed explanatory view of the operation of the medium collection device according to an embodiment of the present invention;
FIG. 20 is a detailed explanatory view of the operation of the medium collection device according to an embodiment of the present invention; and
FIG. 21 is a flowchart of the operation of the medium collection device according to an embodiment of the present invention.

Description of the Preferred Embodiments

[0009] The medium collection device according to an embodiment of the present invention is described below using a medium collection device 5 in an automatic transaction device 1 as an example with reference to the attached drawings. FIG. 1 is the outline of the configuration of the automatic transaction device 1 according to an embodiment of the present invention. As illustrated in FIG. 1, the automatic transaction device 1 includes a preceding stage unit 3, a medium collection device 5, and issue units 6 and 7.

[0010] The preceding stage unit 3 mainly prints data on a document and a passbook. The medium collection device 5 mainly collects a document, a passbook, etc. (hereafter referred to collectively as a medium) in a collection unit 43. The issue units 6 and 7 store a medium used in the process performed by the automatic transaction device 1.

[0011] The preceding stage unit 3 includes a control unit 8, an MS (magnetic stripe) unit 9, an optical read unit 11, a print unit 13, a page turn unit 14, and a conveyance path 15. The control unit 8 controls the entire process of the automatic transaction device 1. The MS unit 9 reads and writes the information held in the magnetic recording unit of a passbook and a card. The optical read unit 11 optically reads the information described on, for example, a document, a passbook, etc. The print unit 13 prints data on a document and a passbook. The page turn unit 14 turns the page of a passbook as necessary.

[0012] The conveyance path 15 is a path configured by a roller etc. not illustrated in the attached drawings are arranged so that a document and a passbook can be automatically conveyed depending on the process. For explanation, the conveyance path 15 includes conveyance paths 15a through 15g.

[0013] In the preceding stage unit 3, the conveyance path 15 includes conveyance path 15a and conveyance path 15b. The conveyance path 15a runs from a inlet not illustrated in the attached drawings of automatic transaction device 1 to the medium collection device 5. The conveyance path 15a conveys the passbook, the document, etc. inserted into the automatic transaction device 1 through the inlet not illustrated in the attached drawings to the medium collection device 5 through the preceding stage unit 3, and conveys a medium to be returned to the inlet from the medium collection device 5 through the preceding stage unit 3. The conveyance path 15b runs from the issue unit 6 to the conveyance path 15a, and introduces the document or the passbook stored in the issue unit 6 to the preceding stage unit 3 as necessary.

[0014] The issue unit 6 has two cassettes 6a and 6b in the example in FIG. 1, and each stores a medium as necessary. The cassettes 6a and 6b can store media of different sizes or the same size. Furthermore, the medium stored in the issue unit 6 is introduced to the conveyance path 15a in the preceding stage unit 3 through the conveyance path 15b as necessary as described above.

[0015] The issue unit 7 similarly has two cassettes 7a and 7b in the example in FIG. 1, and each stores a medium as necessary. The cassettes 7a and 7b can store

media of different sizes or the same size. Furthermore, the medium stored in the issue unit 7 is introduced to the conveyance path 15c in the medium collection device 5 through the conveyance path 15f as necessary as described later.

[0016] The medium collection device 5 includes an upside-down turn unit 17, a collection unit 43, and a conveyance path 15. The upside-down turn unit 17 makes an upside-down turn on a passbook and a document. The collection unit 43 stores a document and a passbook inside.

[0017] In the medium collection device 5, the conveyance path 15 includes the conveyance path 15c, the conveyance path 15d, the conveyance path 15e, the conveyance path 15f and the conveyance path 15g. The conveyance path 15c runs from the preceding stage unit 3 to the branch point to the collection unit 43. The conveyance path 15g runs from the branch point to the collection unit 43 to the upside-down turn unit 17. The conveyance paths 15c and 15g pass the medium conveyed from the preceding stage unit 3 to the upside-down turn unit 17, and convey a medium transmitted from the issue unit 7 and a medium conveyed from the upside-down turn unit 17 or the collection unit 43 to the preceding stage unit 3.

[0018] The conveyance path 15d runs from the conveyance path 15c to the collection unit 43, conveys a medium to the collection unit 43 or the temporary saving side as necessary, and conveys a temporarily saved passbook to the conveyance path 15c. The conveyance path 15e branches from the conveyance path 15d at the entry of the collection unit 43 and further extends as a path for temporary storage of a passbook etc. in the state in which the passbook etc. is held by a roller etc. not illustrated in the attached drawings but provided at the entry of the collection unit 43 when the passbook etc. is temporarily saved. The conveyance path 15f runs from the issue unit 7 to the conveyance path 15g, and introduces the document or the passbook stored in the issue unit 7 to the medium collection device 5 as necessary.

[0019] Next, the configuration of the medium collection device 5 is further described according to the present embodiment with reference to FIGS. 2 through 4. FIG. 2 is an explanatory view of the configuration of the inside of the medium collection device 5. FIG. 3 is a configuration of a pinch roller 31. FIG. 4 is a configuration of a gate 37. In FIGS. 2 through 19, the conveyance path 15f and the upside-down turn unit 17 are omitted.

[0020] As illustrated in FIG. 2, in the automatic transaction device 1, a roller 21 and a pinch roller 23 are arranged face to face at the end part of the preceding stage unit 3 on the medium collection device 5 side. A pinch roller 33 and a roller 35 are arranged face to face in the conveyance path 15g of the medium collection device 5. A sensor 27 for detecting the passage of a medium is provided for the conveyance path 15d. The sensor 27 is, for example, a photosensor. The pinch roller 31 and a roller 29 are arranged face to face at the boundary between the conveyance path 15d and the conveyance path 15e. The gate 37 is further provided on the collection unit 43 side beyond the pinch roller 31 and the roller 29.

[0021] The roller 21 and the pinch roller 23 convey the medium conveyed through the conveyance path 15a or the conveyance path 15c to the medium collection device 5 or inside the preceding stage unit 3 by rotating the medium between the roller 21 and the pinch roller 23. For example, the roller 21 is fixed to the medium collection device 5 through an axis 21a, and rotates by the driving force depending on the direction of conveying a medium. The pinch roller 23 is configures so that it is pressed against the roller 21, and is appropriately movable when a medium passes. The rotation direction of the roller 21 and the pinch roller 23 is variable depending on the direction of the conveyance of a medium.

[0022] A gate 25 rotates as indicated by an arrow 25b on a axis 25a by turning on and off the magnet A not illustrated in the attached drawings, and switches the conveyance path connected to the conveyance path 15c between the conveyance path 15d and the conveyance path 15g. When the conveyance path 15c is connected to the conveyance path 15g, an upside-down turn is made on the conveyed medium and the medium is returned to the conveyance path 15c. By connecting the conveyance path 15c to the conveyance path 15d, the medium conveyed from the conveyance path 15c can be conveyed to the conveyance path 15d, or the medium conveyed from the conveyance path 15d can be conveyed to the conveyance path 15c. The sensor 27 is, for example, a photosensor, and detects whether or not the medium has passed.

[0023] The pinch roller 33 and the roller 35 convey the medium conveyed through the conveyance path 15g to the upside-down turn unit 17 or into the preceding stage unit 3 by rotating the medium between the pinch roller 33 and the roller 35. For example, the roller 35 is fixed on the medium collection device 5 through an axis 35a, and is rotated while driving force is applied to the roller 35 depending on the direction of the conveyance of the medium. The pinch roller 33 is pressed against the roller 35, and is configured so that it can be appropriately movable when the medium passes. The rotation direction of the roller 35 and the pinch roller 33 is variable depending on the direction of the conveyance of the medium.

[0024] The roller 29 and the pinch roller 31 convey the medium conveyed through the conveyance path 15d toward the conveyance path 15e or into the collection unit 43 depending on the rotation state of the gate 37 by rotating the medium between the roller 29 and the pinch roller 31. For example, the roller 29 is fixed on the medium collection device 5 through an axis 29a, and is rotated while driving force is applied to the roller 29 depending on the direction of the conveyance of the medium. The pinch roller 31 is so that it is pressed to the roller 29 and is appropriately movable as the medium passes. The rotation direction of the roller 29 and the pinch roller 31 is variable depending on the direction of the conveyance of the medium. The details of the configuration of the

pinch roller 31 are described later.

[0025] The gate 37 includes a pressure unit 38 and a shield unit 39, and rotates as indicated by an arrow 37b on the axis 37a by turning on and off the magnet B not illustrated in the attached drawings. The gate 37 switches the connection between the conveyance path 15d and the conveyance path 15e or the collection unit 43, and presses the medium to the pinch roller 31 when the medium passes between the pinch roller 31 and the roller 29. When the medium is completely stored in the collection unit 43, the conveyance path 15d is connected to the conveyance path conveyance path 15e by the gate 37. In this state, the shield unit 39 enters a sensor 41, and cuts off the light. The sensor 41 is, for example, a photosensor. The control unit 8 detects that the medium is completely stored in the collection unit 43 by detecting by the sensor 41 that the gate 37 is completely rotated to the position where the 15d is connected to the conveyance path 15e. The details of the configuration of the gate 37 are described later.

[0026] FIG. 3A is a configuration of the outline of the contact surface of the pinch roller 31, and FIG. 3B is a side view of the pinch roller 31. As illustrated in FIG. 3A,and 3B, the pinch roller 31 is formed by convex parts 31a enclosing a notch 31b as illustrated on the right in the example in FIG. 3A about the contact surface with the medium. As illustrated in FIG. 3B, the pinch roller 31 is configured so that, as illustrated from the side, the perimeter of the part on which the convex part 31a is formed is larger (diameter r1), and the notch 31b has the same diameter r2 as other flat part 31c. For example, four notches 31b are formed.

[0027] FIG. 4 is a detailed configuration of the gate 37, and illustrates the position relationship between the 37 and the pinch roller 31. FIG. 4 illustrates the gate 37 and the pinch roller 31 viewed from above the view in FIG. 2. As illustrated in FIG. 4, the gate 37 is fixed to the medium collection device 5 on the axis 37a, and rotates as indicated by the arrow 37b. On the pinch roller 31 side of the gate 37, a pressure unit 38 including a short tooth 38a, a long tooth 38c, and a notch 38b is formed.

[0028] The short tooth 38a is formed opposite the flat part 31c of the pinch roller 31. The notch 38b is formed on both sides of the short tooth 38a. Especially, the convex part 31a side of the pinch roller 31 is formed to avoid the part opposite the convex part 31a, and the pressure unit 38 does not contact the convex part 31a. The long tooth 38c is formed on the part other than the short tooth 38a and the notch 38b of the pressure unit 38.

[0029] For example, it is preferable that at least the surface in contact with the medium of the roller 21, the pinch roller 23, the roller 35, the pinch roller 33, and the roller 29 is formed by rubber, resin, etc. It is preferable that the contact surface with the medium of the pinch roller 31 is formed by a resin to avoid the clogging of the medium.

[0030] The switching state of the gate 25 and the gate 37 in the medium collection device 5 according to the present embodiment is described below with reference to FIGS. 5 through 7. FIGS. 5 through 7 are explanatory views of switching the conveyance path 15 in the medium collection device 5. The gates 25 and 37 can be switched respectively by magnets A and B not illustrated in the attached drawings, and the conveyance route can be changed as follows. Depending on the state of the two magnets, the available conveyance path 15 is switched to the following three types.

1) Magnet A: OFF, Magnet B: OFF ... conveyance path 15g (state in FIG. 5)
2) Magnet A: ON, Magnet B: OFF ... conveyance path 15c → conveyance path 15d → conveyance path 15e (state in FIG. 6)
3) Magnet A: ON, Magnet B: ON ... conveyance path 15c → conveyance path 15d → collection unit 43 (state in FIG. 7)

Hereafter, the state of the gate 37 described above in 1) is referred to as the first state, the state described in 2) above is referred to as the second state, and the state described in 3) above is referred to as the third state.

[0031] FIG. 5 illustrates the case in which a medium is conveyed into the conveyance path 15g. As illustrated in FIG. 5, the gate 25 is in the state in which the conveyance path 15d is closed, the gate 37 is in the state in which the entry to the collection unit 43 is closed. In this case, the medium 50 is transmitted to the roller 21 and the pinch roller 23, and conveyed between the pinch roller 33 and the roller 35.

[0032] FIG. 6 illustrates the case in which a medium is conveyed in the conveyance path 15d and the conveyance path 15e. As illustrated in FIG. 6, the gate 25 is in the state in which the conveyance path 15d is connected to the conveyance path 15c, and the gate 37 is in the state in which the entry to the collection unit 43 is closed. In this case, the medium 50 is transmitted to the roller 21 and the pinch roller 23, and temporarily saved in the state in which a part is conveyed to the conveyance path 15e by being enclosed by the pinch roller 31 and the roller 29.

[0033] FIG. 7 illustrates the case in which a medium is collected by the collection unit 43. As illustrated in FIG. 7, the gate 25 is in the state in which the conveyance path 15d is connected to the conveyance path 15c, and the gate 37 is in the state in which the conveyance path 15e is closed. In this case, the medium 50 is transmitted to the roller 21 and the pinch roller 23, and collected by the collection unit 43 by being enclosed by the pinch roller 31 and the roller 29.

[0034] The medium collecting operation of the medium collection device 5 according to the present embodiment is described with reference to FIGS. 8 through 13. FIGS. 8 through 13 are explanatory views of the medium collecting operation of the medium collection device 5 when the number of media collected by the collection unit 43 is sufficiently small. In FIGS. 8 through 13, the shield unit 39 of the gate 37 is omitted in FIGS. 8 through 13.

[0035] As illustrated in FIG. 8, the medium 50 conveyed through the conveyance path 15a of the preceding stage unit 3 is conveyed to the conveyance path 15c of the medium collection device 5 by being enclosed by the roller 21 and the pinch roller 23. In this case, the two magnets A and B are in the OFF position, and the gates 25 and 37 are in the first state.

[0036] When the medium 50 is collected in the collection unit 43, the two magnets A and B are first placed in the ON position as illustrated in FIG. 9, and the gates 25 and 37 are in the third state. When the tip of the medium 50 reaches the position of the sensor 27, the control unit 8 detects that the sensor 27 has been shielded, thereby determining that the medium 50 has been conveyed.

[0037] As illustrated in FIG. 10, the medium 50 is conveyed in the direction of an arrow 56 through the conveyance path 15d, and enclosed between the pinch roller 31 and the roller 29. As illustrated in FIG. 11, the medium 50 is conveyed in the direction of an arrow 60 by the rotation of the pinch roller 31, further conveyed into the collection unit 43, and completely collected in the collection unit 43 as illustrated in FIG. 12.

[0038] As illustrated in FIG. 13, when the sensor 27 detects that the rear end of the medium 50 has been conveyed into the collection unit 43, and, for example, when the rotation of the pinch roller 31 exceeds a specified number of steps, the control unit 8 turns off the magnet B. That is, when it is considered that the medium 50 has passed the pinch roller 31, the control unit 8 turns off the magnet B. Thus, the control unit 8 switches the gate 37 to the second state, and, for example, stops the applying of the driving force to the roller 29, thereby stopping the rotation of the pinch roller 31. Furthermore, by turning off the magnet A, the control unit 8 rotates the gate 25 and places it in the first state.

[0039] Next, with reference to FIGS. 14 through 20, the medium collecting method according to the present embodiment is described below using as an example the case in which the number of media stored in the collection unit 43 is approaching the allowance. FIGS. 14 through 20 are detailed explanatory views of the operation of the medium collection device 5 according to the present embodiment. As illustrated in FIG. 14, it is assumed that the gates 25 and 37 are in the third state. If a medium has already been collected in the collection unit 43, a contact load can occur in a position as indicated by, for example, a range 51, and the medium 50 may not be completely collected in the collection unit 43.

[0040] As illustrated in FIG. 15, for example, if the rotation of the pinch roller 31 has exceeded a specified number of steps after the sensor 27 detects the passage of the medium 50, the control unit 8 turns off the magnet B. However, since the medium 50 is still enclosed by the pinch roller 31 and the roller 29, the shield unit 39 does not enter the sensor 41, and the control unit 8 cannot detect the change to the second state. Therefore, the roller 29 and the pinch roller 31 continue their rotation. In addition, the pressure unit 38 of the gate 37 presses the medium 50 against the pinch roller 31 in the direction indicated by an arrow 62.

[0041] As illustrated in FIG. 16, when the pinch roller 31 rotates with the medium 50 pressed against the roller, the rear end of the medium 50 conveyed forward is arranged at the notch 31b of the pinch roller 31 and engaged in the notch. Then, as illustrated in FIG. 17, the further rotation of the pinch roller 31 applies propelling force exceeding the contact load generated, for example, in the range 51 illustrated in FIG. 14 to the rear end of the medium 50 by the convex part 31a, and the medium is pushed in the direction of the conveyance as indicated by an arrow 64.

[0042] As illustrated in FIGS. 18 and 19, the medium 50 is conveyed in the direction indicated by the arrow 64 with the rotation of the pinch roller 31. In the meantime, as illustrated in FIG. 19, the long tooth 38c presses the medium 50 in the direction indicated by the arrow 62.

[0043] As illustrated in FIG. 20, when the medium 50 is completely collected in the collection unit 43, the rotation of the pressure unit 38 of the gate 37 is not stopped by the medium 50, and further rotates in the direction in which the entry of the collection unit 43 is blocked . Since the portions facing the pinch roller 31 of the pressure unit 38 are the short tooth 38a and the notch 38b as illustrated in FIG. 4, the rotation of the gate 37 is not stopped by the pinch roller 31, but continues rotating up to the position where the conveyance path 15d is connected to the conveyance path 15e. In this case, the shield unit 39 provided for the gate 37 enters the sensor 41. The control unit 8 detects that the gate 37 fully rotates and enters the second state by the shielding of the sensor 41. By the control unit 8 detecting that the gate 37 has fully rotated, it determines that the medium 50 has been completely collected in the collection unit 43. Furthermore, the control unit 8 turns off the magnet A, switches the gate 25, and places it in the first state.

[0044] It is preferable that, for example, if the rotation of the pinch roller 31 exceeds a specified number of steps and the sensor 41 does not detect the rotation of the gate 37 after the control unit 8 has detected the medium 50 using the sensor 27, the medium 50 can be easily caught by the notch 31b of the pinch roller 31 by turning on and off the magnet B.

[0045] The operation above is further described below with reference to FIG. 21. FIG. 21 is a flowchart of the operation of the medium collection device 5. As illustrated in FIG. 21, the control unit 8 first turns on the magnets A and B, and as illustrated in FIG. 9 for example, makes the gates 25 and 37 enters the third state for collecting the medium 50 in the collection unit 43 (S101). The medium 50 starts moving by being enclosed by the pinch roller 23 and the roller 21 as illustrated in FIG. 9 for example (S102).

[0046] For example, as illustrated in FIG. 9, when the medium 50 is conveyed to the position of the sensor 27 for detection of a medium, the control unit 8 detects that the sensor 27 has been shielded (S103). For example,

as illustrated in FIG. 11, when the rear end of the medium 50 passes the sensor 27, the control unit 8 detects the passage of the medium 50 by the sensor 27 not shielded (S104).

[0047] Until counting a specified number of steps of the motor not illustrated in the attached drawings but for rotating the roller 29 after passing the medium 50, the control unit 8 conveys the medium 50 (S105). Then, the control unit 8 turns off the magnet B, and issues an instruction to move the gate 37 in the second state in which the collection unit 43 is closed (S106). Furthermore, the control unit 8 conveys the medium 50 until a specified number of steps of the motor not illustrated in the attached drawings but for rotating the roller 29 is counted (S107). In the meantime, as illustrated in FIGS. 15 through 19, the medium 50 is conveyed toward the inside of the collection unit 43 by the convex part 31a of the pinch roller 31 pushing the rear end of the medium 50.

[0048] The control unit 8 determines whether or not the sensor 41 has been shielded by the shield unit 39 (S108), and if it determines the shielding, it stops the rotation of the roller 29 and the pinch roller 31, turns off the magnet A, and places it in the first state, thereby terminating the process (S109). In S108, while the shielding of the sensor 41 is not detected, it is repeated to turn on the magnet B (S110), and then turn it off (S106).

[0049] In the embodiment above, the pinch roller 31 is an example of a roller according to the present embodiment, the roller 29 is an example of an opposite roller, the sensor 27 is an example of a medium detection unit, and the sensor 41 is an example of a collection detection unit. The conveyance path 15e is an example of a temporary save path. The gate 37 is an example of a path switch unit according to the present invention.

[0050] As described above in detail, in the medium collection device 5 of the automatic transaction device 1 according to the present embodiment, the pinch roller 31 provided at the entry of the collection unit 43 is provided with the convex part 31a and the notch 31b. The convex part 31a and the notch 31b are provided on one side of the direction of the pinch roller 31 orthogonal to the direction of the conveyance of the medium. Two pinch rollers 31 are provided at an interval in the direction orthogonal to the direction of the conveyance.

[0051] The destination of the conveyance from the conveyance path 15d is not only the collection unit 43, but also the conveyance path 15e available for temporary save. The pressure unit 38 and the shield unit 39 are provided for the gate 37 for switch between the collection unit 43 and the conveyance path 15e for a conveyance destination from the conveyance path 15d. Furthermore, the sensor 27 for detecting the passage of the medium 50 is provided for the conveyance path 15d, and the sensor 41 for detecting the movement of the 37 using the shield unit 39 is provided.

[0052] With the above-mentioned configuration, when the medium 50 is collected in the collection unit 43, the convex part 31a can push the rear end of the medium 50. Therefore, although there have been a large number of media almost reaching the allowance in the collection unit 43, the conveyance force exceeding the contact load with the already stored media can be applied, thereby collecting the media without fail.

[0053] The convex part 31a and the notch 31b are provided on one side of the direction of the pinch roller 31 orthogonal to the direction of the conveyance of the media. Therefore, the pinch roller 31 can be produced easily, and when a plurality of pinch rollers 31 are prepared, the pinch rollers of the same form can be produced. In addition, two pinch rollers 31 are provided in the direction orthogonal to the direction of the conveyance of the medium. Thus, the media in wave shape can be conveyed, thereby improving the capability of conveyance.

[0054] The pressure unit 38 of the gate 37 is formed in the shape of comb teeth. Especially, the portion facing the pinch roller 31 includes the short tooth 38a and the notch 38b. Therefore, the short tooth 38a continues pushing the flat part 31c of the pinch roller 31 until the medium 50 is separated from the pinch roller 31 and completely collected in the collection unit 43. Thus, the gate 37 cannot rotate to the position in which the entry to the collection unit 43 is completely blocked until the medium 50 is separated from the pinch roller 31. Therefore, by detecting the shield unit 39 shielding the sensor 41, it is detected that the medium 50 has been completely collected in the collection unit 43.

[0055] Thus, the medium not completely collected in the collection unit 43 can be prevented from being taken out together with a temporarily saved medium when it is ejected. In this case, since the conveyance path 15e for temporary save is provided, there is further an effect of preventing a medium from being unnecessarily accompanied when a temporarily saved medium is ejected.

[0056] Thus, although a large number of media almost reaching the allowance are stored in the collection unit 43, the media can be collected without fail. Therefore, the number of media which can be collected but is reduced for a smaller space of the collection unit 43 for the reason of improving the performance of a printer of passbooks can be equal to or exceed the number of media which have been conventionally collected.

[0057] Furthermore, since the conveyance path 15e for temporary save and the switching gate 37 are newly added, erroneous collection can be reduced although the space of the collection unit 43 is smaller than the conventional device. Accordingly, the number of media which can be collected is equal to or exceeds the number of media which can be collected by the conventional device.

[0058] Thus, the present invention can provide a medium collection device and a medium collecting method capable of storing media without reducing the number of media which can be collected in a collection unit without fail.

[0059] Furthermore, the present invention is not limited to the embodiments above, but can be realized with var-

ious configurations or embodiments within the scope of the gist of the present invention. For example, both the roller 21 and the pinch roller 23 can rotate, or for example, the pinch roller 23 can be rotated by applying driving force in the direction of the conveyance of a medium without applying the driving force for rotation to the roller 21. For example, four notches 31b are formed, but a different number of notches can be formed. In the example in FIG. 4, the long tooth 38b is also formed in a comb tooth shape, but, for example, two pinch rollers 31 can be consecutive.

Claims

1. A medium collection device, comprising:

a collection unit (43) collecting a medium;
a roller (31) having a convex part (31a) provided on a contact surface with the medium and a notch (31b) provided in a rotation direction of the contact surface of the convex part, and conveying the medium by rotating in contact with the medium;
a medium detection unit (27) detecting whether or not the medium has passed a specified position; and
a pressure unit (38) pressing the medium against the roller when it is detected that the medium has passed the specified position; wherein
a rear end of the medium is pressed by the convex part when the pressure unit presses the medium against the roller, thereby collecting the medium in the collection unit.

2. The device according to claim 1, further comprising a temporary save path (15e) temporarily saving the medium, wherein
the pressure unit (38) is a path switch unit (37) switching a conveyance path of the medium between the temporary save path and the collection unit.

3. The device according to claim 2, further comprising an opposite roller (29) which is provided opposite the roller and pressing the medium against the roller, wherein
when the pressure unit switches the conveyance path to the temporary save path, the roller rotates in a first direction to convey the medium to the conveyance path side with the medium held between the roller and the opposite roller, and rotates in a second direction which is a reverse direction to the first direction, thereby releasing the temporary save.

4. The device according to claim 2 or 3, wherein
the pressure unit (38) is comb-tooth shaped, and has a part opposite the roller formed shorter than a part not opposite the roller.

5. The device according to claim 4, further comprising a collection detection unit (41) detecting that the path switch unit has switched the conveyance path to the collection unit if the medium passes through the roller (31) and the pressure unit (38).

6. The device according to any of claims 1 through 5, wherein
a plurality of convex parts (31a) are formed at intervals in a rotation direction of the contact surface of the roller.

7. The device according to any of claims 1 through 6, wherein
two rollers (31) are provided in a direction orthogonal to the conveyance direction.

8. The device according to any of claims 1 through 7, wherein
at least a contact surface of the roller (31) with the medium is formed by a resin.

9. A method for collecting a medium, comprising:

a process (S103) of detecting whether or not the medium has passed a specified position;
a process (S105) of moving the medium by a roller for conveying the medium by rotating in contact with the medium using a convex part provided on a contact surface with the medium, and a notch provided in a rotation direction of the contact surface of the convex part;
a process (S106) of a pressure unit pressing the medium against the roller when it is detected that the medium has passed the specified position; and
processes (S107 through S109) of pressing the rear end by the convex part when the pressure unit presses the medium against the roller, thereby collecting the medium in the collection unit.

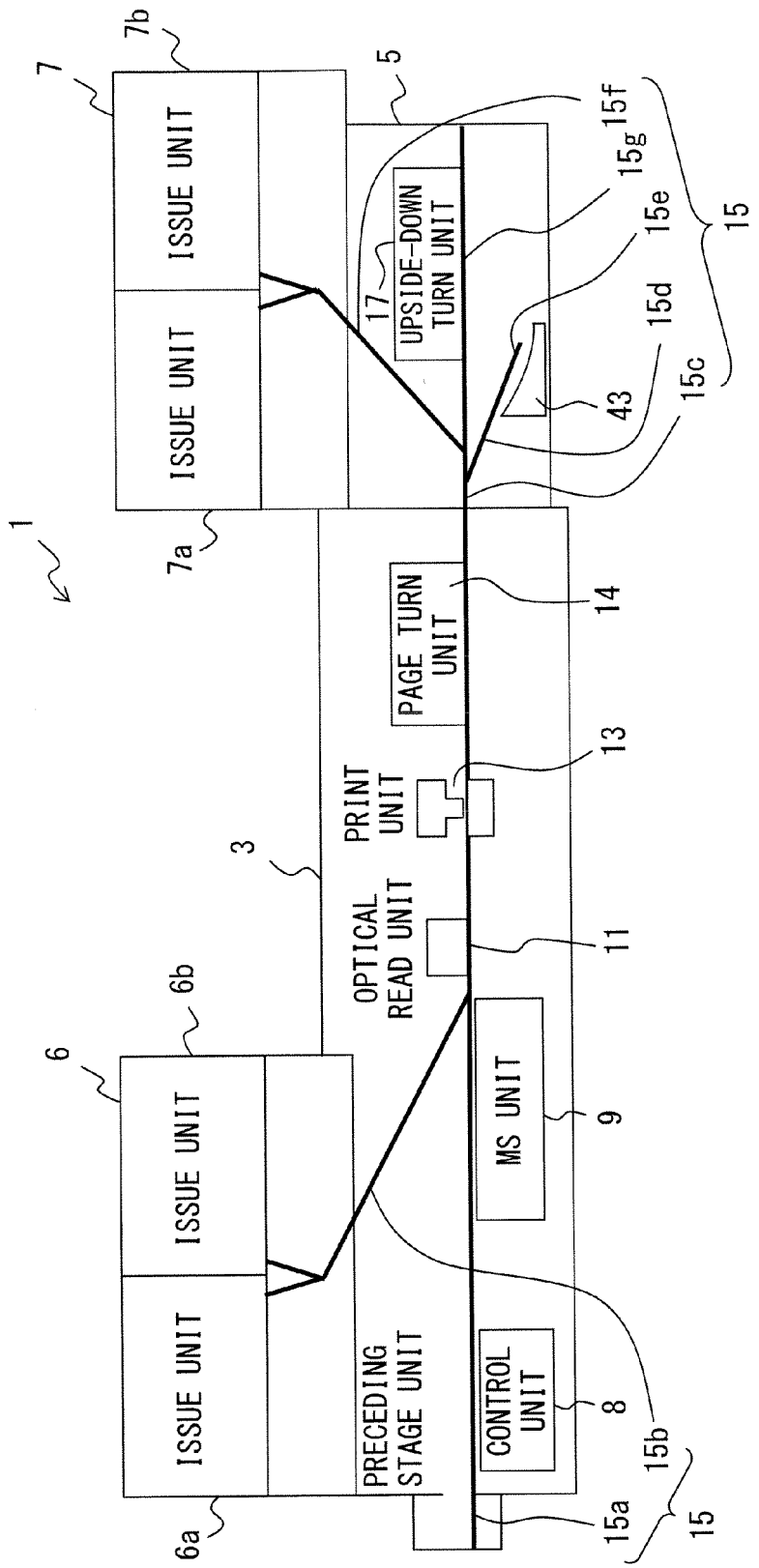
1
7
7b
ISSUE UNIT
ISSUE UNIT
7a
5
UPSIDE-DOWN TURN UNIT
17
15f
15g
15e
15d
15c
15
43
PAGE TURN UNIT
14
PRINT UNIT
13
3
OPTICAL READ UNIT
11
6
6b
ISSUE UNIT
ISSUE UNIT
6a
PRECEDING STAGE UNIT
MS UNIT
9
CONTROL UNIT
8
15b
15a
15

FIG. 1

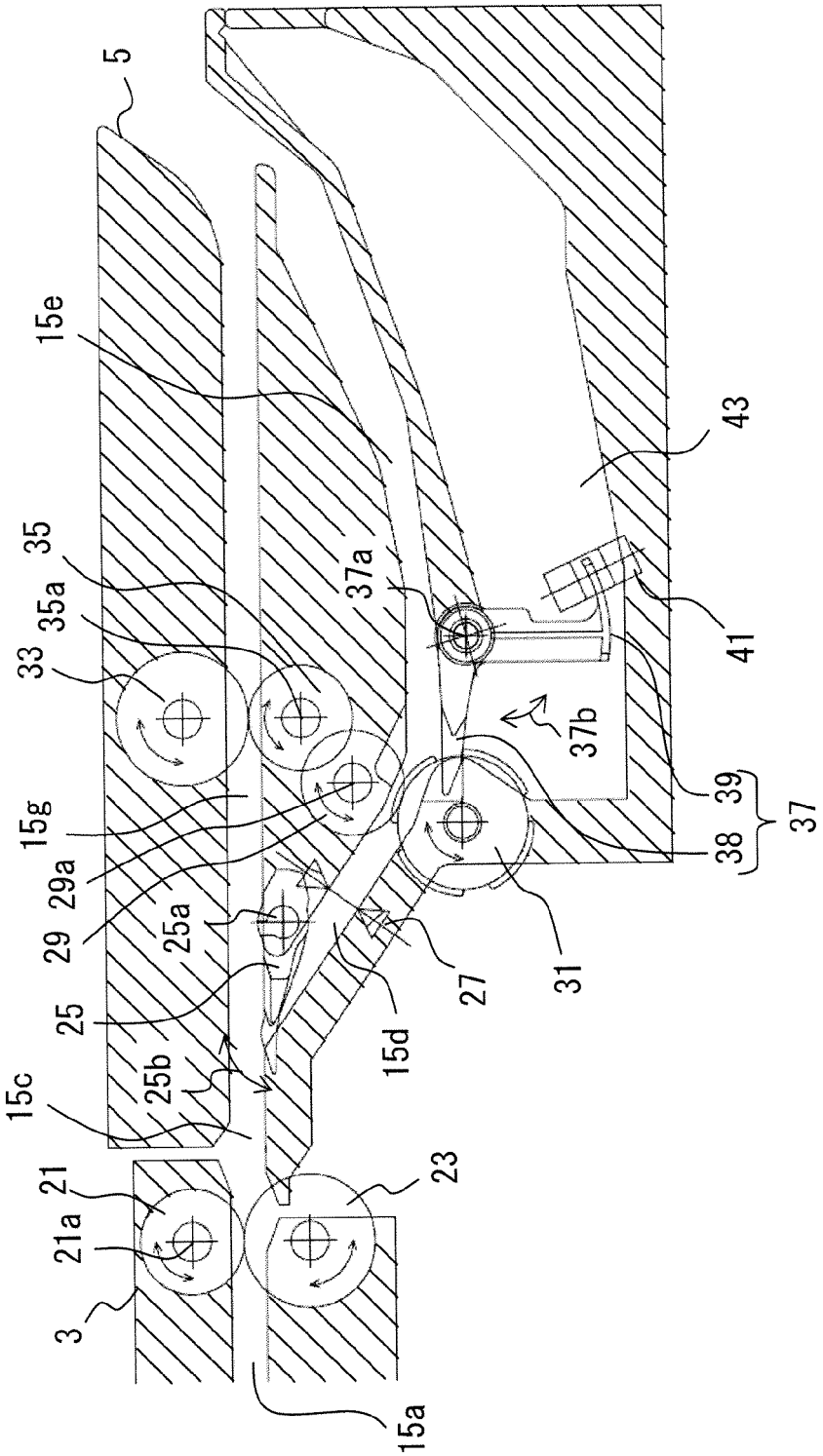
5
15e
43
35
35a
33
37a
41
37b
15g
29a
29
25a
25
25b
15c
15d
27
31
39
38
37
21
21a
3
23
15a

FIG. 2

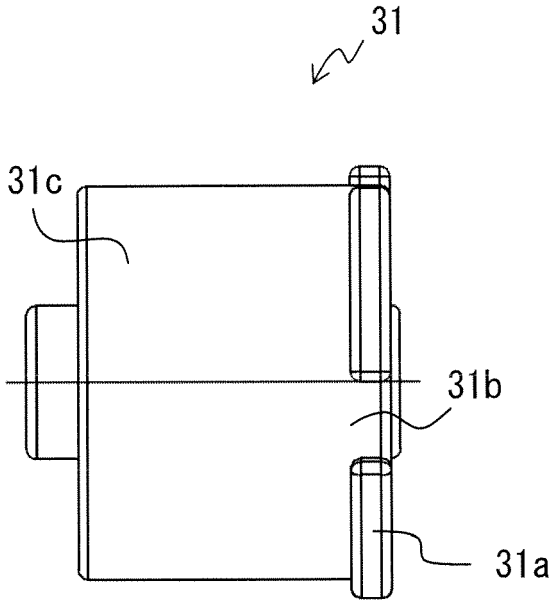

FIG. 3A

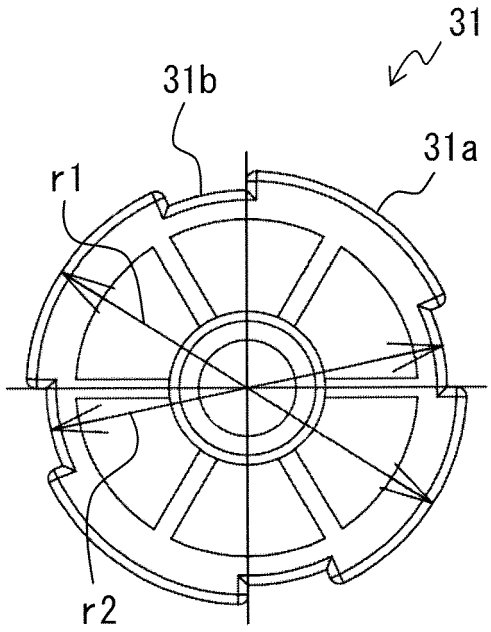

FIG. 3B

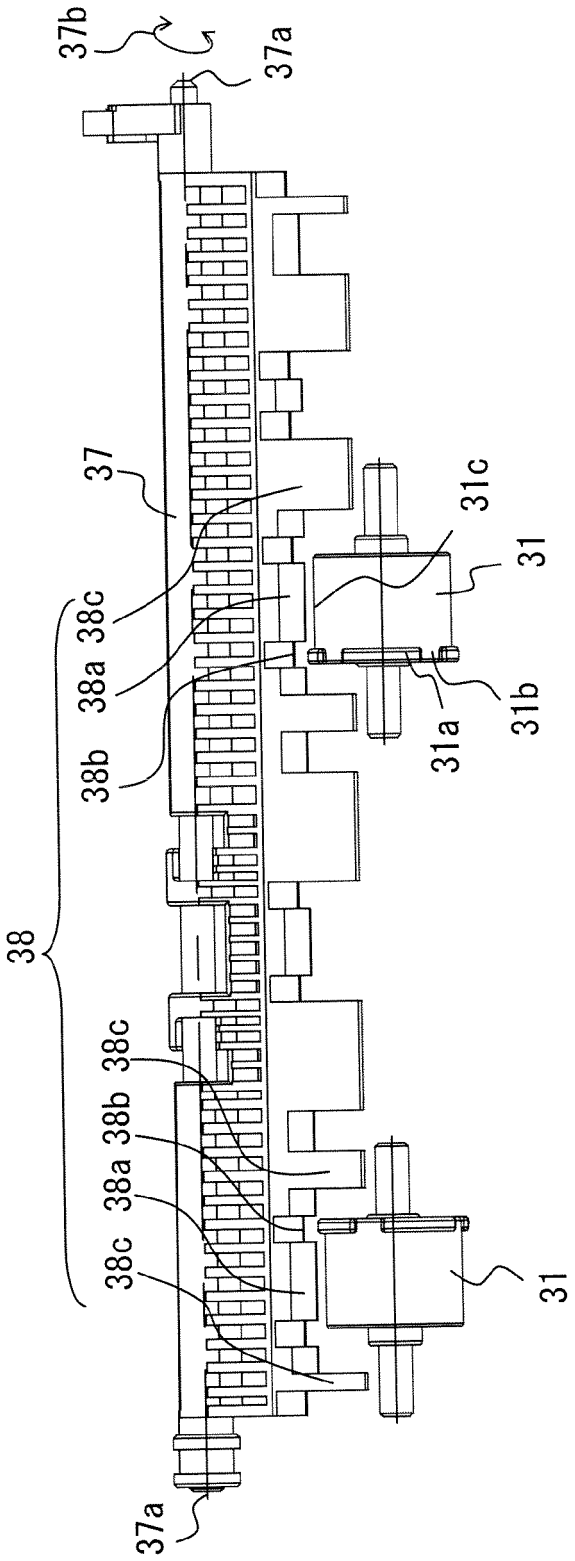

FIG. 4

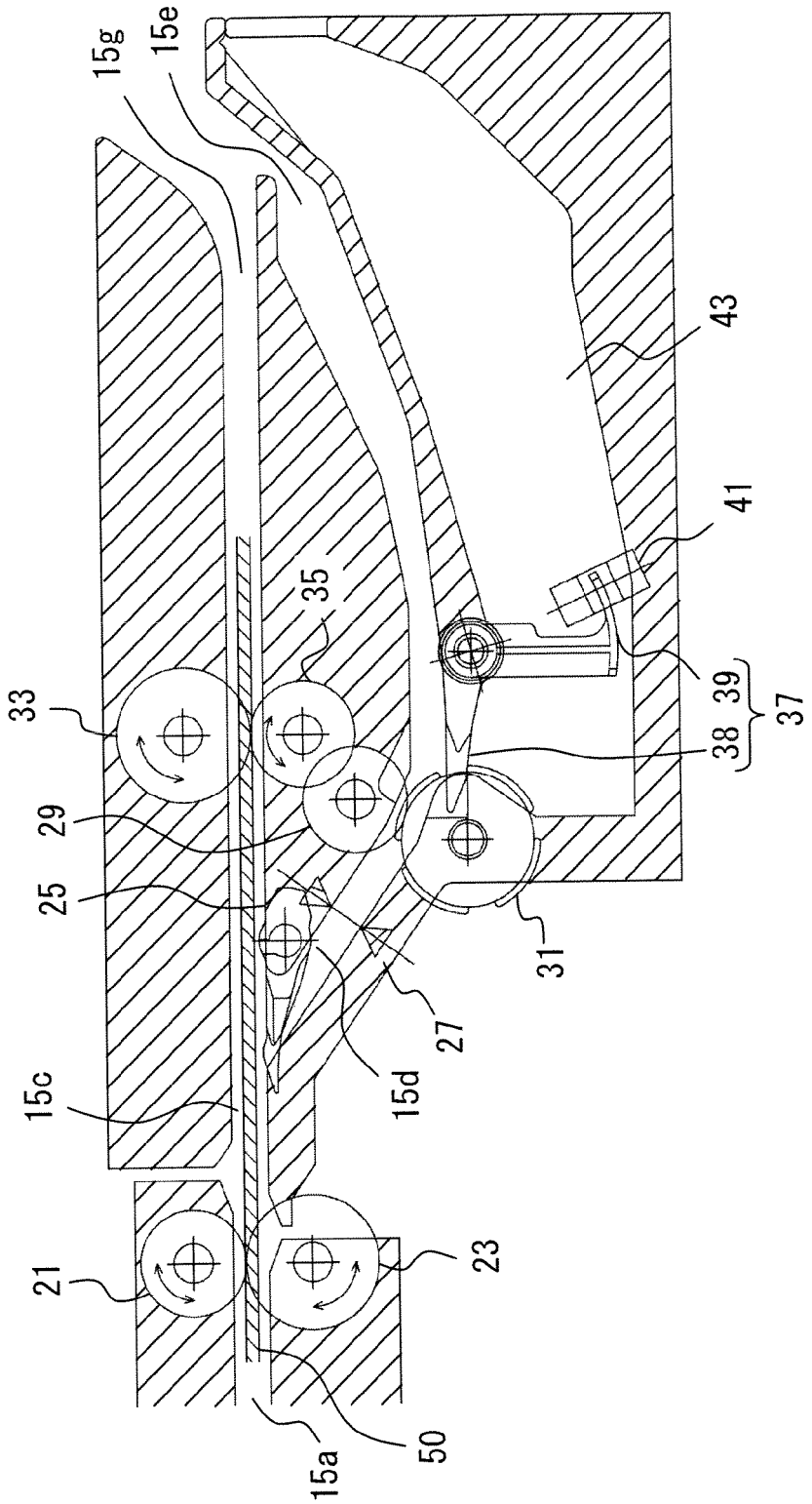

FIG. 5

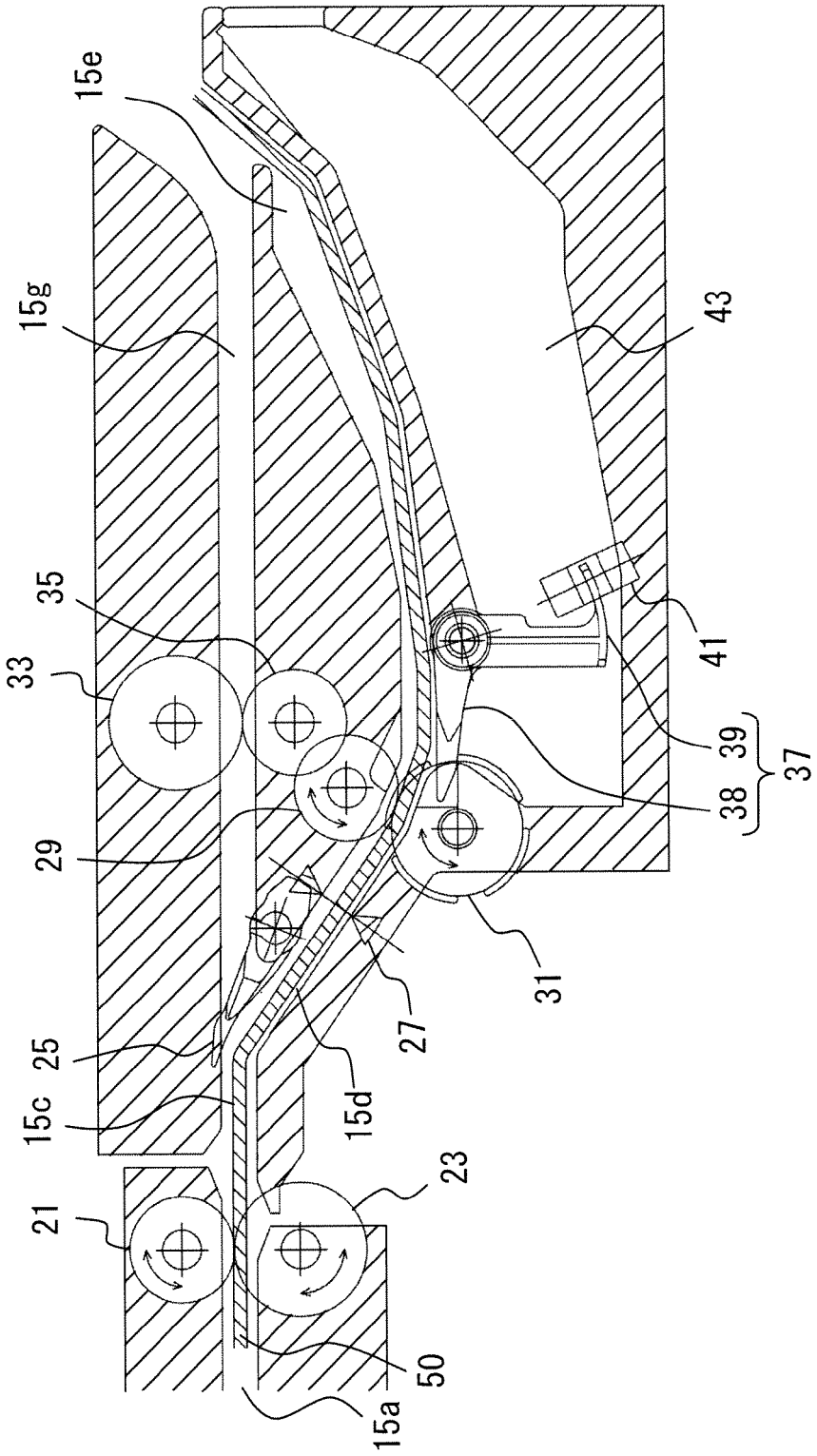

FIG. 6

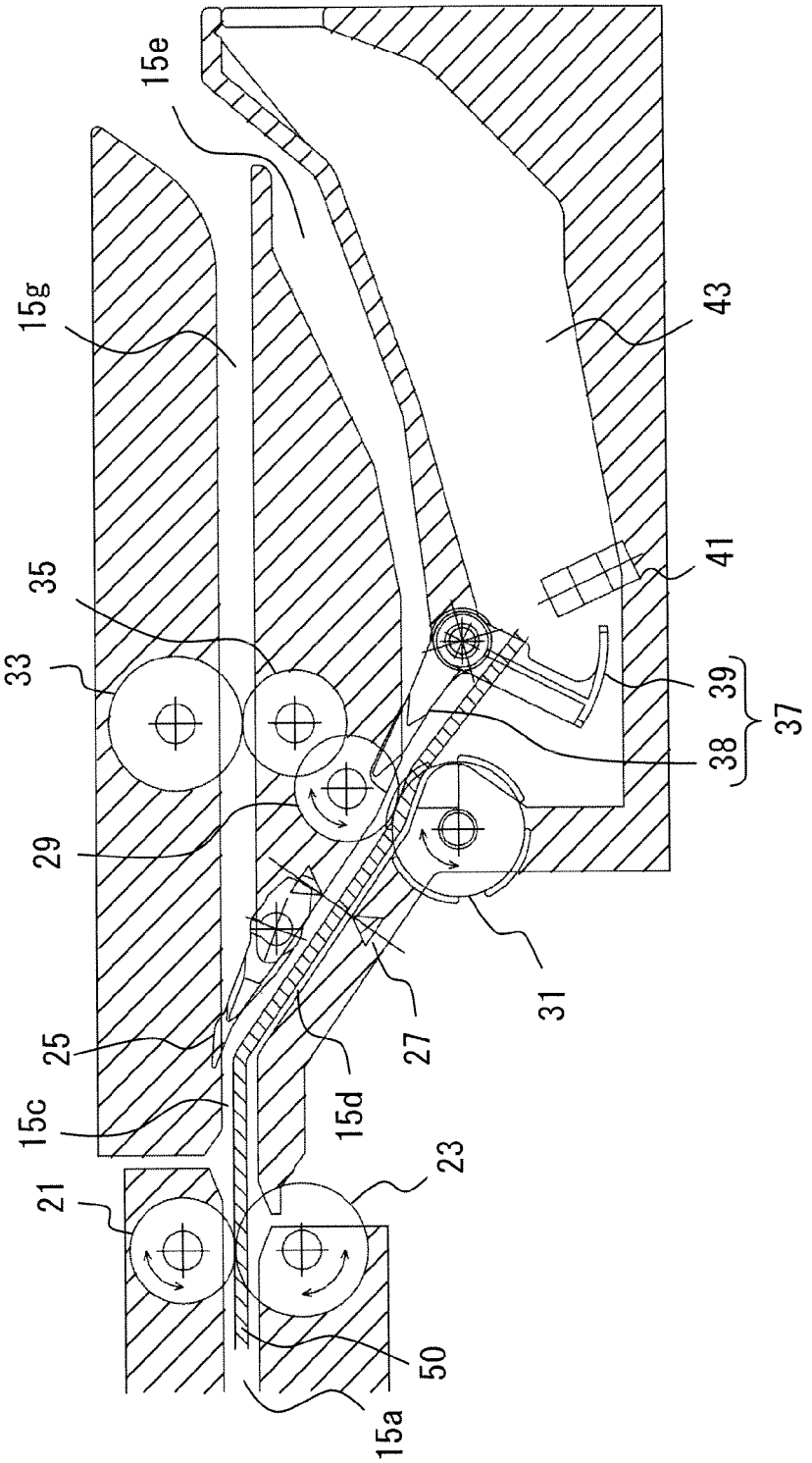

FIG. 7

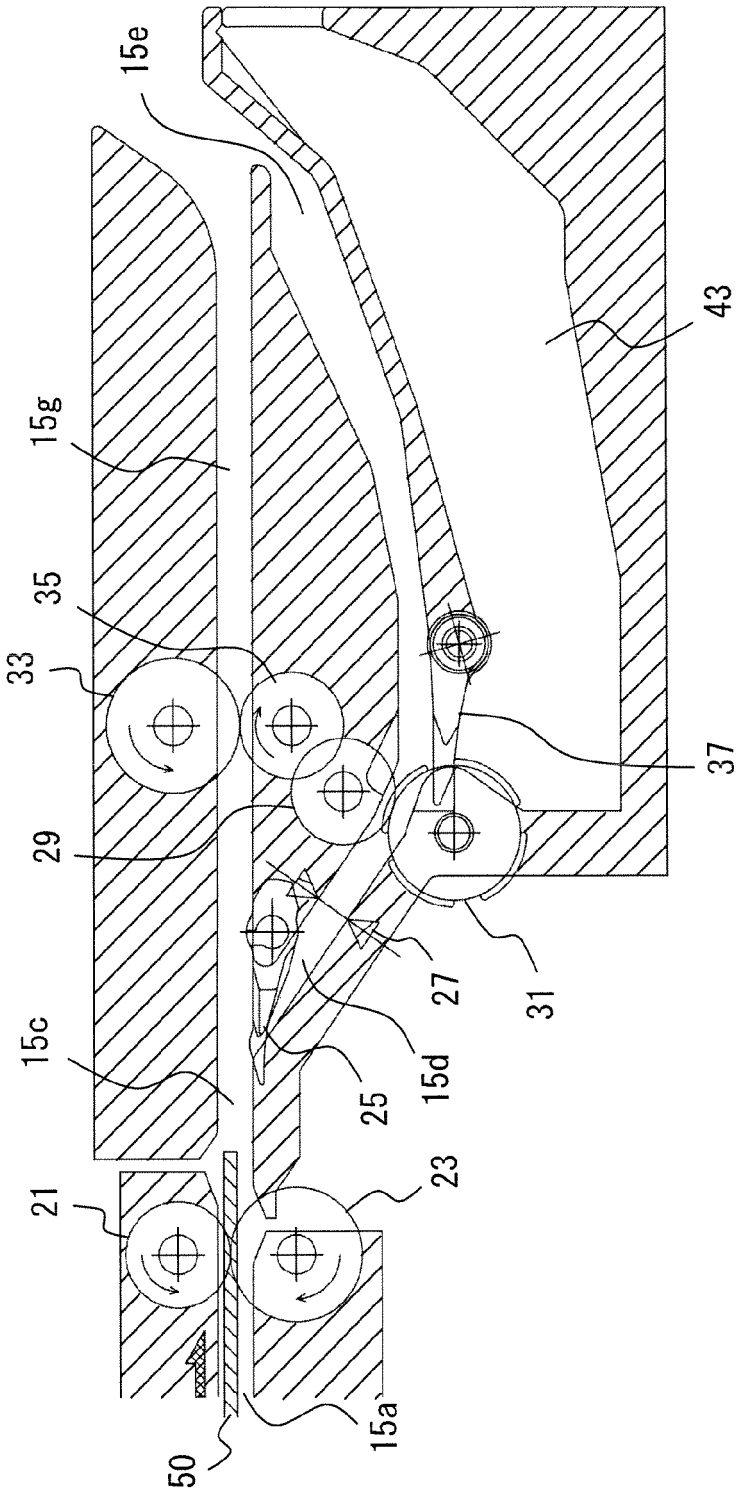

FIG. 8

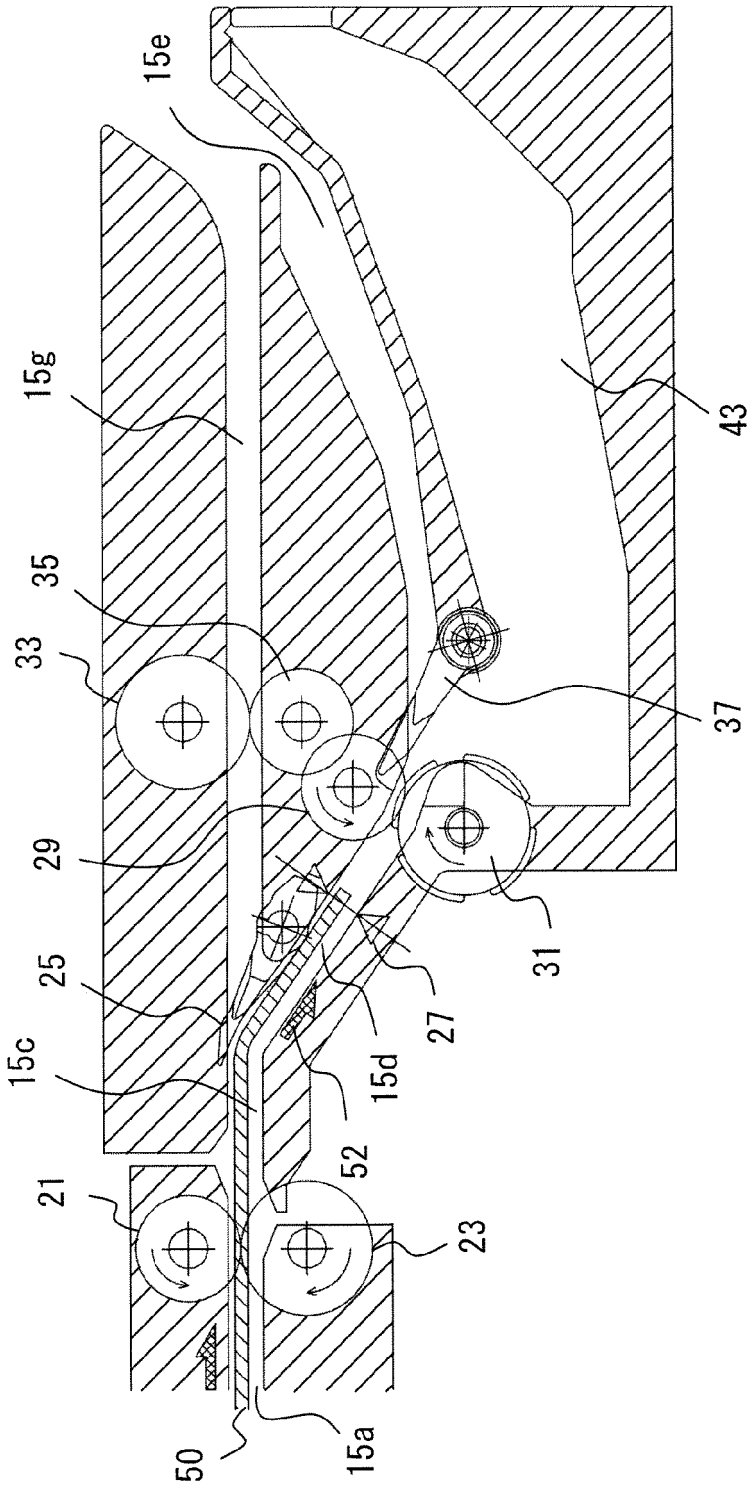

FIG. 9

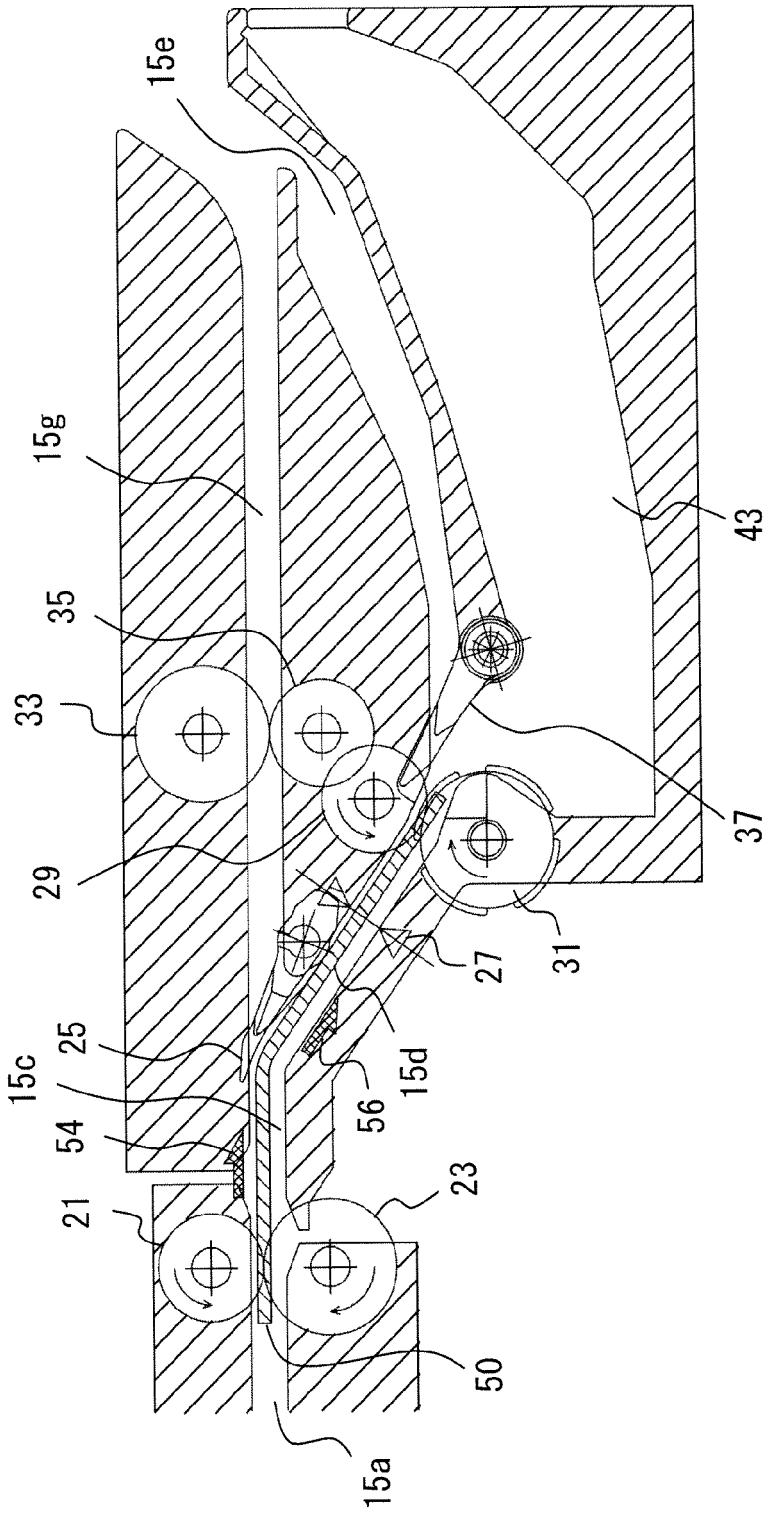

FIG. 10

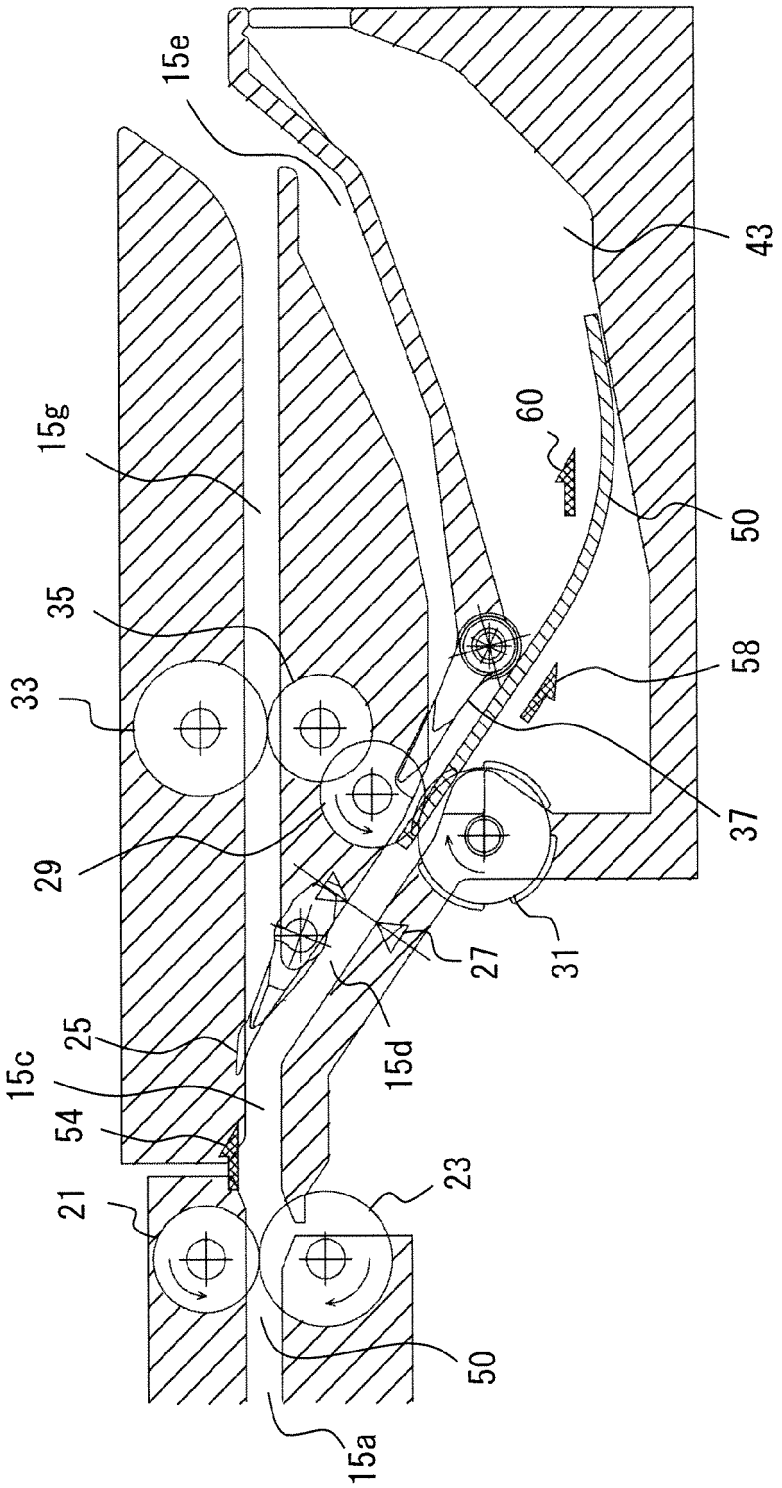

FIG. 11

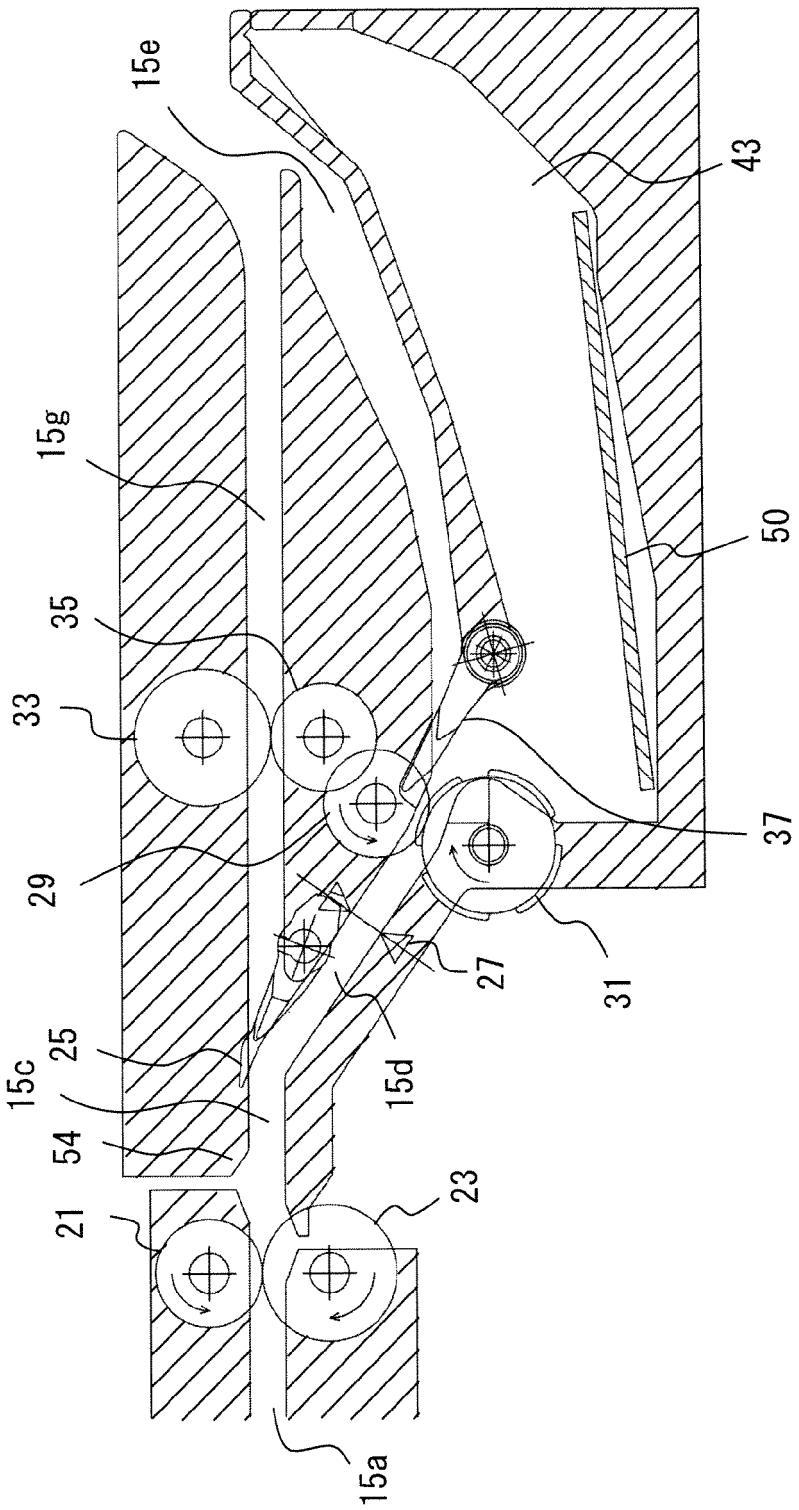

FIG. 12

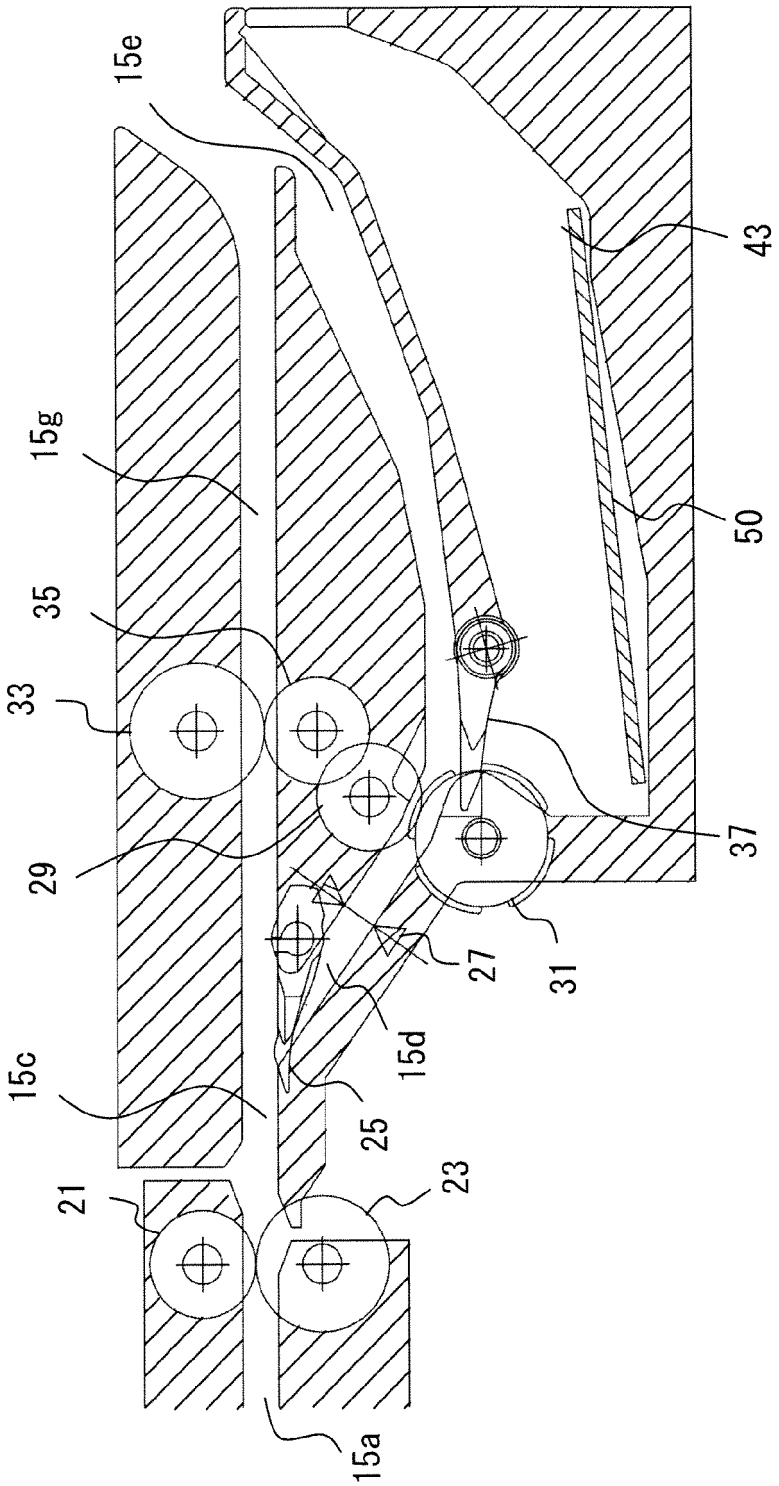

FIG. 13

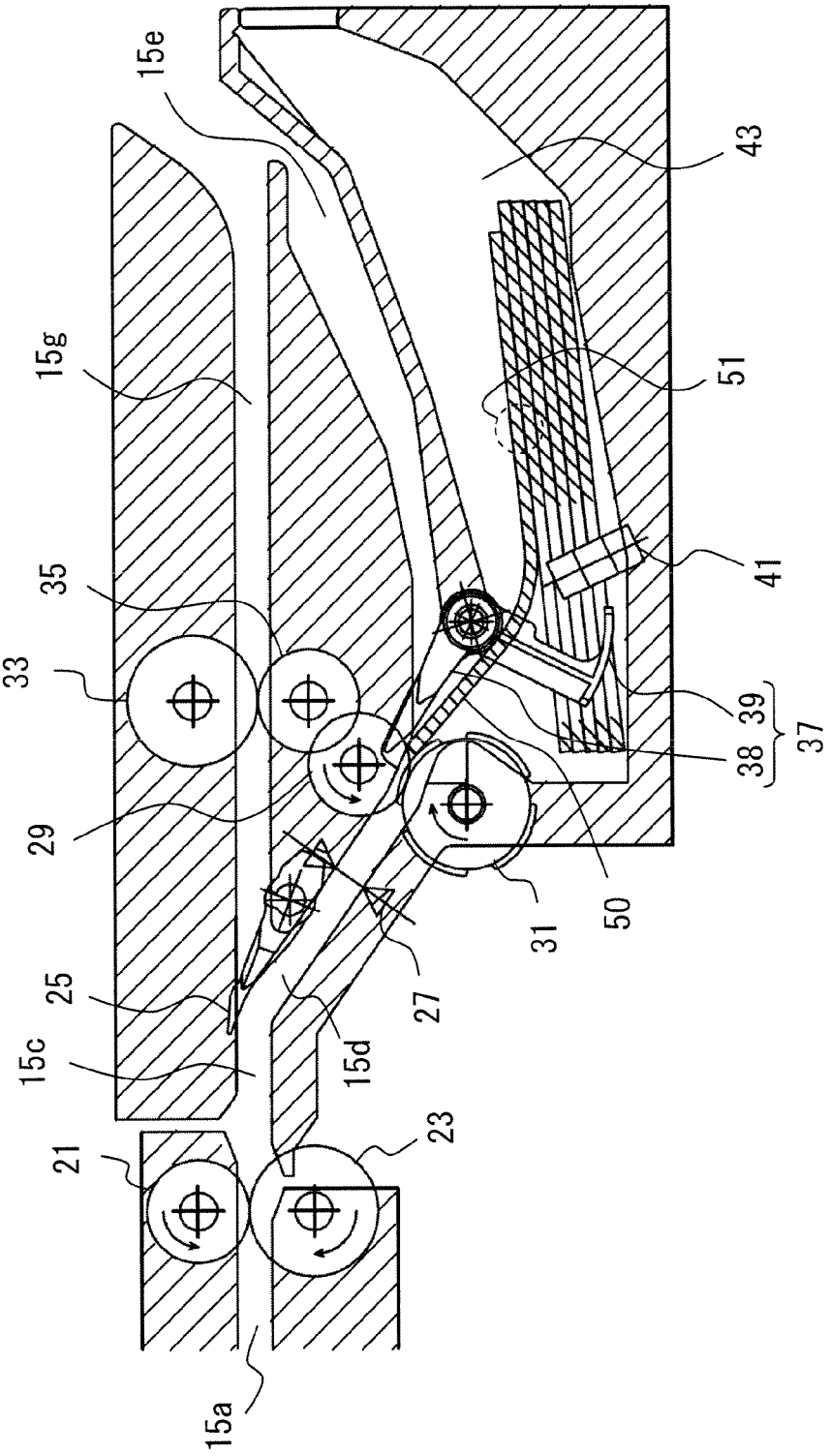

FIG. 14

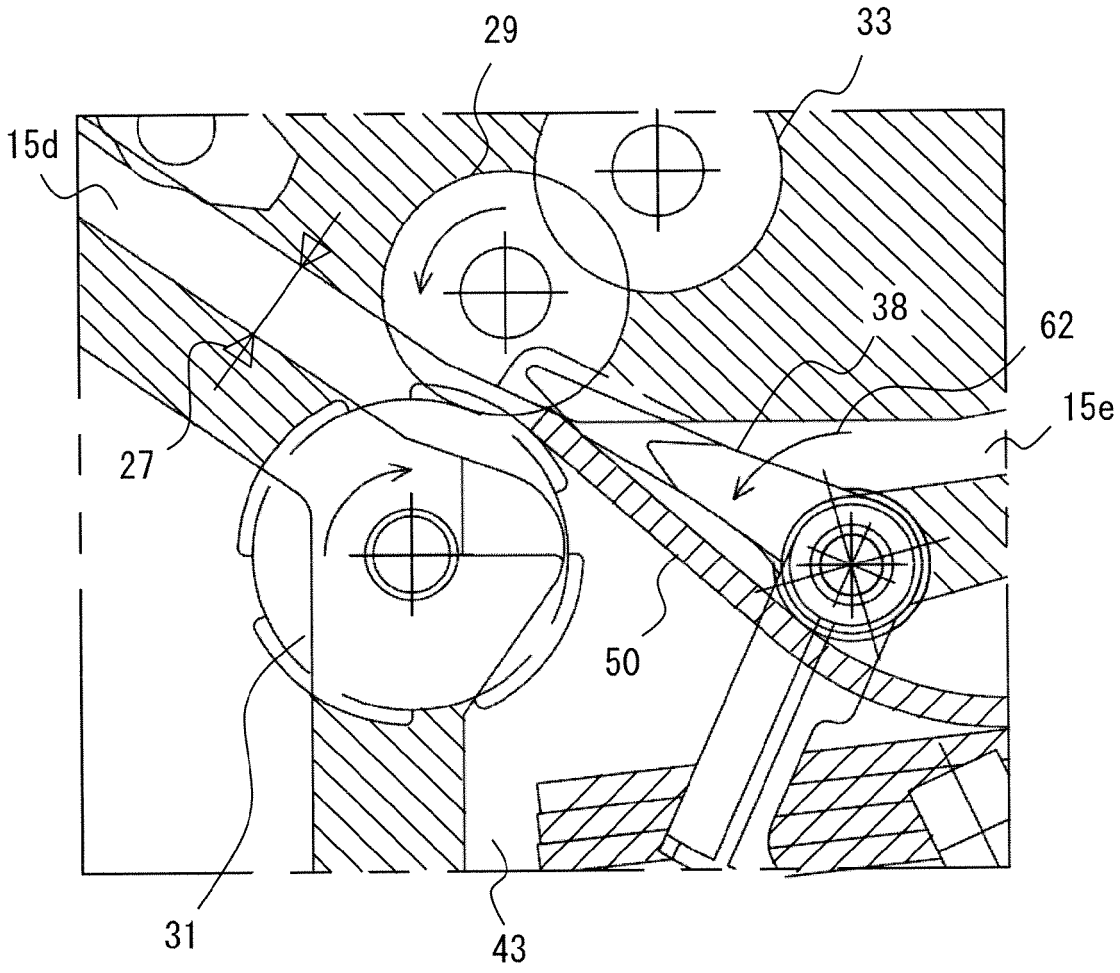

FIG. 15

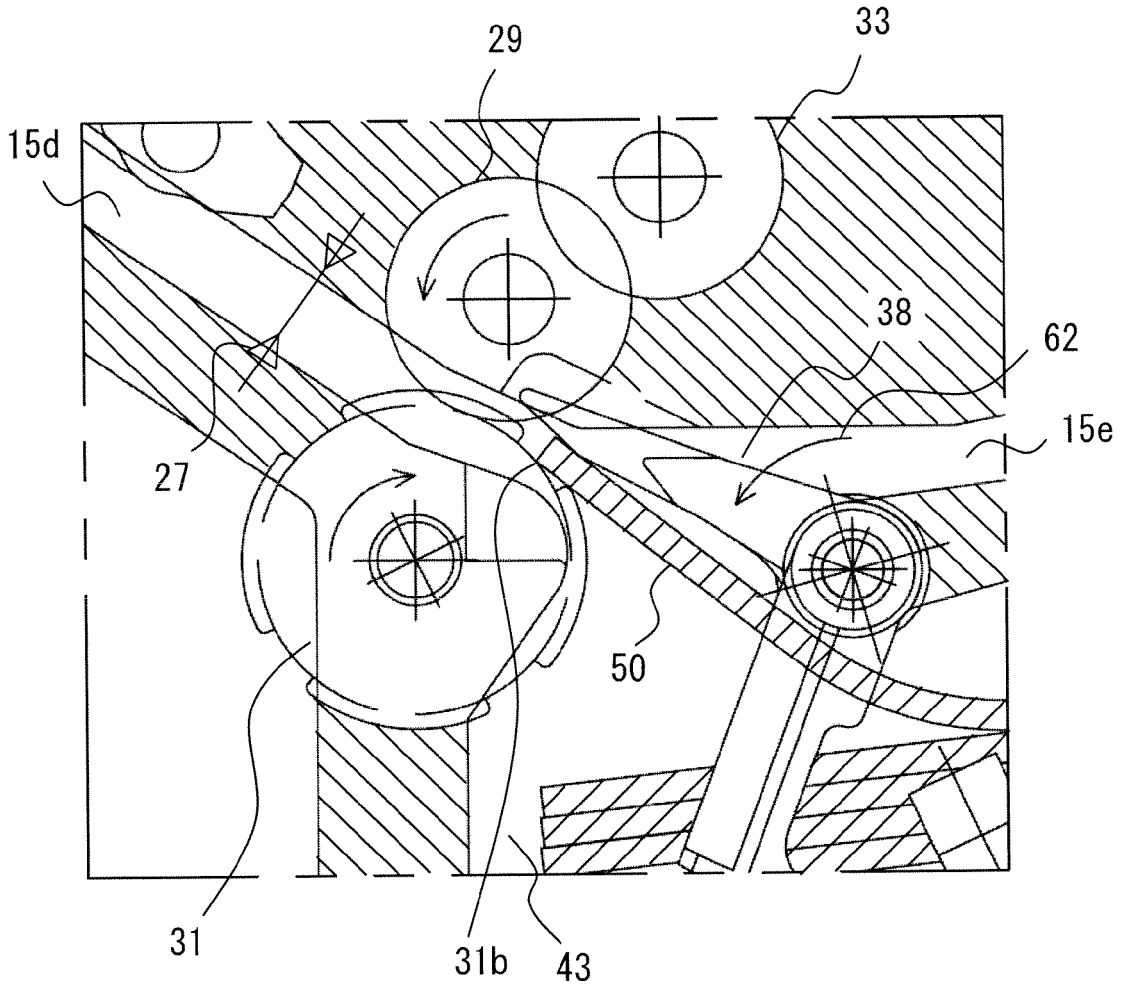

FIG. 16

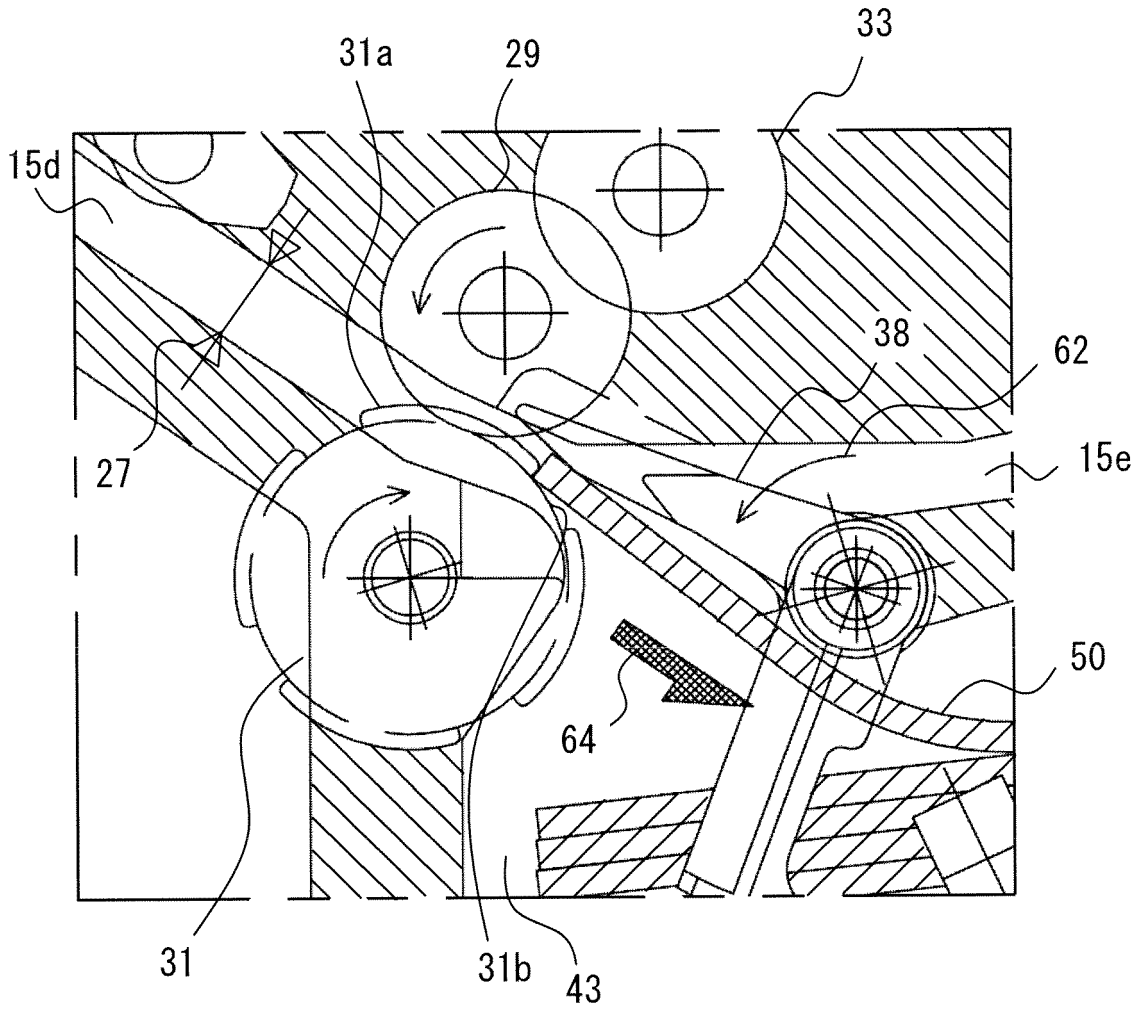

FIG. 17

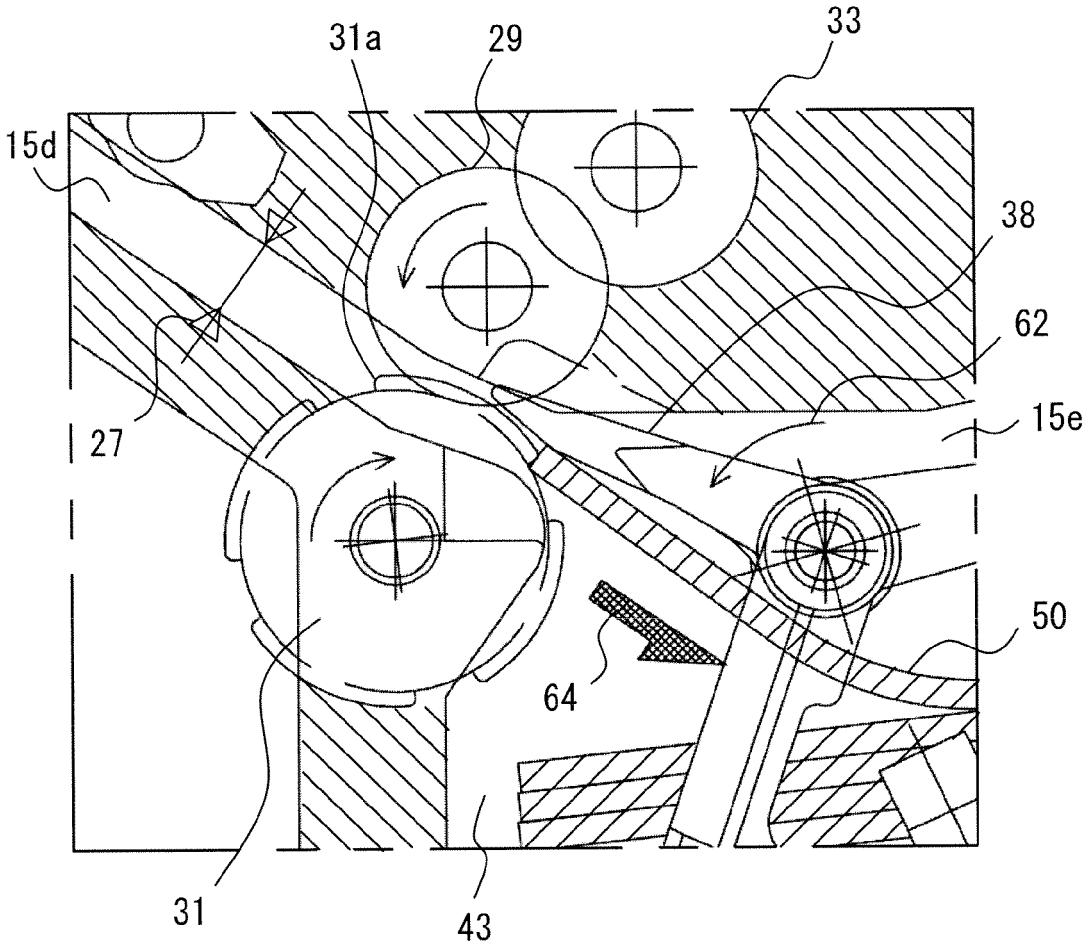

FIG. 18

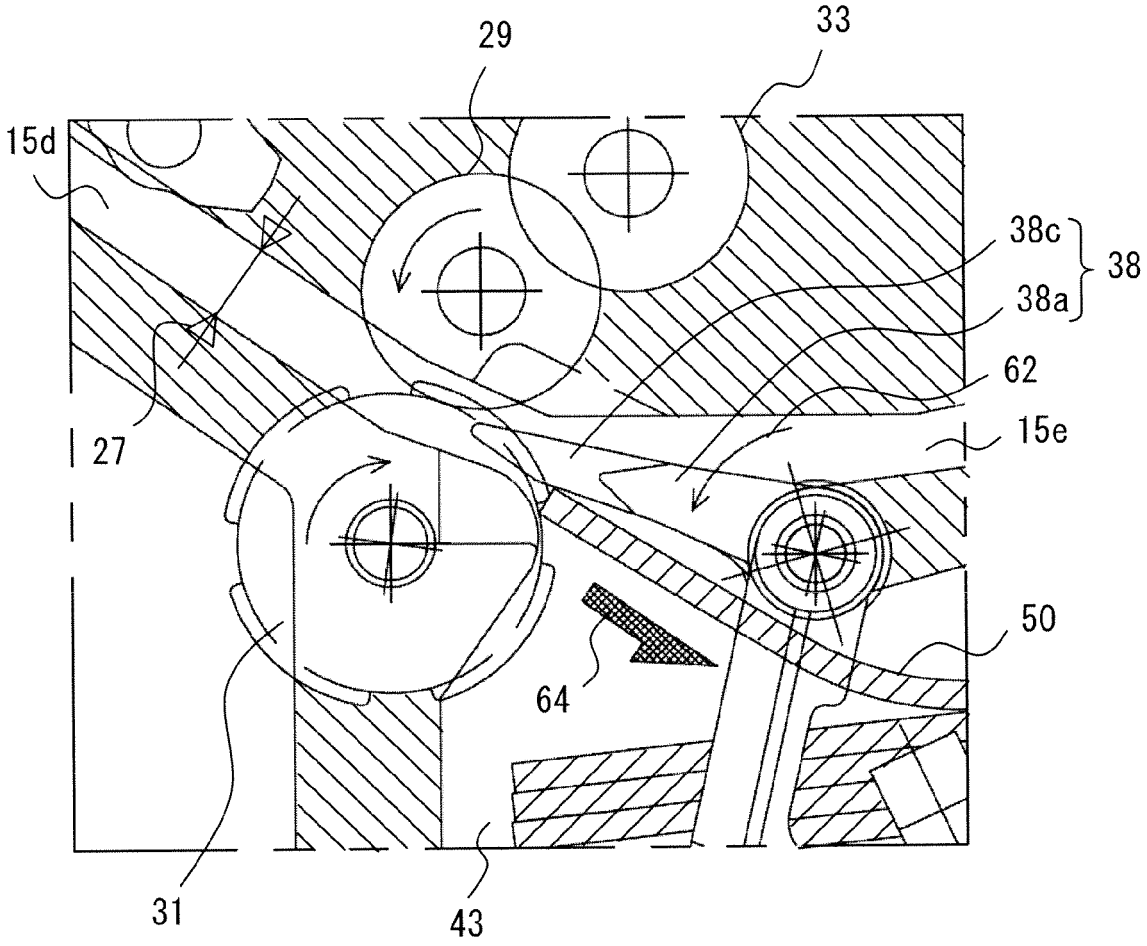

FIG. 19

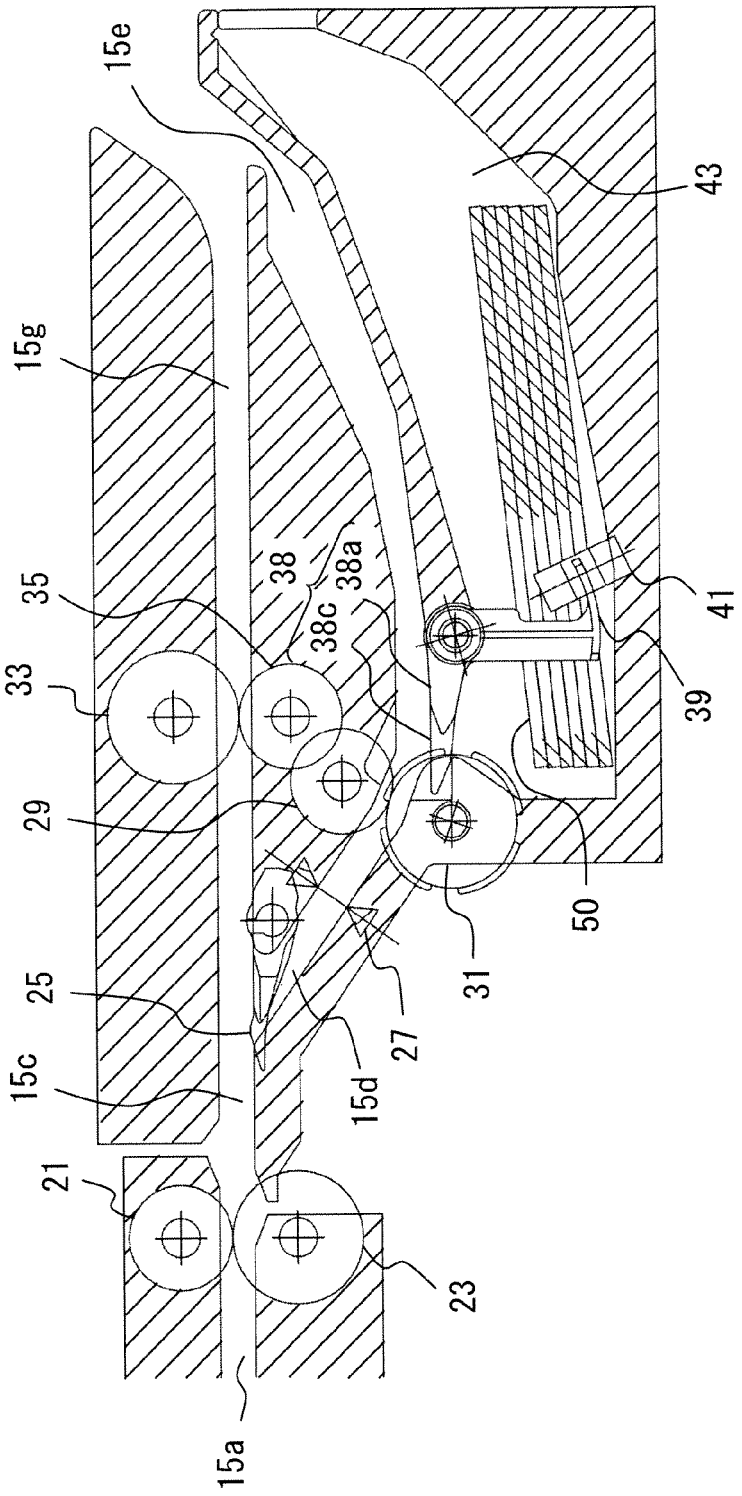

FIG. 20

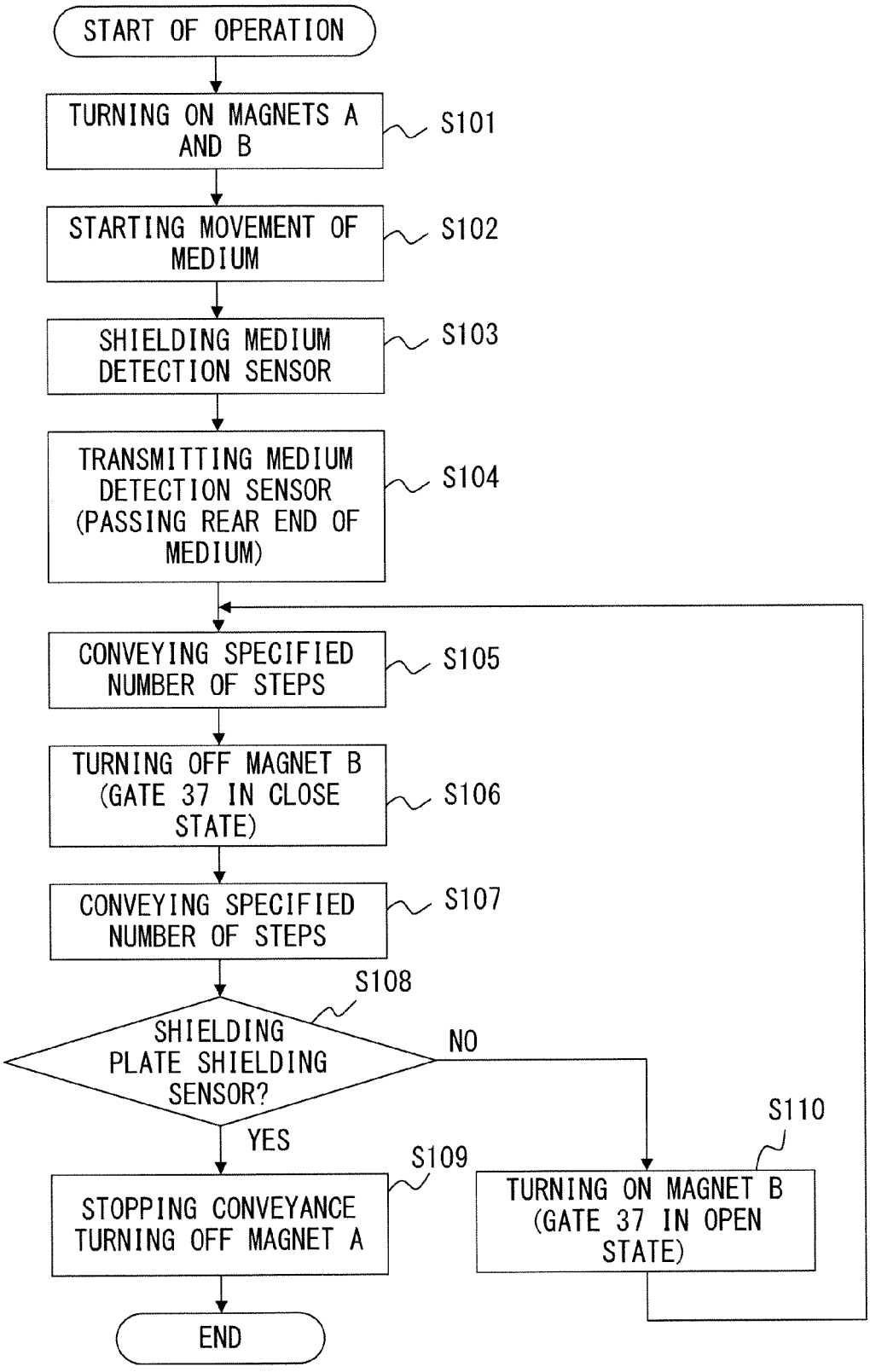
START OF OPERATION
TURNING ON MAGNETS A AND B
S101
STARTING MOVEMENT OF MEDIUM
S102
SHIELDING MEDIUM DETECTION SENSOR
S103
TRANSMITTING MEDIUM DETECTION SENSOR (PASSING REAR END OF MEDIUM)
S104
CONVEYING SPECIFIED NUMBER OF STEPS
S105
TURNING OFF MAGNET B (GATE 37 IN CLOSE STATE)
S106
CONVEYING SPECIFIED NUMBER OF STEPS
S107
S108
SHIELDING PLATE SHIELDING SENSOR?
NO
YES
S109
STOPPING CONVEYANCE TURNING OFF MAGNET A
S110
TURNING ON MAGNET B (GATE 37 IN OPEN STATE)
END

FIG. 21

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 9235058 A **[0003]**
- JP 2008213988 A **[0003]**
- JP 7098777 A **[0003]**