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

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(45) **Date of Patent: Feb. 14, 2023**

(54) **DRIVE TRANSMISSION SWITCHING MECHANISM, PAPER SHEET STORAGE UNIT, AND PAPER SHEET PROCESSING DEVICE**

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(73) Assignee: **JAPAN CASH MACHINE CO., LTD.**, Osaka (JP)

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PCT Pub. Date: **Sep. 26, 2019**

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G07D 11/225 (2019.01)
(Continued)

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CPC ***G07D 11/18*** (2019.01); ***B65H 29/006*** (2013.01); ***B65H 29/58*** (2013.01); ***G07D 11/225*** (2019.01); *B65H 2301/41912* (2013.01)

(58) **Field of Classification Search**
CPC G07D 11/18; G07D 11/225; G07D 9/00; B65H 29/006; B65H 29/58;
(Continued)

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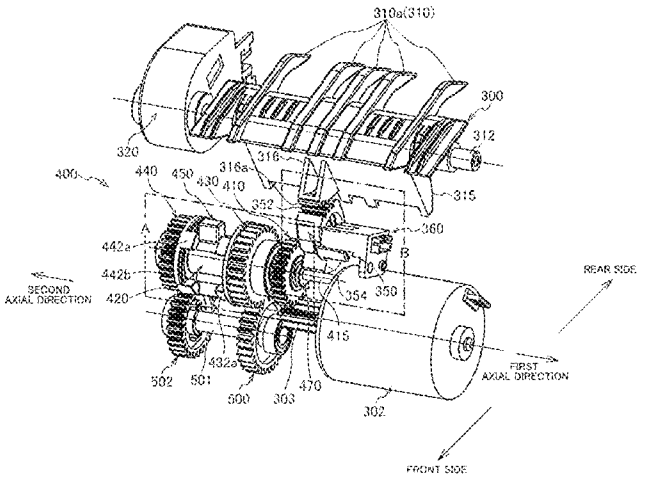
(74) *Attorney, Agent, or Firm* — Masuvalley & Partners; Peter Martinez

(57) **ABSTRACT**

Provided is a drive transmission switching mechanism that can switch and drive two circulation units by one motor in response to a switching operation of a paper sheet transport direction. A paper sheet storage unit includes a first circulation unit **100** and a second circulation unit **200** that respectively receive transported paper sheets upon reception of a drive force from a single motor **302** and feed paper sheets stored therein, a sorter **310** that sorts paper sheets to either one of the circulation units, and a drive transmission switching mechanism **400** that transmits a drive force from the motor to either one of the circulation units. The drive
(Continued)



transmission switching mechanism is activated in conjunction with an operation to change the posture of the sorter, thereby switching and transmitting the drive force to either one of the circulation units.

4 Claims, 13 Drawing Sheets

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B65H 29/00 (2006.01)
B65H 29/58 (2006.01)

(58) **Field of Classification Search**
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See application file for complete search history.

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FIG.1(a)

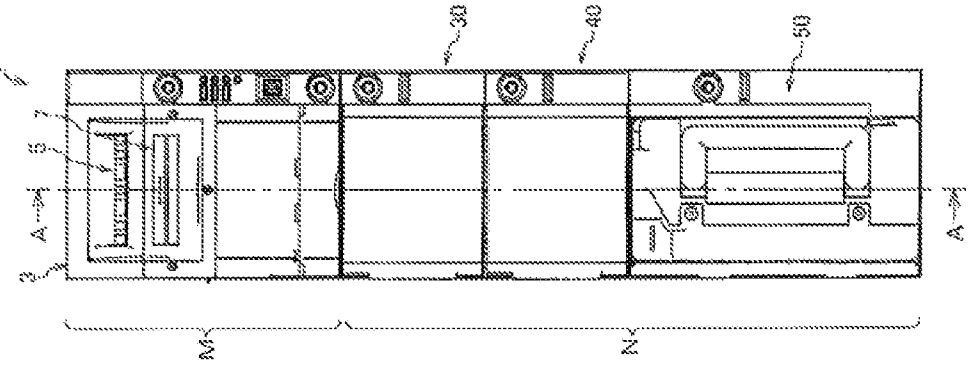


FIG.1(b)

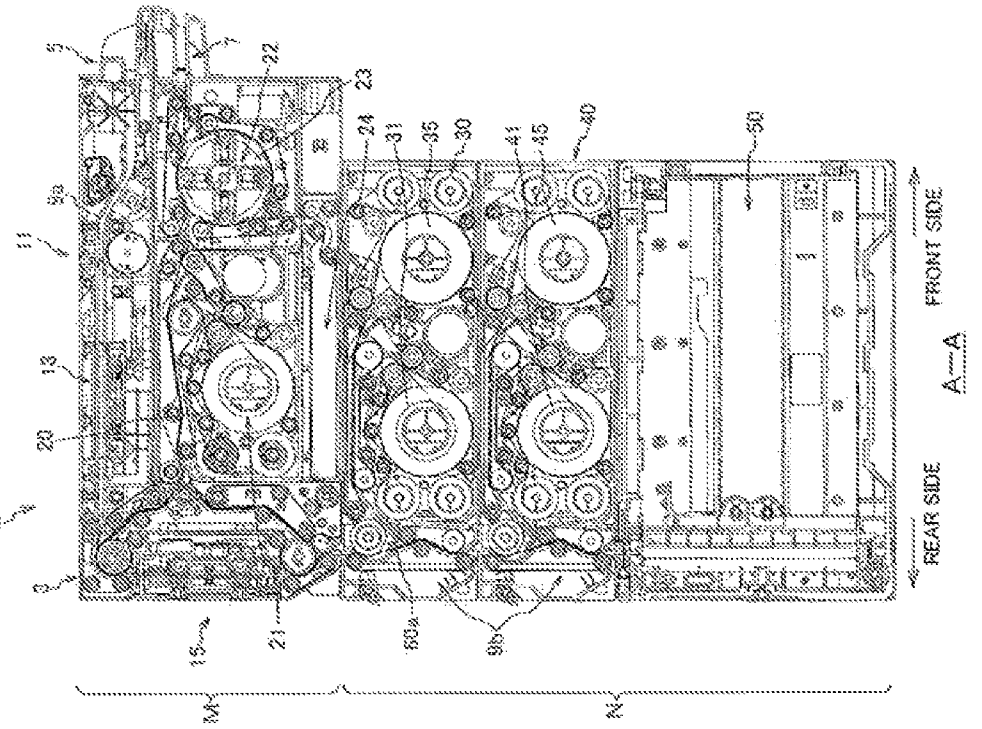


FIG.2(a)

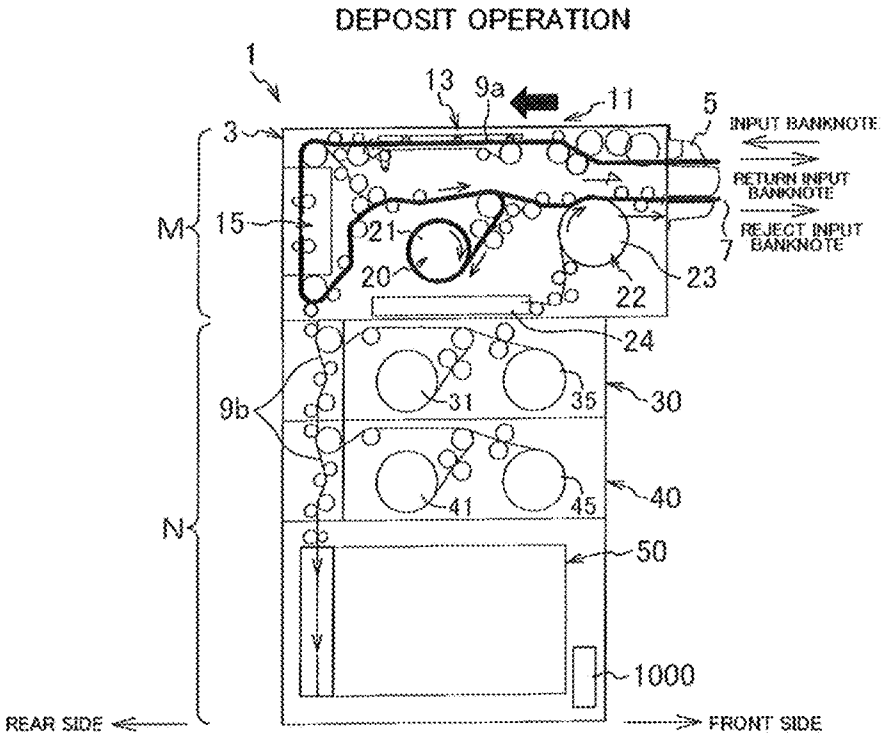

DEPOSIT OPERATION
1
13
9a
11
5
INPUT BANKNOTE
RETURN INPUT BANKNOTE
REJECT INPUT BANKNOTE
3
M
15
21
20
22
23
7
24
9b
31
35
30
N
41
45
40
50
1000
REAR SIDE
FRONT SIDE

FIG.2(b)

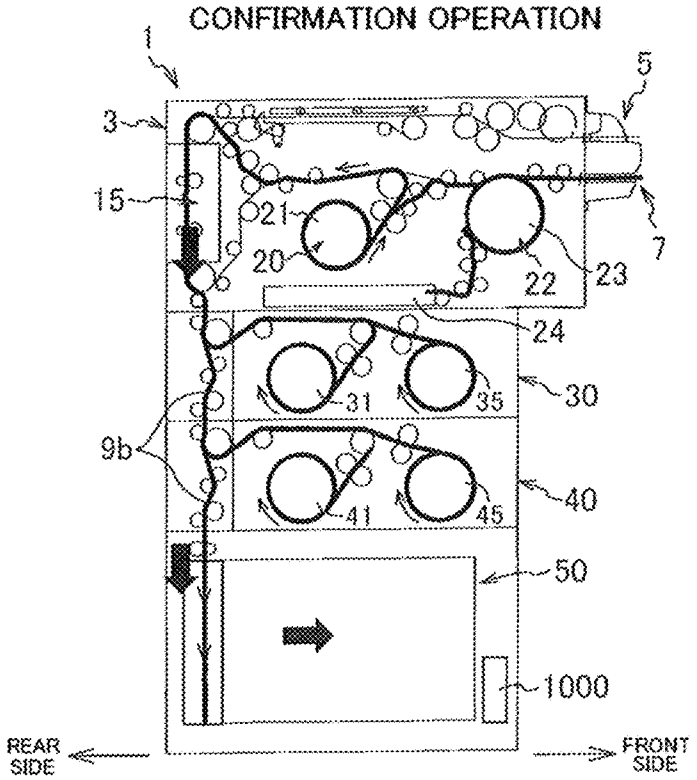

CONFIRMATION OPERATION
1
5
3
15
21
20
22
23
7
24
31
35
30
9b
41
45
40
50
1000
REAR SIDE
FRONT SIDE

FIG.3(a)

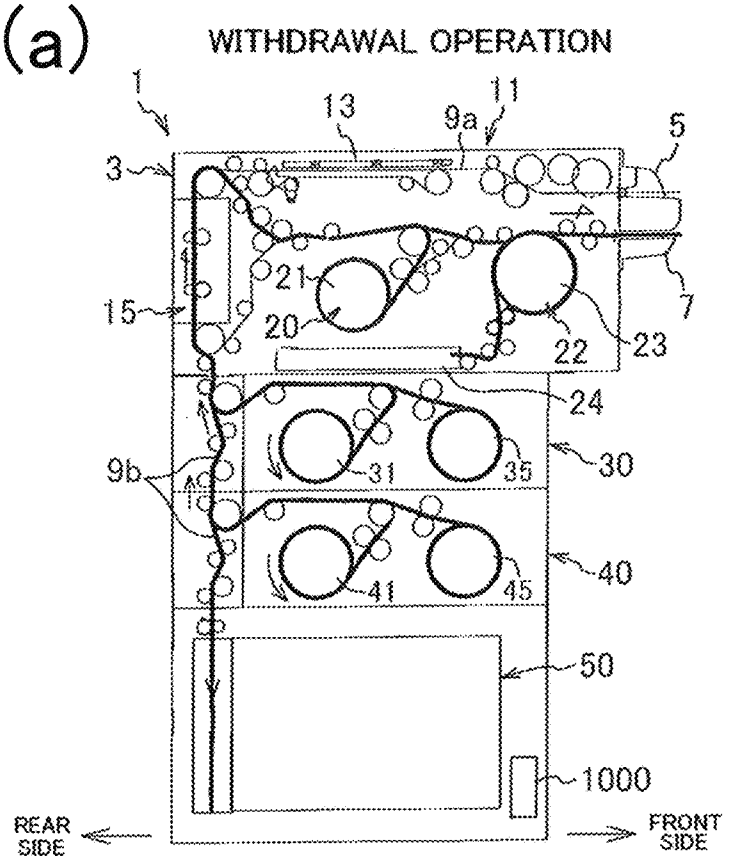

WITHDRAWAL OPERATION
1
13
9a
11
5
3
21
15
20
22
23
7
24
9b
31
35
30
40
41
45
50
1000
REAR SIDE
FRONT SIDE

FIG.3(b)

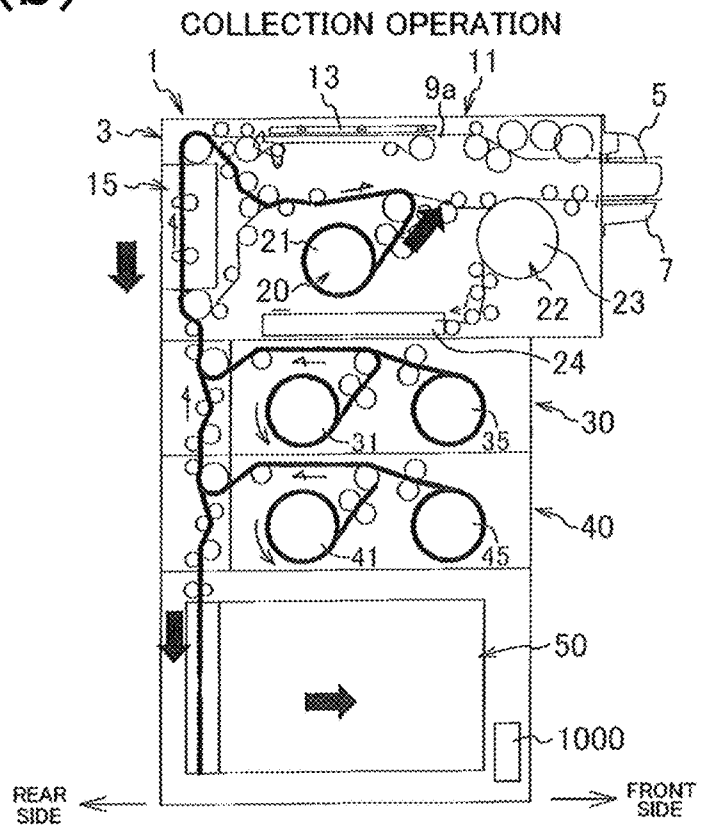

COLLECTION OPERATION
1
13
9a
11
5
3
15
21
20
22
23
7
24
30
31
35
40
41
45
50
1000
REAR SIDE
FRONT SIDE

FIG.4

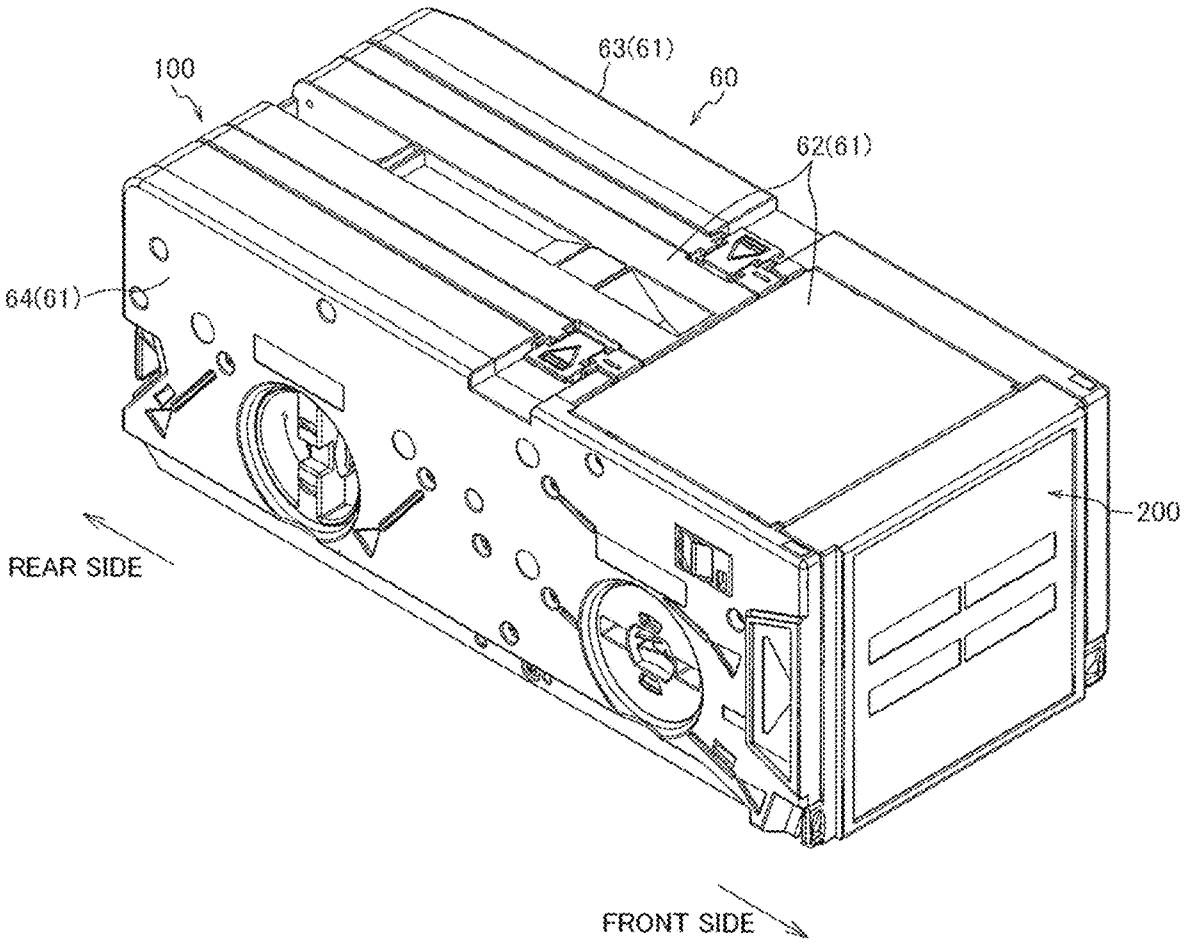


FIG.5

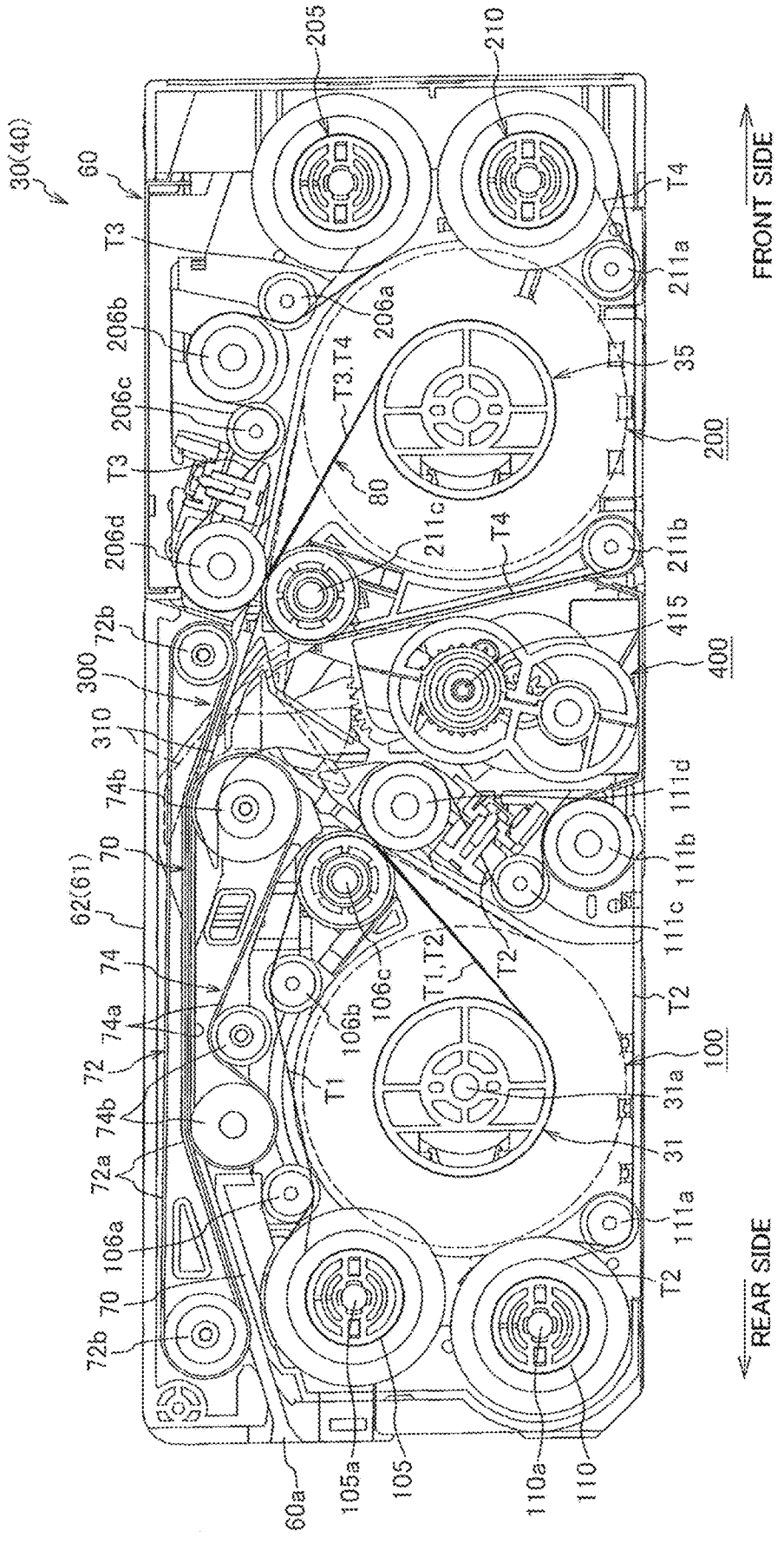
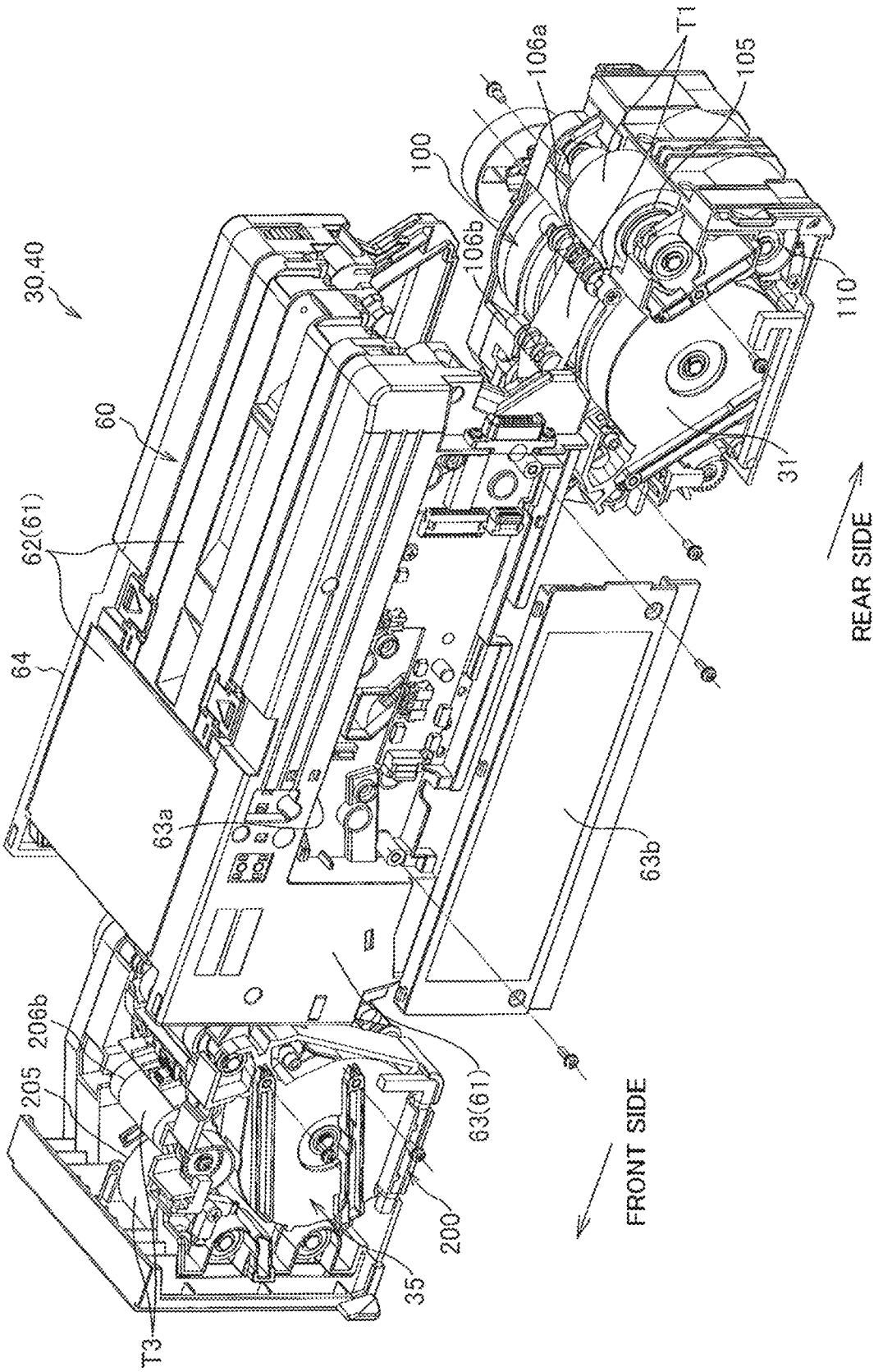

30(40)
60
205
210
T3
T4
206a
206b
206c
206d
T3.T4
80
211a
211b
211c
35
200
415
400
72b
300
310
74b
70
62(61)
74
74a
72
74b
72a
106a
72b
T1
106b
106c
T1, T2
T2
111a
111b
111c
111d
31
31a
100
60a
105a
105
110a
110
FRONT SIDE
REAR SIDE

FIG.6


T1
106a
105
100
106b
110
30,40
60
31
62(61)
64
REAR SIDE
63a
63b
206b
205
63(61)
FRONT SIDE
200
35
T3

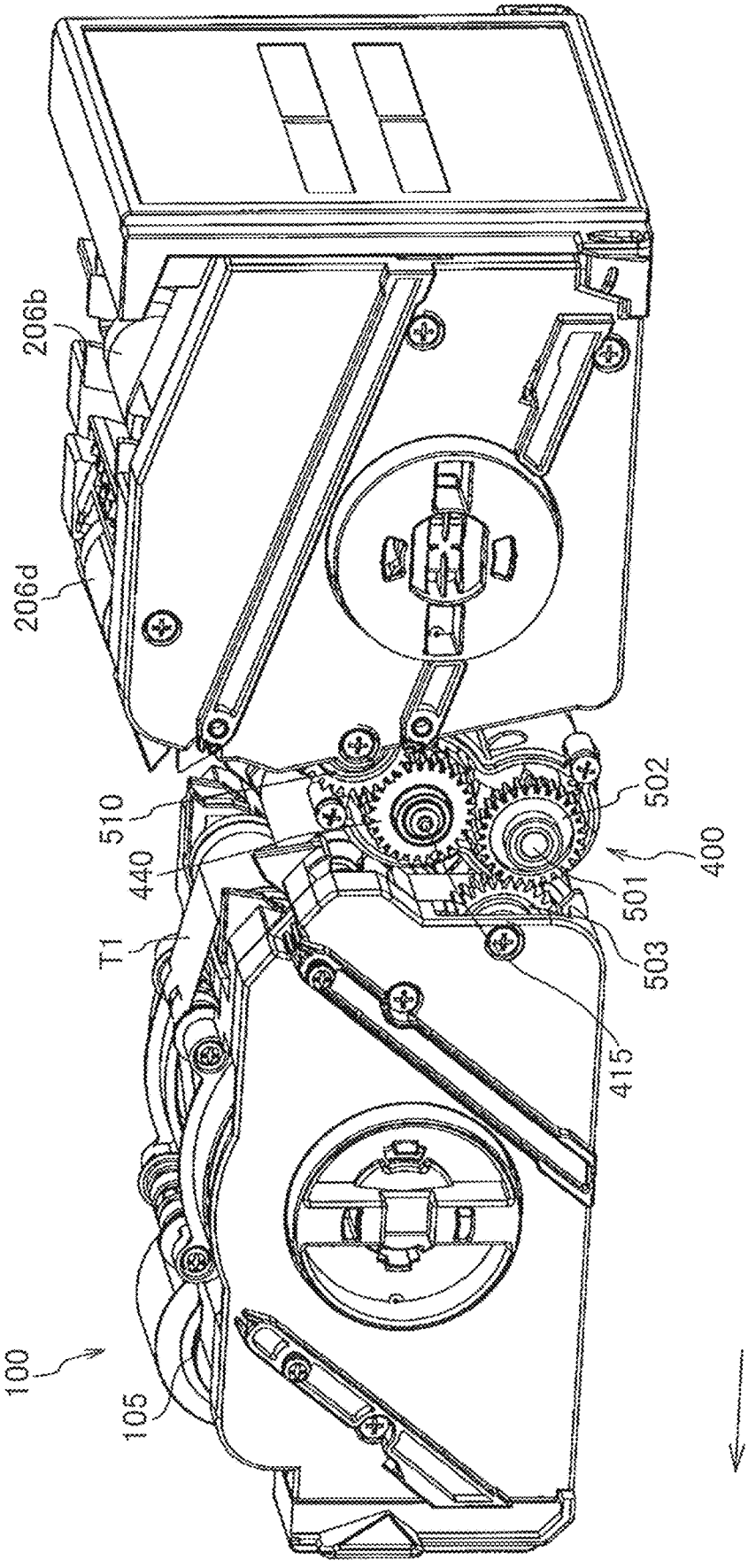

200
206b
206d
510
440
T1
100
105
502
400
501
503
415
FRONT SIDE
(FRONT)
REAR SIDE
(BACK)

FIG.7

FIG.8

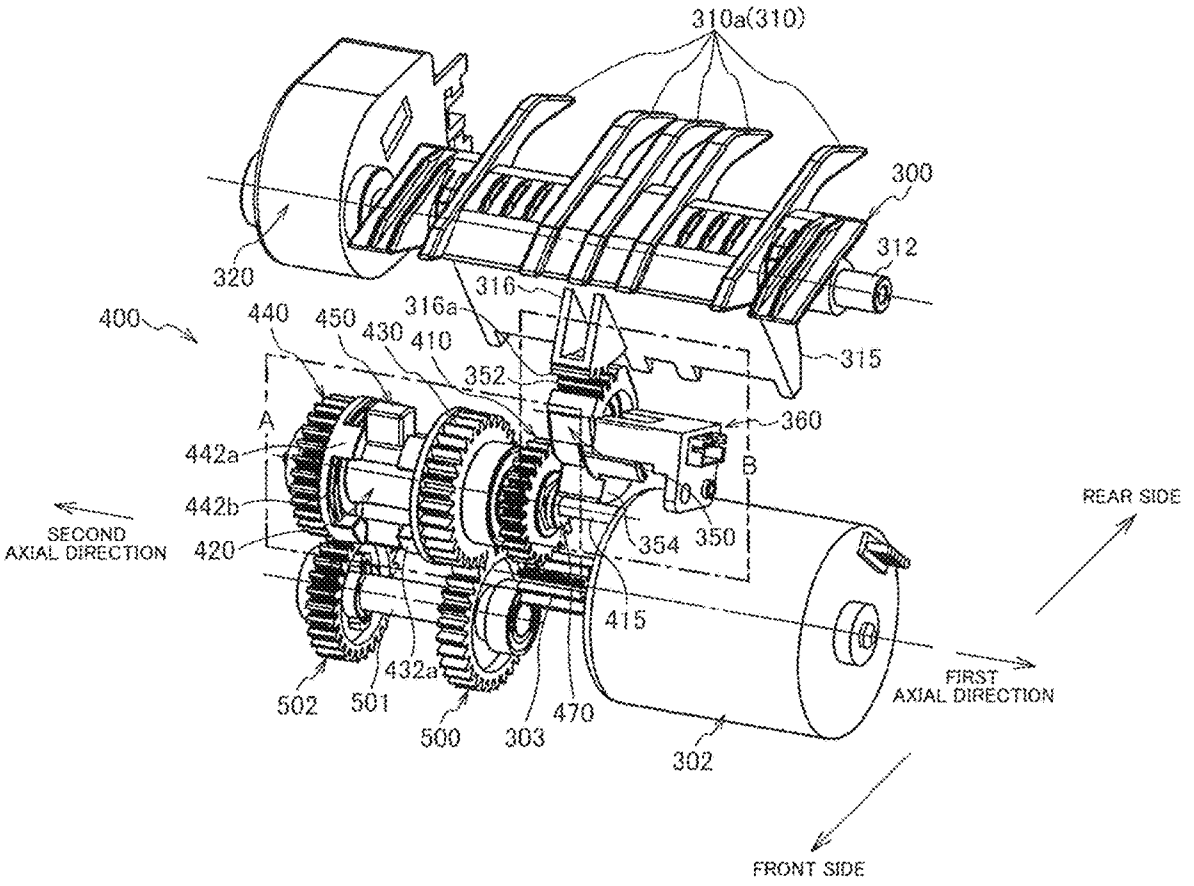

310a(310)
300
312
320
316
316a
400
440
450
430
410
352
315
360
A
B
442a
442b
420
354
350
SECOND AXIAL DIRECTION
REAR SIDE
415
FIRST AXIAL DIRECTION
432a
502
501
500
303
470
302
FRONT SIDE

FIG.9

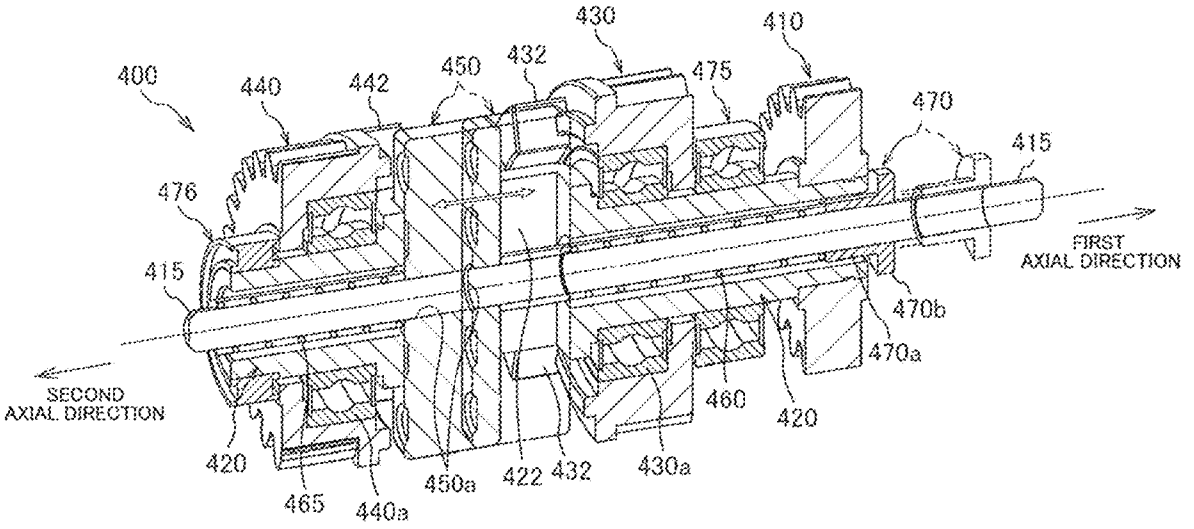

400
440
442
450
432
430
475
410
470
415
476
415
FIRST
AXIAL DIRECTION
470b
470a
SECOND
AXIAL DIRECTION
460
420
420
465
440a
450a
422
432
430a

FIG.10

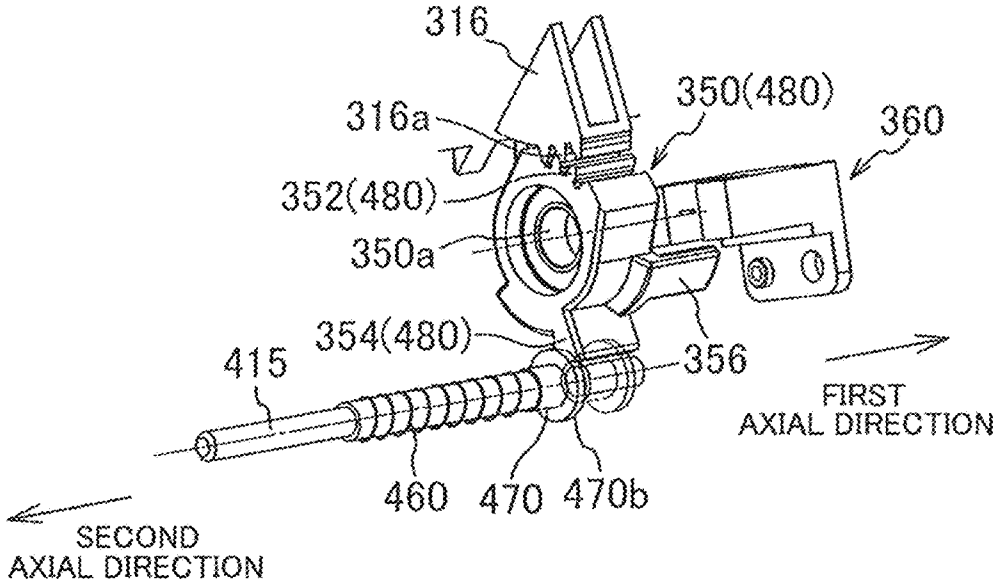

316
316a
350(480)
360
352(480)
350a
354(480)
356
415
FIRST
AXIAL DIRECTION
460
470
470b
SECOND
AXIAL DIRECTION

FIG.11

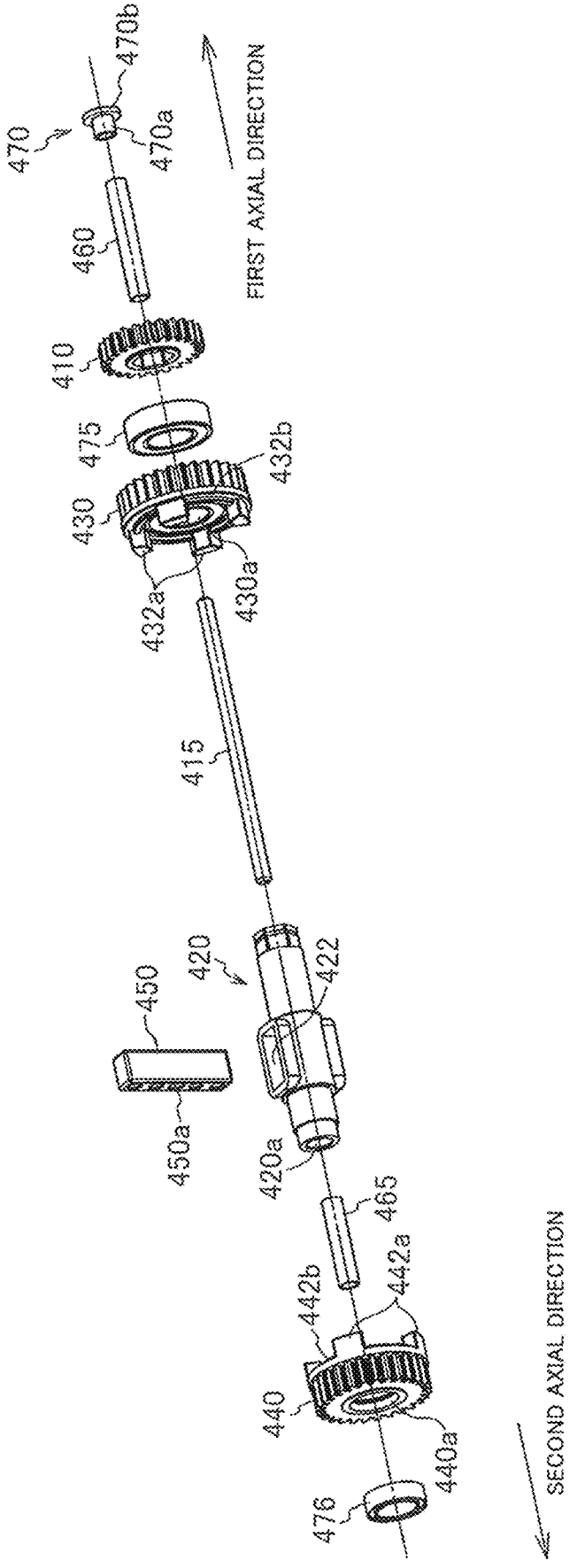

470
470b
470a
460
410
475
430
432b
432a
430a
415
420
422
450
450a
420a
465
442b
442a
440
440a
476
FIRST AXIAL DIRECTION
SECOND AXIAL DIRECTION

FIG.12(a-1)

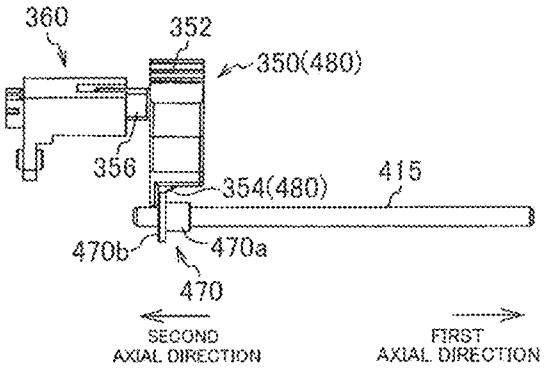


FIG.12(b-1)

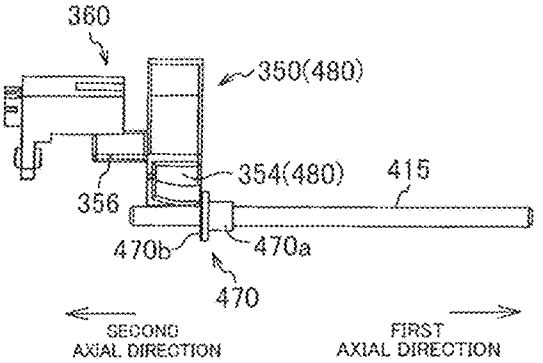


FIG.12(a-2)

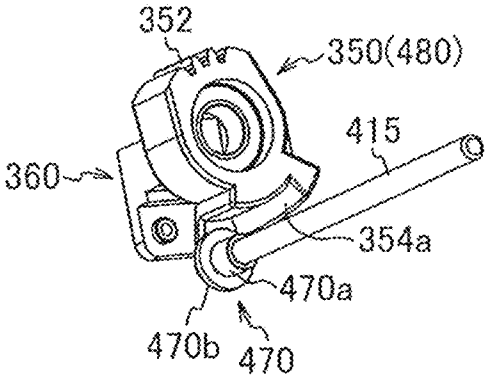


FIG.12(b-2)

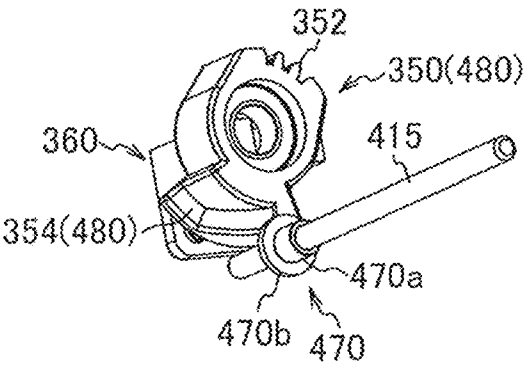


FIG.12(a-3)

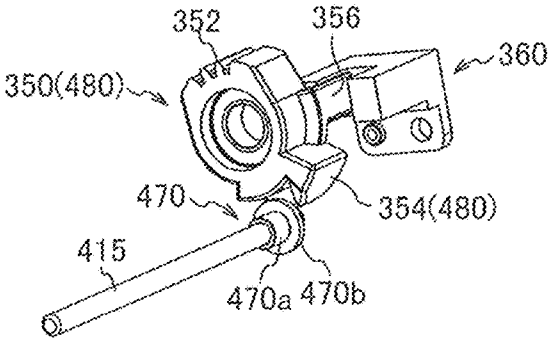


FIG.12(b-3)

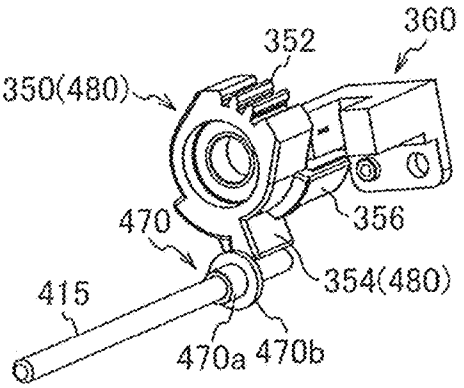
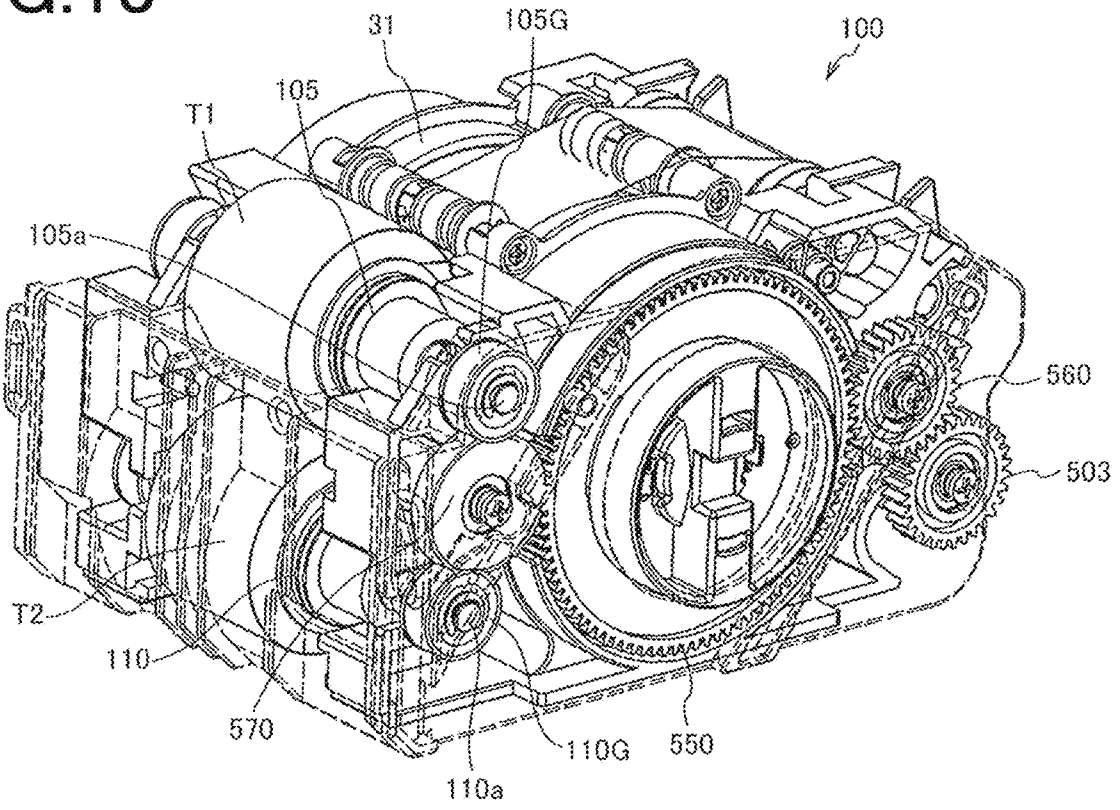


FIG.13



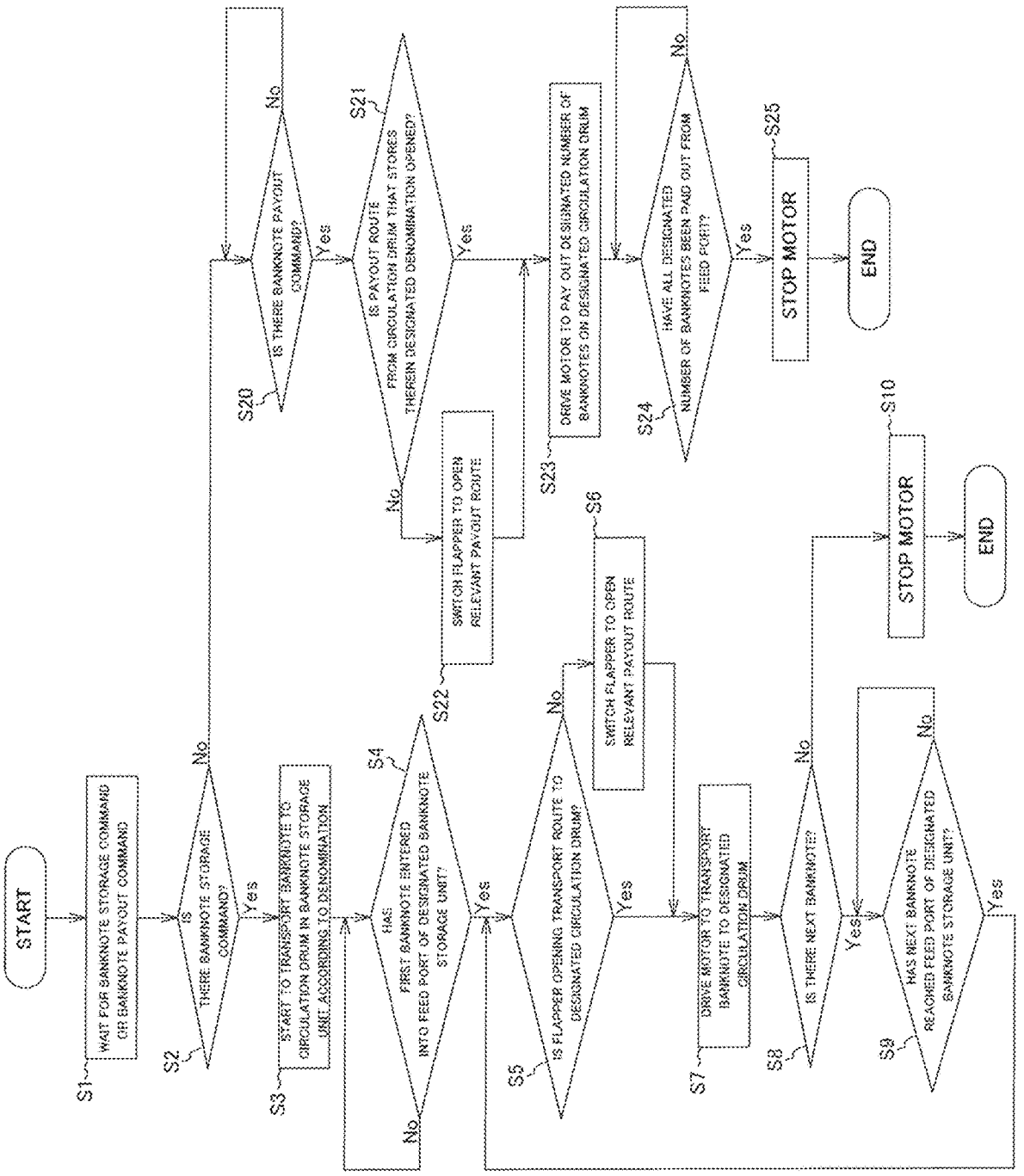

START
S1
WAIT FOR BANKNOTE STORAGE COMMAND OR BANKNOTE PAYOUT COMMAND
S2
IS THERE BANKNOTE STORAGE COMMAND?
No
Yes
S3
START TO TRANSPORT BANKNOTE TO CIRCULATION DRUM IN BANKNOTE STORAGE UNIT ACCORDING TO DENOMINATION
S4
HAS FIRST BANKNOTE ENTERED INTO FEED PORT OF DESIGNATED BANKNOTE STORAGE UNIT?
No
Yes
S5
IS FLAPPER OPENING TRANSPORT ROUTE TO DESIGNATED CIRCULATION DRUM?
No
Yes
S6
SWITCH FLAPPER TO OPEN RELEVANT PAYOUT ROUTE
S7
DRIVE MOTOR TO TRANSPORT BANKNOTE TO DESIGNATED CIRCULATION DRUM
S8
IS THERE NEXT BANKNOTE?
No
Yes
S9
HAS NEXT BANKNOTE REACHED FEED PORT OF DESIGNATED BANKNOTE STORAGE UNIT?
No
Yes
S10
STOP MOTOR
END
S20
IS THERE BANKNOTE PAYOUT COMMAND?
No
Yes
S21
IS PAYOUT ROUTE FROM CIRCULATION DRUM THAT STORES THEREIN DESIGNATED DENOMINATION OPENED?
No
Yes
S22
SWITCH FLAPPER TO OPEN RELEVANT PAYOUT ROUTE
S23
DRIVE MOTOR TO PAY OUT DESIGNATED NUMBER OF BANKNOTES ON DESIGNATED CIRCULATION DRUM
S24
HAVE ALL DESIGNATED NUMBER OF BANKNOTES BEEN PAID OUT FROM FEED PORT?
No
Yes
S25
STOP MOTOR
END

FIG.14

DRIVE TRANSMISSION SWITCHING MECHANISM, PAPER SHEET STORAGE UNIT, AND PAPER SHEET PROCESSING DEVICE

RELATED APPLICATIONS

This application is the U.S. National Phase of and claims priority to International Patent Application No. PCT/JP2019/000327, International Filing Date Jan. 9, 2019, entitled Drive Transmission Switching Mechanism, Paper Sheet Storage Unit, And Paper Sheet Processing Device; which claims priority to Japanese Application No. 2018-056037 filed Mar. 23, 2018; both of which are incorporated herein by reference in their entireties.

FIELD

The present invention relates to a drive transmission switching mechanism that enables to switch and transmit a drive force from one motor to two system loads, and a paper sheet storage unit and a paper sheet processing device that include the drive transmission switching mechanism.

BACKGROUND

As a banknote processing device installed in a banknote handling device such as a vending machine having a function of providing various articles and services by receiving an input banknote, a game-medium lending machine in a game hall, a ticket machine, a cash machine, and a money changer, a circulation-type banknote processing device capable of receiving, storing, and dispensing banknotes of a plurality of denominations has been known.

The circulation-type banknote processing device is provided with a banknote storage unit for storing therein banknotes prepared for payout beforehand and banknotes input during operation by denomination, or in a state of mixed denominations.

There are a circulation-type banknote storage unit having a function of storing banknotes and discharging banknotes to outside as change, and a banknote storage unit for collection (a collection box) that collects all the banknotes in the banknote processing device at the closing time or the like, as the banknote storage unit.

As a configuration of the circulation-type banknote storage unit, such a type has been known in which banknotes are stored between tapes overlapped spirally (helically) and wound around an outer periphery of a circulation drum, like "banknote handling device" disclosed in Patent Literature 1. Further, in the patent literature, there is described a circulation-type banknote storage unit that can store banknotes of different denominations by providing two circulation drums in parallel in one circulation-type banknote storage unit.

However, since it is required to provide a drive motor for each circulation drum, two motors are required in one circulation-type banknote storage unit, thereby causing problems such as an increase in size and weight of each circulation-type banknote storage unit, a decrease in the number of banknotes stacked in each circulation drum, and cost increase.

CITATION LIST

Patent Literature

Patent Literature 1: Japanese Patent Application Laid-open No. 2016-218965

SUMMARY

Technical Problem

The present invention has been achieved in view of the problems described above, and an object of the present invention is to provide a drive transmission switching mechanism that can switch and drive two circulation units by one motor in response to a switching operation of a paper sheet transport direction, a paper sheet storage unit, and a paper sheet processing device.

Solution to Problem

In order to achieve the above object, a paper sheet storage unit according to the present invention comprises: a single motor; a first circulation unit and a second circulation unit that respectively receive transported paper sheets by operating upon reception of a drive force from the motor and feed paper sheets stored therein; a sorter that sorts transported paper sheets to either one of the circulation units by changing a posture thereof; a sorter drive mechanism that drives the sorter; and a drive transmission switching mechanism that selectively switches and transmits the drive force from the motor to either one of the circulation units, wherein the drive transmission switching mechanism is activated in conjunction with an operation of the sorter to change the posture, to switch and transmit the drive force from the motor to either one of the circulation units.

Advantageous Effects of Invention

According to the present invention, it is possible to switch and drive two circulation units by one motor in response to a switching operation of a paper sheet transport direction without making the configuration complicated.

BRIEF DESCRIPTION OF DRAWINGS

FIGS. **1**(*a*) and (*b*) are respectively a front elevation and an A-A sectional view of a banknote (paper sheet) processing device including a drive transmission switching mechanism and a paper sheet storage unit according to one embodiment of the present invention.

FIGS. **2**(*a*) and (*b*) are explanatory diagrams illustrating a deposit operation and a confirmation operation of the banknote processing device.

FIGS. **3**(*a*) and (*b*) are explanatory diagrams illustrating a withdrawal operation and a collection operation of the banknote processing device.

FIG. **4** is an external perspective view of a circulation-type banknote storage unit including the drive transmission switching mechanism according to the embodiment of the present invention.

FIG. **5** is a longitudinal sectional view illustrating an inner configuration of the circulation-type banknote storage unit.

FIG. **6** is an exploded perspective view of the circulation-type banknote storage unit.

FIG. **7** is a perspective view illustrating an assembly state of two circulation drum units and the drive transmission switching mechanism.

FIG. **8** is an external perspective view of a flapper drive mechanism and the drive transmission switching mechanism.

FIG. **9** is a longitudinal sectional view of the drive transmission switching mechanism (a sectional view of a part A in FIG. **8**).

FIG. **10** is a perspective view illustrating an assembly state of a chipped gear member, a cam gear, a pressurizing member, and the like (an enlarged view of a part B in FIG. **8**).

FIG. **11** is an exploded perspective view of the main component of the drive transmission switching mechanism.

FIGS. **12**(*a*-**1**), (*a*-**2**), and (*a*-**3**) and (*b*-**1**), (*b*-**2**), and (*b*-**3**) are explanatory diagrams illustrating a state in which the cam gear activates the pressurizing member.

FIG. **13** is a perspective view of a first circulation drum unit including a gear train that drives a circulation drum and respective bobbins.

FIG. **14** is a flowchart of storage and payout procedures by the circulation-type banknote processing device.

DESCRIPTION OF EMBODIMENTS

The present invention will be described below in detail with embodiments illustrated in the drawings.

[Configuration of Banknote Processing Device]

FIGS. **1**(*a*) and (*b*) are respectively a front elevation and an A-A sectional view of a banknote (paper sheet) processing device including a drive transmission switching mechanism and a paper sheet storage unit according to one embodiment of the present invention.

In the present embodiment, although a device that processes banknotes as an example of paper sheets is described, the drive transmission switching mechanism, the paper sheet storage unit, and the paper sheet processing device according to the present invention can be also applied to a processing device of general paper sheets such as cash vouchers, tickets, and marketable securities, other than banknotes.

A circulation-type banknote processing device (hereinafter, "banknote processing device") **1** illustrated in FIG. **1** is a unit that is installed in or together with a banknote handling device, for example, a vending machine, a ticket machine, a game-medium lending machine in a game hall, a cash machine, or a money changer, to receive banknotes and dispense banknotes as change or the like.

The banknote processing device **1** is schematically constituted by a housing **3** constituting an exterior body, a deposit and withdrawal processing unit M that transports a banknote inserted into the housing in a required route in the machine and discharges a banknote to outside, a banknote storage unit N that stores therein a banknote transported from the deposit and withdrawal processing unit M and transfers banknotes between the deposit and withdrawal processing unit M and the banknote storage unit N, a transport mechanism that transports banknotes through various routes, and a control unit (a CPU, an MPU, a ROM, a RAM, or the like) **1000** that controls various control targets (FIG. **2** and FIG. **3**).

The deposit and withdrawal processing unit M includes an input/output port **5** that collectively receives a bundle of banknotes up to 30 sheets including banknotes of different denominations and becomes a return port at the time of returning input banknotes, a return port **7** that becomes a dispensing port of banknotes up to 30 sheets and an input-rejection return port, and a collective deposit unit **11** that separates a bundle of banknotes input and set in the input/output port **5** from each other and introduces each banknote into a device body along a stored-banknote transport route **9***a*. The deposit and withdrawal processing unit M also includes a centering unit **13** arranged on a downstream side of the collective deposit unit **11** to align the position in a width direction of a transported banknote to the center of a transport route, a recognition unit **15** arranged on a downstream side of the centering unit to judge the denomination and the authenticity of the input banknote by using an optical sensor and a magnetic sensor together, an escrow unit (temporary holding unit) **20** that temporarily holds the input banknotes having passed the recognition unit up to 30 sheets, and after acceptance is confirmed, feeds the banknote to each of a storage unit and a collection box described later, or at the time of cancellation and return due to a return request or the like, feeds the banknote to a payout stacking unit (payout stacking device) **22**, and the payout stacking unit (stacking device of returned banknotes) **22** that once stacks banknotes to be returned or rejected banknotes transported from the escrow unit (hereinafter, "returned banknote"), and then discharges the banknotes to the return port **7**. Further, the deposit and withdrawal processing unit M includes a forgotten-banknote storage unit (banknote holding unit) **24** in which, when a returned banknote paid out from the payout stacking unit **22** to the return port **7** is not collected by a customer even after a predetermined time has passed, the banknote is transported in a reverse direction by the payout stacking unit and stored therein as a forgotten banknote.

The banknote storage unit N includes first and second circulation-type banknote storage units (circulation-type banknote storage devices) **30** and **40** that accommodate banknotes fed from the escrow unit **20** one by one when acceptance of the input banknotes is confirmed, and transported on the stored-banknote transport routes **9***a* and **9***b* for each denomination so that the banknotes can be taken in and out, and a collection box (collected-banknote storage unit) **50** detachably attached into an accommodation space provided below the second circulation-type banknote storage unit **40** from a front side, to collect all denominations of banknotes from each circulation-type banknote storage unit at the closing time or the like, and collect high-denomination banknotes that are not used as change and excessive banknotes that cannot be accommodated in each circulation-type banknote storage unit.

The transport mechanism includes a motor, a solenoid, and a pulley for generating and transmitting a drive force for transporting banknotes along the respective transport routes **9***a* and **9***b* and other transport routes, a belt, a gate, and the like.

A control unit **1000** controls control targets such as the deposit and withdrawal processing unit M, the banknote storage unit N, the transport mechanism, and the like.

The maximum number of banknotes to be handled in the input/output port **5** and the return port **7** is only an example.

The first and second circulation-type banknote storage units **30** and **40** in the present example respectively include two circulation drums (**31**, **35**, **41**, and **45**) respectively having the maximum storage number of 60 sheets. The respective circulation drums **31**, **35**, **41**, and **45** are of a type suitable for circulation in which a banknote is stored between two long tapes (long films) overlapped and spirally (helically) wound around respective outer peripheries of these drums.

Since the first and second circulation-type banknote storage units **30** and **40** include a drive transmission switching mechanism **400** according to the present invention described later, the first and second circulation-type banknote storage units **30** and **40** can respectively drive the two circulation drums **31** and **35**, and the two circulation drums **41** and **45** by a single motor.

[Various Operations of Banknote Processing Device]

Next, an outline of a deposit operation, a confirmation operation, a withdrawal operation, and a collection operation in the banknote processing device **1** including the drive transmission switching mechanism according to the present invention illustrated in FIG. **1** is described with reference to FIG. **2** and FIG. **3**.

That is, FIGS. **2**(*a*) and (*b*) are explanatory diagrams illustrating the deposit operation and the confirmation operation of the banknote processing device, and FIGS. **3**(*a*) and (*b*) are explanatory diagrams illustrating the withdrawal operation and the collection operation of the banknote processing device.

First, in the deposit operation in FIG. **2**(*a*), when one or a plurality of sheets of banknotes are input from the input/output port **5**, upon reception of a signal from a sensor having detected the banknote, the control unit **1000** activates the transport mechanism to take in the banknotes by using the collective deposit unit **11** and the input-banknote transport route **9***a*. The collective deposit unit **11** extracts the banknote one by one from the uppermost banknote in the bundle of banknotes set in the input/output port **5**, and transports the extracted banknote to the centering unit **13**. The banknote transported to the centering unit is subjected to centering and is then moved to the recognition unit **15** to be recognized. The banknote judged to be acceptable by the recognition unit **15** is transported to the escrow unit **20**, in which the banknotes are wound one by one around an outer periphery of an escrow drum **21** and temporarily held, to wait for confirmation of the deposit. If a rejected banknote, which is judged to be unacceptable in the recognition unit, is a banknote input one by one from the input/output port **5**, the banknote is directly discharged to outside from the return port **7**. Meanwhile, when a plurality of banknotes collectively input are rejected, the banknotes are once stacked (one to plural sheets) in the payout stacking unit **22**, and then are discharged to outside and returned collectively from the return port **7**. Further, when a customer requests return of banknotes by operating a cancel button (not illustrated), the banknotes temporarily held in the escrow unit **20** are fed to the payout stacking unit **22** one by one, overlapped one by one and wound on an outer periphery of a rotating payout drum **23**, and are stacked in a laminated state. When stacking of all the banknotes input by the customer on the outer periphery of the payout drum is completed, the payout drum **23** rotates in a payout direction, to cause the bundle of banknotes to project outside and be returned from the return port **7**, thereby prompting the customer to receive the banknotes.

If the bundle of banknotes projected to outside for return from the return port **7** are not collected by the customer even after a predetermined time has passed, the payout drum is reversely rotated in a return direction to transport the banknotes into the machine, and stored as forgotten banknotes in the forgotten-banknote storage unit **24**.

In the confirmation operation in FIG. **2**(*b*), when deposit of the input banknotes temporarily held in the escrow unit **20** is confirmed, the banknotes are fed out one by one from the escrow unit, and banknotes to be used as change are stored in either one of the circulation-type banknote storage units **30** and **40** by denomination via the stored-banknote transport route **9***b*, and banknotes not to be used as change are stored in the collection box **50**.

In the withdrawal operation in FIG. **3**(*a*), banknotes stored in the circulation-type banknote storage units **30** and **40** are extracted and recognized in the recognition unit **15** at the time of dispensing the banknote as change, and if the banknote is a banknote capable of being returned, the banknote is once stacked (one to plural sheets) in the payout stacking unit **22**, and paid out collectively as change from the return port **7**.

On the other hand, when it is judged that the banknote is a banknote that cannot be returned by the recognition of the recognition unit **15**, the banknote is temporarily held in the escrow unit **20**, and then transferred to the collection box **50** to be stored therein.

In the collection operation in FIG. **3**(*b*), the banknotes stored in the circulation-type banknote storage units (circulation-type banknote storage devices) **30** and **40** at the closing time are once stacked in the escrow unit **20**, and then stored in the collection box **50**.

[Drive Transmission Switching Mechanism and Circulation-Type Banknote (Paper Sheet) Storage Unit]

<Banknote Storage Unit>

FIG. **4** is an external perspective view of the circulation-type banknote storage unit including the drive transmission switching mechanism according to the embodiment of the present invention. FIG. **5** is a longitudinal sectional view illustrating an inner configuration of the circulation-type banknote storage unit, and FIG. **6** is an exploded perspective view of the circulation-type banknote storage unit. FIG. **7** is a perspective view illustrating an assembly state of two circulation drum units and the drive transmission switching mechanism. FIG. **8** is an external perspective view of a flapper drive mechanism and the drive transmission switching mechanism. FIG. **9** is a longitudinal sectional view of the drive transmission switching mechanism (a sectional view of a part A in FIG. **8**). FIG. **10** is a perspective view illustrating an assembly state of a chipped gear member, a cam gear, a pressurizing member, and the like (an enlarged view of a part B in FIG. **8**). FIG. **11** is an exploded perspective view of the main component of the drive transmission switching mechanism. FIGS. **12**(*a*-**1**), (*a*-**2**), and (*a*-**3**) and (*b*-**1**), (*b*-**2**), and (*b*-**3**) are explanatory diagrams illustrating a state in which the cam gear activates the pressurizing member.

(Circulation-Type Banknote Storage Unit)

The circulation-type banknote storage units (circulation-type banknote storage devices=banknote storage units) **30** and **40** have a schematic configuration including two circulation drum units **100** and **200** in a casing **60**, a flapper drive mechanism **300** that switches the transport route of the banknote (feed route, payout route) to either one of the circulation drum units, and the drive transmission switching mechanism **400** that switches and transmits a drive force from a motor alternatively (selectively) to either one of the circulation drum units, in conjunction with a switching operation of a banknote transport direction by the flapper drive mechanism **300**.

The circulation-type paper sheet storage units **30** and **40** according to the present invention include a single motor **302**, a first circulation unit (first circulation drum unit) **100** and a second circulation unit (second circulation drum unit) **200** that respectively receive transported paper sheets by operating upon reception of a drive force from the motor and feed paper sheets stored therein, a sorter (flapper) **310** that sorts transported paper sheets to either one of the circulation units by changing a posture (position) thereof, a sorter drive mechanism (flapper drive mechanism) **300** that drives the sorter, and the drive transmission switching mechanism **400** that selectively switches and transmits a drive force from the motor to either one of the circulation units, by operating in conjunction with a sorting operation by the sorter drive mechanism **300**. The configuration is characterized such that the drive transmission switching mechanism is activated by

changing the posture (transport direction) of the sorter **310** by the sorter drive mechanism, to switch and transmit the drive force from the motor to either one of the circulation units.

The configuration of the circulation-type banknote storage units (circulation-type banknote storage devices) **30** and **40** is described below in detail.

As illustrated in FIG. **6**, the casing **60** includes a casing body **61** having a top panel **62** and right and left side plates **63** and **64**, and a side plate lid **63***b* attached to an opened portion **63***a* of the side plate **63**. The casing **60** is constituted so that the respective circulation drum units **100** and **200** can be attached thereto from each opening portion on a rear side and a front side of the casing body **61**. A feed port **60***a* for receiving a banknote transported from the deposit and withdrawal processing unit M toward the banknote storage unit N on the stored-banknote transport routes **9***a* and **9***b* is formed in an upper part of the rear side of the casing **60**.

The respective circulation-type banknote storage units **30** and **40** have substantially the same configuration, and thus the circulation-type banknote storage unit **30** is mainly described below. The circulation drum unit is described below as an example of an object to be driven by the motor. However, the object to be driven widely includes not only a circulation unit of a drum and tape type, but also other circulation units.

As illustrated in FIG. **5** and FIG. **7**, the flapper drive mechanism **300** and the drive transmission switching mechanism **400** are arranged between the circulation drum units **100** and **200**, and it is configured to switch the transmission direction of a drive force from the motor to either one of the circulation units, in conjunction with the switching operation of the transport direction by the flapper.

As illustrated in FIG. **5**, the circulation drum unit **100** on the rear side includes a feed route (transport route) **70** formed in an upper part in the casing to transport banknotes fed from the feed port **60***a* into the casing, a transport mechanism **72** (a belt **72***a* and rollers **72***b*) respectively arranged on an upper side and a lower side of the feed route **70**, and a transport mechanism **74** (a belt **74***a* and rollers **74***b*). The circulation drum unit **100** also includes a rear-side circulation drum (first circulation drum) **31** that winds tapes (films) T**1** and T**2** on the rear side around a periphery thereof in an overlapped state on each other at the time of rotation in a clockwise direction by fixing one end of both the tapes T**1** and T**2**, a first bobbin **105** capable of performing forward and reverse rotation to spirally wind (in multiple layers) and hold the first tape T**1** to be supplied to the outer periphery of the first circulation drum **31**, and guide rollers **106***a* to **106***c* that guide the first tape T**1** pulled out from the first bobbin toward the outer periphery of the first circulation drum. The circulation drum unit **100** further includes a second bobbin **110** capable of performing forward and reverse rotation to spirally wind and hold the second tape T**2** to be supplied to the outer periphery of the first circulation drum **31**, and guide rollers **111***a* to **111***d* that guide the second tape T**2** pulled out from the second bobbin toward the outer periphery of the first circulation drum. The respective tapes T**1** and T**2** are respectively wound around the outer periphery of the first circulation drum through routes along the respective guide rollers **106***a* to **106***c* and **111***a* to **111***d*, and fed from the first circulation drum to the respective bobbins **105** and **110**.

The banknotes fed from the feed port **60***a* and transported through the feed route **70** toward the first circulation drum by the transport mechanisms **72** and **74** are fed into a contact travel area in which both the tapes T**1** and T**2** are overlapped on each other and travel, in a nip portion between the guide roller **106***c* and the guide roller **111***d* at the final position, and stacked on the outer periphery of the first circulation drum that rotates in a winding direction (clockwise direction), while being held between the both tapes.

When the banknotes stacked between the tapes on the outer periphery of the first circulation drum **31** are to be discharged one by one to outside of the circulation drum unit **100**, by rotating the respective bobbins **105** and **110** in a winding direction (counter-clockwise direction), while rotating the first circulation drum in a feeding direction (counter-clockwise direction), the respective tapes T**1** and T**2** are fed in a reverse direction in the same route as that at the time of feeding from the respective bobbins **105** and **110** and wound around the respective bobbins, and the banknotes placed between the respective tapes are sequentially fed out from the nip portion to the feed route **70** and the feed port **60***a*.

The final guide roller **106***c* for the first tape T**1** and the final guide roller **111***d* for the second tape T**2** form the nip portion, and after the nip portion, both the tapes T**1** and T**2** are wound around the outer periphery of the first circulation drum **31** in an overlapped state on each other. Further, when the flapper (sorter) **310** for switching the transport direction, which is arranged in the banknote transport route at an intermediate position between the both circulation drum units **100** and **200**, is in a first posture (at a first position) indicated by a broken line, by guiding the banknote transported in the feed route **70** in the front direction to the nip portion between the final guide roller **106***c* and the final guide roller **111***d*, the banknote is wound around the outer periphery of the first circulation drum **31** rotating in a clockwise direction in a state being placed between the both tapes T**1** and T**2** in the nip portion.

On the other hand, when the flapper **310** is in a second posture (at a second position) indicated by a solid line, a bifurcation portion from an end portion of the feed route **70** toward a feed route **80** on the front side (to be formed between tapes T**3** and T**4**) is opened. Therefore, the banknote is transported to the feed route **80**.

The circulation drum unit **200** on the front side includes the front-side feed route **80** that is continuous from the end portion of the feed route **70** (the contact travel area of the belts **72***a* and **74***a*), the circulation drum (second circulation drum) **35** on the front side that winds the both tapes T**3** and T**4** in a state overlapped on each other around a periphery thereof at the time of rotating in a clockwise direction by fixing one end of the both tapes T**3** and T**4** on the front side, a third bobbin **205** capable of performing forward and reverse rotation to wind and hold the third tape T**3** to be supplied to the outer periphery of the second circulation drum **35**, guide rollers **206***a* to **206***d* that guide the third tape T**3** pulled out from the third bobbin toward the outer periphery of the second circulation drum, a fourth bobbin **210** capable of performing forward and reverse rotation to wind and hold the fourth tape T**4** to be supplied to the outer periphery of the second circulation drum **35**, and guide rollers **211***a* to **211***c* that guide the fourth tape T**4** pulled out from the second bobbin toward the outer periphery of the second circulation drum.

The respective tapes T**3** and T**4** are wound around the outer periphery of the second circulation drum **35** through routes along the respective guide rollers **206***a* to **206***d* and **211***a* to **211***c*, and fed from the second circulation drum to the respective bobbins **205** and **210**.

Banknotes fed from the feed port **60***a* and transported toward the bifurcation portion where the flapper **310** is located, through the feed route **70** by the transport mecha-

nisms **72** and **74** are guided to the feed route (transport route) **80** on the front side, when the flapper is in the second posture indicated by the solid line.

The feed route **80** is a route from the nip portion between the guide roller **206***c* and the guide roller **211***d* at the final positions to the outer periphery of the second circulation drum **35**, and is constituted by the contact travel area in which the both tapes T**3** and T**4** overlap on each other and travel. The banknote having passed the bifurcation portion is fed into the feed route **80**, and is stacked on the outer periphery of the second circulation drum that rotates in a winding direction (clockwise direction), while being placed between the both tapes.

When the banknotes stacked between the tapes T**3** and T**4** on the outer periphery of the second circulation drum **35** are to be discharged one by one to outside of the circulation drum unit **100**, by rotating the respective bobbins **205** and **210** in a winding direction (counter-clockwise direction), while rotating the second circulation drum in a feeding direction (counter-clockwise direction), the respective tapes T**3** and T**4** are fed in a reverse direction in the same route as that at the time of feeding from the respective bobbins **205** and **210** and wound around the respective bobbins, and the banknotes placed between the respective tapes are sequentially fed out from the nip portion to the feed routes **80** and **70** and the feed port **60***a*.

The final guide roller **206***d* for the third tape T**3** and the final guide roller **211***c* for the fourth tape T**4** form the nip portion, and after the nip portion, the both tapes T**3** and T**4** are wound around the outer periphery of the second circulation drum **35** in an overlapped state on each other. That is, when the flapper **310** for switching the transport direction, which is arranged in the banknote transport route at an intermediate position between the both circulation drum units **100** and **200**, is in a second posture indicated by a solid line, by guiding the banknote transported in the feed route **70** to the nip portion between the final guide roller **206***d* and the final guide roller **211***c*, the banknote is wound around the outer periphery of the second circulation drum **35** rotating in a clockwise direction in a state being placed between the both tapes T**3** and T**4** in the nip portion. When the banknote on the outer periphery of the second circulation drum is to be fed out, reverse feed of the banknote is performed in a state of maintaining the flapper in the second posture.

(Sorter Drive Mechanism)

Next, in an overall external perspective view of the flapper drive mechanism and the drive transmission switching mechanism in FIG. **8**, a reference numeral **300** denotes the flapper drive mechanism (sorter drive mechanism) that moves the flapper (sorter) **310** for switching the transport direction rotationally in forward and reverse directions within a predetermined angle range, in the present example, in an angle range of 20 degrees. The flapper **310** includes a plurality of claws **310***a* fixed to a pivot shaft **312** and integrally move rotationally together with the pivot shaft. The claws enter into a gap between the respective transport belts **72***a* and **74***a* constituted by a plurality of belts arranged in parallel with a predetermined gap, thereby enabling to change the posture between the first posture and the second posture and switch the transport direction of the banknote.

The pivot shaft **312** is supported by a swing solenoid **320** at one end to move the flapper **310** rotationally. On one surface of a protruding piece **315** protruding to an opposite side to the flapper **310**, having the pivot shaft **312** therebetween, a clutch activating piece (chipped gear member) **316** having sides each formed by a triangular plate material is provided in a protruding manner, and a gear portion **316***a* having a small number of gear threads is formed on a lower surface of the clutch activating piece.

As illustrated in a relevant-part enlarged diagram in FIG. **10**, immediately below the clutch activating piece **316**, a cam gear **350** that moves rotationally around a shaft portion **350***a* parallel to the pivot shaft **312** of the flapper is arranged so as to be able to move rotationally. The cam gear **350** includes a driven gear portion **352** that engages with the gear portion **316***a* of the clutch activating piece, a cam portion **354**, and a douser **356** on the periphery thereof. Since the flapper **310** moves rotationally by the swing solenoid **320**, the drive force is transmitted from the gear portion **316***a* of the clutch activating piece to the driven gear portion **352**, and the cam gear **350** moves rotationally. The cam portion **354** provided in a protruding manner on the opposite side to the driven gear portion **352** moves rotationally in forward and reverse directions to advance and retreat a pressurizing member **470** described later in an axial direction, thereby switching the transmission direction of the drive force by the drive transmission switching mechanism **400** to the rear-side circulation drum unit **100** and the front-side circulation drum unit **200** alternately.

The douser **356** advances and retreats between a light-emitting element and a light-receiving element constituting a route-switching detection sensor **360** formed of a photo interrupter, and when located between these elements, transmits a signal indicating that the flapper is at a home position (at a first axial position) to a control unit. In the state in FIG. **10**, since the flapper and the cam portion **354** are in the second posture, the douser **356** is not located between the elements, and the pressurizing member **470** is at a second axial position indicated by a solid line. When the flapper moves rotationally to shift to the first posture and the cam portion **354** moves rotationally from the posture in FIG. **10** by a predetermined angle in a counter-clockwise direction, the douser enters into between the elements to become a light-shielded state. Therefore, the pressurizing member moves to the first axial position indicated by a chain line.

The control unit can confirm in which state of the first posture and the second posture the flapper **310** is, by detecting the posture of the cam gear **350** by the route-switching detection sensor **360**.

(Drive Transmission Switching Mechanism)

The drive transmission switching mechanism **400** is a unit that switches and transmits a drive force from a single motor **302** alternatively (selectively) to either one of the circulation drum unit (first load) **100** on the rear side and the circulation drum unit (second load) **200** on the front side. The respective circulation drum units include a drive mechanism formed of a gear and the like, and by activating the respective drive mechanisms by the drive force from the drive transmission switching mechanism **400**, the circulation drums, the bobbins, and the transport mechanisms are rotated by the single motor, thereby realizing winding and feed of the banknote.

The drive transmission switching mechanism **400** operates in conjunction with the flapper drive mechanism **300**, and when the flapper (sorter) **310** is closing the front-side feed route **80**, transmits the drive force from the motor **302** only to the circulation drum unit (first load) **100** on the rear side, and when the flapper **310** is opening the front-side feed route **80**, transmits the drive force from the motor **302** only to the circulation drum unit (second load) **200** on the front side.

As illustrated in FIG. **8**, FIG. **9**, and FIG. **11**, the drive transmission switching mechanism **400** includes a main drive gear **410** driven to be rotated upon reception of a drive force from an output gear **303** of the motor **302**, a fixed shaft

415 that does not rotate and pivotally supports a shaft hole of the main drive gear so as to be able to rotate via a rotary sleeve **420**, and the rotary sleeve **420** being a long cylindrical body that is supported immovably in an axial direction but so as to be able to rotate relative to an outer periphery of a fixed shaft inserted into a central hole **420***a* penetrating in an axial direction, and fixedly supports a shaft hole of the main drive gear **410**. The drive transmission switching mechanism **400** further includes a first transmission gear **430** in which a shaft hole (a shaft core, a bearing member **430***a*) is pivotally supported so as to be able to rotate relative to an outer periphery of the rotary sleeve **420** on the second axial direction side (the left side in each drawing) of the main drive gear **410**, to transmit the drive force to the circulation drum unit **100** (first load) side on the rear side, a second transmission gear **440** in which a shaft hole (a bearing member **440***a*) is pivotally supported so as to be able to rotate relative to an outer periphery of the rotary sleeve **420** on the second axial direction side of the first transmission gear, to transmit the drive force to the circulation drum unit **200** (second load) side on the front side, and first dog teeth **432** and second dog teeth **442** provided on opposite surfaces of the first transmission gear **430** and the second transmission gear **440**.

The respective dog teeth **432** and **442** are respectively constituted by peaks **432***a* and **442***a*, and valleys **432***b* and **442***b*.

Further, the drive transmission switching mechanism **400** includes a dog clutch key **450** that is supported axially movably by a movable support hole **422** provided in a rotary sleeve portion located between the first transmission gear **430** and the second transmission gear **440** and meshes with the first dog teeth **432** when located at a position biased toward the first axial direction, and meshes with the second dog teeth **442** when located at a position biased toward the second axial direction. The drive transmission switching mechanism **400** also includes a first coil spring (first resilient member) **460** constituted by a compression spring arranged between an outer periphery of the fixed shaft **415** and an inner periphery of the central hole **420***a* of the rotary sleeve **420** at a position closer to the first transmission gear **430** than the dog clutch key (first axial direction side), and a second coil spring (second resilient member) **465** constituted by a compression spring arranged between the outer periphery of the fixed shaft **415** and the inner periphery of the central hole **420***a* of the rotary sleeve at a position closer to the second transmission gear **440** than the dog clutch key (second axial direction side). The drive transmission switching mechanism **400** further includes the pressurizing member (slide bush) **470** inserted into a gap between the outer periphery of the fixed shaft and the central hole **420***a* of the rotary sleeve from an end on the second axial direction side to pressurize the dog clutch key **450** toward the second transmission gear **440** via the first coil spring.

It is set that the resilience (spring load) of the second coil spring **465** becomes larger than that of the first coil spring **460**. Since the second coil spring **465** is configured not to move in the second axial direction by being locked by a locking unit (not illustrated) at the end on the second axial direction side, the second coil spring **465** is reliably compressed at the time of being pressurized in the second axial direction by the dog clutch key. Further, an axial length and an arrangement position of the first coil spring are set so as not to block the behavior of the dog clutch key, as indicated by a chain line in FIG. **9**, when the second coil spring shifts the dog clutch key **450** to an end in the first axial direction in the movable support hole. Meanwhile, the axial length and the resilience of the first coil spring are set so that the first coil spring can cause the dog clutch key to mesh with the second dog teeth **442** of the second transmission gear, while sufficiently compressing the second coil spring via the dog clutch key, when the pressuring member compresses the first coil spring in the second axial direction.

When the pressuring member **470** is not pressing the first coil spring **460** or is pressing the first coil spring **460** with a weaker force than a predetermined value, the dog clutch key **450** is pressed in the first axial direction by the second coil spring **465**, so as to be meshed with the first dog teeth (valleys) of the first transmission gear **430**, thereby transmitting the drive force from the main drive gear **410** to the circulation drum unit **100** on the rear side. Further, when the flapper drive mechanism **300** operates to activate the activation mechanism (the cam gear **350**), so that the pressurizing member **470** presses the first coil spring **460** in the second axial direction with a force equal to or larger than a predetermined value, the dog clutch key **450** moves in the second axial direction so as to be meshed with the second dog teeth **442** (valleys) of the second transmission gear **440**, thereby transmitting the drive force from the main drive gear **410** to the circulation drum unit (second load) **200** on the front side.

The dog clutch key **450** moves axially to be meshed alternately with the respective valleys **432***b* and **442***b* of the first dog teeth **432** and the second dog teeth **442** provided on faces opposite to each other of the first transmission gear **430** and the second transmission gear **440**, thereby enabling switching transmission of the drive force, by alternately integrating the respective transmission gears with the main drive gear **410**.

That is, the dog clutch key **450** is substantially in a rectangular shape, is fitted into the movable support hole **422**, which is a long through hole provided in the rotary sleeve, in such a manner that the opposite ends thereof protrude from the movable support hole, and is supported movably in an axial direction. An insertion hole **450***a* for inserting the fixed shaft **415** so as to be able to move relatively is formed penetrating therethrough in an intermediate part between two opposite end faces of the dog clutch key **450**. By inserting the fixed shaft **415** into the insertion hole **450***a*, the dog clutch key **450** can advance and retreat in the movable support hole **422** in the same posture. That is, since the dog clutch key axially moves along the movable support hole **422**, while the posture thereof is steadily guided by the fixed shaft, the dog clutch key can smoothly mesh with the respective dog teeth.

While the main drive gear **410** is fixed to an outer periphery of the rotary sleeve **420** at a first axial end, the first transmission gear **430** is pivotally supported so as to be able to rotate relative to the outer periphery of the rotary sleeve **420** via the bearing member **430***a*. Further, the second transmission gear **440** is pivotally supported so as to be able to rotate relative to the outer periphery of the rotary sleeve on the second axial direction side via the bearing member **440***a*.

The rotary sleeve **420** is pivotally supported rotatably at the axial opposite ends by bearing members **475** and **476**. The bearing members **475** and **476** are supported by a fixing portion (not illustrated).

As illustrated in FIG. **8**, the first transmission gear **430** meshes with one rear-side driven gear **500** located immediately below thereof, to drive another rear-side driven gear **502** integrated therewith via a rear-side drive shaft **501**. The rear-side driven gear **502** meshes with another rear-side

driven gear **503** illustrated in FIG. **7**, to drive an object to be driven in the rear-side circulation drum unit **100**.

The second transmission gear **440** meshes with another front-side driven gear **510** illustrated in FIG. **7**, to drive an object to be driven in the front-side circulation drum unit **200**.

(Activation Mechanism)

Next, a configuration and operations of an activation mechanism **480** that causes the respective transmission gears **430** and **440** to connect with and disconnect from the main drive gear **410**, which is directly connected with the motor **302**, by the flapper drive mechanism **300** that advances and retreats the pressurizing member **470** to axially move the dog clutch key **450** are described with reference to FIG. **10** and FIG. **12**.

That is, the activation mechanism **480** that activates the pressurizing member **470** supported by the fixed shaft **415** so as to be able to advance and retreat axially includes a driven gear portion **352** that is moved rotationally by the pivot shaft **350***a* parallel to the fixed shaft **415** and receives a drive force from the other drive gear portion (in this example, the gear portion **316***a* of the clutch activating piece **316**) in a part of the outer periphery, and the cam gear **350** including the cam portion **354**, which comes into contact with and activates a cam follower **470***b* provided in the pressurizing member **470**, in the other part of the outer periphery. The activation mechanism **480** is characterized such that the cam portion **354** has a shape that axially advances and retreats the cam follower **470***b* in a process in which the cam gear **350** moves rotationally in forward and reverse directions.

FIGS. **12**(*a*-**1**), (*a*-**2**), and (*a*-**3**) illustrate a state in which the cam gear **350** (the cam portion **354**) is not pressing the pressurizing member **470** because it is in the first posture (a drive force transmission state to the circulation drum unit **100** on the rear side), and FIGS. **12**(*b*-**1**), (*b*-**2**), and (*b*-**3**) illustrate a state in which the cam portion **354** is pressing the pressurizing member **470** in the second axial direction because it is in the second posture (a drive force transmission state to the circulation drum unit **200** on the front side).

The pressurizing member (slide bush) **470** is constituted by a cylindrical portion **470***a* inserted into the fixed shaft **415** and a flange (cam follower) **470***b* provided at one end of the cylindrical portion.

The cam portion **354** provided in the cam gear **350** includes a cam surface **354***a* as an inclined surface having a predetermined inclination with respect to the axial direction of the fixed shaft. The cam surface **354***a* has a positional relationship in which the cam surface **354***a* comes in sliding contact with an outer peripheral edge of the flange **470***b* of the pressuring member **470**, and the cam surface **354***a* generates a force to cause the pressuring member to advance or retreat axially via the flange, by pressing or releasing pressure against the flange **470***b* in the process in which the cam gear **350** moves rotationally in forward and reverse directions.

In the state illustrated in FIGS. **12**(*a*-**1**) to (*a*-**3**), since the cam portion **354** is in the first posture, the cam surface **354***a* does not press the flange **470***b* in the second axial direction, and thus the pressurizing member stops at a position biased toward the first axial direction. Therefore, the first coil spring **460** does not move the dog clutch key **450** in the second axial direction, and the dog clutch key **450** stops at a position biased toward the first axial direction by the second coil spring **465**. Accordingly, the dog clutch key can maintain the state meshed with the first dog teeth **432** of the first transmission gear **430** on the rear side.

Since the dog clutch key drives the motor in the state being meshed with the first dog teeth, a drive force is transmitted from the output gear **303** through the main drive gear **410**, the rotary sleeve **420**, the dog clutch key **450**, and the first transmission gear **430**. During the rotation, the first and second coil springs do not rotate, or follow the rotation of the rotary sleeve.

In this example, when the cam portion **354** is in the first posture, the pressurizing member does not pressurize the first coil spring at all. However, the pressurizing member may come into contact with the first coil spring or apply pressure lightly to the first coil spring so as not affect the movement of the dog clutch key.

In the state illustrated in FIGS. **12**(*b*-**1**) to (*b*-**3**), since the cam portion **354** is in the second posture, the cam surface **354***a* presses the flange **470***b* in the second axial direction, and thus the pressurizing member moves in the second axial direction against the first coil spring **460** (while compressing the first coil spring). Therefore, the first coil spring **460** moves the dog clutch key **450** in the second axial direction against the second coil spring **465**, and the dog clutch key can maintain the state meshed with the second dog teeth **442** of the second transmission gear **440** on the front side.

Since the dog clutch key drives the motor in the state being meshed with the second dog teeth, a drive force is transmitted from the output gear **303** through the main drive gear **410**, the rotary sleeve **420**, the dog clutch key **450**, and the second transmission gear **440**. During the rotation, the first and second coil springs do not rotate, or follow the rotation of the rotary sleeve. In any case, the respective coil springs do not block transmission of a drive force during a period in which the drive force from the motor is being transmitted to either one of the transmission gears.

According to the present embodiment, since the swing solenoid **320** causes the flapper **310** to move rotationally between the first posture indicated by a broken line and the second posture indicated by a solid line in FIG. **5**, the pressuring member **470** advances and retreats between a non-pressing position indicated by a solid line in FIG. **9** (FIGS. **12**(*a*-**1**) to (a-**3**) and a pressing position indicated by a broken line in FIG. **9** (FIGS. **12**(*b*-**1**) to (b-**3**)). Since the flapper is an essential component as a transport-direction switching unit of banknotes in a two drum-type banknote storage device, reduction in the number of components, downsizing, and low cost can be realized by also using the operation of the essential component also as means for switching a drive force.

(Measures Against Meshing Failure)

A force for meshing the dog clutch key **450** with the respective dog teeth is basically a pressure from the respective coil springs. However, if the resilience of the respective coil springs decreases due to an increase of sliding resistance of the respective coil springs by wear between the central hole **420***a* of the rotary sleeve and the coil springs over time, the pressure for achieving mesh becomes insufficient, and friction and catch between the dog clutch key and peaks of the respective dog teeth cannot be resolved and the dog clutch key cannot mesh with the respective dog teeth.

That is, in the process in which the dog clutch key **450** advances and retreats in the movable support hole **422** in line with the advance and retreat of the pressurizing member **470**, such a situation may occur that the dog clutch key **450** collides with the peaks **432***a* or **442***a* of the dog teeth of either one of the transmission gears **430** and **440**, and cannot enter into the valleys **432***b* or **442***b*.

In the present invention, the dog clutch key **450** can rotate relative to the peaks of the respective dog teeth at the timing

of initial motion, by driving the motor **302** while maintaining (locking) the posture of the flapper **310** (clutch activating piece **316**) so as not to move rotationally, with the swing solenoid **320** being kept in a biased state, thereby enabling to cause the dog clutch key to fall into any of the valleys **432***b* and **442***b* immediately.

That is, when the clutch activating piece **316** holds the cam gear **350** in the first posture illustrated in FIG. **12**(*a*-**1**) and the like, the cam portion **354** does not press the flange **470***b* and holds the pressurizing member on the first axial direction side. In this state, since the dog clutch key **450** is displaced in the first axial direction within the movable support hole **422** by the force of the second coil spring **465**, the dog clutch key **450** is located on the side of the first transmission gear **430**. In this stage, even if the dog clutch key **450** collides with the peaks **432***a* of the dog teeth of the first transmission gear **430** to cause friction and catch so as not to be able to fall into the valleys **432***b*, by driving the motor **302** while maintaining the cam gear **350** in the first posture, the dog clutch key **450** is rotated by the drive force. Therefore, the dog clutch key **450** can fall into the valleys **432***b* immediately, thereby preventing that the poor meshing state continues.

Further, when the clutch activating piece **316** holds the cam gear **350** in the second posture illustrated in FIG. **12**(*b*-**1**) and the like, the cam portion **354** presses the flange **470***b* to move the pressurizing member to the second axial direction side. In this state, since the dog clutch key **450** is displaced in the second axial direction within the movable support hole **422** by the force of the first coil spring **460**, the dog clutch key **450** is located on the side of the second transmission gear **440**. In this stage, even if the dog clutch key **450** collides with the peaks **442***a* of the second dog teeth of the second transmission gear **440** so as not to be able to fall into the valleys **442***b*, by driving the motor while maintaining the cam gear **350** in the second posture, the dog clutch key **450** is rotated by the drive force. Therefore, the dog clutch key **450** can fall into the valleys **442***b* immediately.

In this manner, even if the resilience of the respective coil springs decreases due to an increase of sliding resistance of the respective coil springs by wear between the central hole **420***a* of the rotary sleeve and the coil springs over time, to decrease the force of pressing the dog clutch key against the dog teeth **432** or **442** of respective transmission gears, by continuously pressing the dog clutch key against the dog teeth **432** or **442** of each transmission gear while maintaining the posture of the cam gear **350** in a state in which the swing solenoid is biased continuously, the dog clutch key can fit into the valleys **432***b* or **442***b* together with the rotation of the respective transmission gears, thereby enabling to prevent the dog clutch key from detaching from the respective valleys.

If it is prevented that the force of pressing the dog clutch key against the dog teeth of the respective transmission gears decreases over time by improving the spring load of the coil springs, the resilience of the coil springs excessively increases so that the cam gear **350** constituting the activation mechanism is returned in a reverse direction to change the posture of the flapper, or causes a problem such that malfunction is caused due to insufficient torque of the swing solenoid. Therefore, it is not a favorable idea.

According to the present invention, even if a spring load of the coil spring decreases, mesh between the dog clutch key and the respective dog teeth can be achieved smoothly by continuously biasing the swing solenoid to lock the state of the activation mechanism in a predetermined state continuously, without increasing the spring load of the coil spring.

(Configuration Example of Circulation Drum Unit)

A configuration of the drive mechanism that realizes the above operation of the circulation drum and the bobbin in the circulation drum units **100** and **200** is described. Since the configuration of the circulation drum units **100** and **200** are the same (substantially bilaterally symmetrical), only the first circulation drum unit **100** is described here.

FIG. **13** is a perspective view of the first circulation drum unit **100** including a gear train that drives the circulation drum **31** and the respective bobbins **105** and **110**.

A drum gear **550** having a large diameter is coaxially integrated with one side surface of the circulation drum **31**, and the rear-side driven gear **503** illustrated in FIG. **7** transmits a drive force to the drive gear **550** via a driven gear **560**.

Each of bobbin gears **105**G and **110**G is pivotally supported at ends of rotation shafts **105***a* and **110***a* of the first bobbin **105** and the second bobbin **110** via a one-way clutch (not illustrated), and a relay gear **570** that is meshed with the drum gear **550** at all times meshes with the both bobbin gears **105**G and **110**G at all times. When the drum gear **550** rotates in a clockwise direction for winding the both tapes T**1** and T**2** with respect to the respective bobbin gears coupled with the rotation shafts **105***a* and **110***a* of the respective bobbins via the one-way clutch, drive from the first bobbin gear **105** and the second bobbin gear **110** is not transmitted to the respective rotation shafts **105***a* and **110***a* (respective bobbins) due to the action of the one-way clutch. That is, when the respective tapes are to be pulled out by rotating the circulation drum **31** in a winding direction, pullout of the tapes is permitted, while the respective bobbins **105** and **110** in a free state rotate together with the tapes.

Further, when the drum gear **550** rotates in a counterclockwise direction for feeding the both tapes T**1** and T**2**, drive from the first bobbin gear **105** and the second bobbin gear **110** is transmitted to the respective rotation shafts **105***a* and **110***a* (respective bobbins) due to the action of the one-way clutch. That is, when the respective tapes are to be fed out by rotating the circulation drum **31** in a feeding direction, the bobbins **105** and **110** are driven in a winding direction by the respective bobbin gears, to wind the tapes.

Detailed configurations other than those described above, for example, a configuration for preventing deflection of a tape is not relevant to the main subject of the present invention, and thus descriptions thereof are omitted.

<Storage and Payout Procedures by Circulation-Type Banknote Processing Device>

Next, storage and payout procedures by the circulation-type banknote processing device are described with reference to a flowchart in FIG. **14**.

In the flowchart, it is assumed that there is a space for storing a new banknote in all the circulation drums at the time of storing the banknotes, and a necessary number of banknotes of a designated denomination are stored in all the circulation drums at the time of paying out the banknotes. Further, the denomination of the banknote to be stored in each of the circulation drums is determined beforehand, and pieces of information relating to, for example, the denomination and the number of banknotes, and the circulation drum to store the banknotes are included in a banknote storage command from the control unit. Further, pieces of information relating to, for example, the denomination and

the number of banknotes to be paid out, and the circulation drum to pay out the banknotes are included in a banknote payout command.

At Step S1, the circulation-type banknote storage unit waits for a banknote storage command or a banknote payout command. When an acceptance condition is satisfied such that a first banknote input from the input/output port **5** illustrated in FIG. **1** by a customer is authentic, the control unit outputs a banknote storage command, designates a circulation drum corresponding to the denomination of the first banknote, for example, the first circulation drum **31**, and transports the banknote from the deposit and withdrawal processing unit M toward the banknote storage unit N by driving the transport mechanism (YES at Step S2, and Step S3).

Next, when a paper feed sensor (not illustrated) arranged in the feed port **60***a* of the circulation-type banknote storage unit **30** installed with the first circulation drum **31** detects entrance of the first banknote (YES at Step S4), the control unit confirms whether the flapper **310** is in the first posture in which a route advancing toward the first circulation drum **31** is opened based on an output of the detection sensor **360** at Step S5. When the flapper **310** is in the first posture (YES at Step S5), the control unit drives the motor **302** in a normal rotation direction to rotate the first circulation drum **31** in a winding direction, and rotates the respective bobbins **105** and **110** in a feeding direction, thereby stacking the first banknote on the outer periphery of the first circulation drum while placing the first banknote between the tapes T1 and T2 (Step S7).

When the flapper **310** is in the first posture, since the clutch activating piece **316** integrated with the flapper holds the cam gear **350** in the first posture by the swing solenoid **320**, the pressuring member **470** is at a non-pressurizing position illustrated in FIG. **12**(*a*) and at a non-pressurizing position indicated by a broken line in FIG. **9** and FIG. **10**, and the dog clutch key **450** meshes with the first dog teeth of the first transmission gear **430**. Therefore, a drive force from the motor **302** is transmitted to the first circulation drum unit **100** (the drive mechanism of the first circulation drum **31**) via the first transmission gear **430**.

At Step S5, when the flapper is not in the first posture, the control unit activates the flapper drive mechanism **300** to move the flapper rotationally from the second posture to the first posture (Step S6). It is judged that the flapper is switched to the first posture by an output of the detection sensor **360**.

In a case in which the second circulation drum **35** is designated as a storage destination in the banknote storage command output at Step S2, when the paper feed sensor arranged in the feed port **60***a* of the circulation-type banknote storage unit **30** installed with the second circulation drum **35** has detected entrance of the first banknote (YES at Step S4), it is confirmed whether the flapper **310** is in the second posture in which a route advancing toward the second circulation drum **35** is opened at Step S5. When the flapper **310** is in the second posture, the control unit drives the motor **302** in a normal rotation direction to rotate the second circulation drum **35** in a winding direction, and rotates the respective bobbins **205** and **210** in a feeding direction, thereby stacking the first banknote on the outer periphery of the second circulation drum while placing the first banknote between the tapes T3 and T4 (Step S7). When the flapper **310** is in the second posture, since the clutch activating piece **316** integrated with the flapper holds the cam gear **350** in the second posture by the swing solenoid **320**, the pressuring member **470** is at a pressurizing position illustrated in FIGS. **12**(*b*-**1**) to (*b*-**3**) and at a pressurizing position indicated by a solid line in FIG. **9** and FIG. **10**, and the dog clutch key **450** meshes with the second dog teeth of the second transmission gear **440**. Therefore, the drive force from the motor **302** is transmitted to the second circulation drum unit **200** (the drive mechanism of the second circulation drum **35**) via the second transmission gear **440**.

At Step S5, when the flapper is not in the second posture, the control unit activates the flapper drive mechanism **300** to move the flapper rotationally from the first posture to the second posture (Step S6).

By performing the procedures at Step S5 and thereafter for all the subsequent input banknotes, when storage of all the banknotes has completed, the motor is stopped to end the flow (Steps S7 to 10).

Next, at Step S2, when the banknote storage command is not output, it is checked whether there is a banknote payout command at Step S20, and when the control unit outputs a banknote payout command, it is checked at Step S21 whether a payout route (discharge route) from the circulation drum (for example, the first circulation drum **31**) that stores the denomination designated in the banknote payout command is opened (whether the flapper is in the first posture). When the payout route is being opened, control proceeds to Step S23.

At Step S21, when the flapper is not in the first posture, the control unit moves the flapper rotationally from the second posture to the first posture by activating the flapper drive mechanism **300** (Step S22).

At Step S21, when the payout route from the first circulation drum **31** to the feed port **60***a* is being opened (the flapper is in the first posture), the control unit drives the motor **302** in a reverse rotation direction, to rotate the first circulation drum **31**, which is in a state connected with the motor, in a feeding direction by the drive transmission switching mechanism **400**, and rotates the respective bobbins **105** and **110** in a winding direction, thereby sequentially feeding out the banknotes placed between the tapes T1 and T2 from the outer periphery of the first circulation drum by a designated number of banknotes (Step S23). The number of banknotes paid out is counted by the paper feed sensor at the feed port **60***a*.

When the flapper **310** is in the first posture, since the clutch activating piece **316** integrated with the flapper holds the cam gear **350** in the first posture by the swing solenoid **320**, the pressuring member **470** is at the non-pressurizing position illustrated in FIG. **12**(*a*) and at the non-pressurizing position indicated by the broken line in FIG. **9** and FIG. **10**, and the dog clutch key **450** meshes with the first dog teeth of the first transmission gear **430**. Therefore, the drive force from the motor **302** is transmitted only to the first circulation drum unit **100** (the drive mechanism of the first circulation drum **31**) via the first transmission gear **430**.

At Step S21, when the flapper is not in the first posture, the control unit activates the flapper drive mechanism **300** to move the flapper rotationally from the second posture to the first posture (Step S22).

When the denomination designated for payout is stored in the second circulation drum **35**, the control unit confirms whether the flapper **310** is in the second posture to open the route connecting the second circulation drum **35** with the feed port **60***a*. When the flapper **310** is in the second posture, the control unit drives the motor **302** in a reverse rotation direction to rotate the second circulation drum **35** in a feeding direction, and rotates the respective bobbins **205** and **210** in a winding direction to sequentially pay out the banknotes being placed between the both tapes in the

process of feeding the tapes T3 and T4 from the second circulation drum up to a designated number of banknotes (Step S23). When the flapper **310** is in the second posture, since the clutch activating piece **316** integrated with the flapper holds the cam gear **350** in the second posture by the swing solenoid **320**, the pressuring member **470** is at the pressurizing position illustrated in FIGS. **12**(*b*-**1**) to (*b*-**3**) and at the pressurizing position indicated by the solid line in FIG. **9** and FIG. **10**, and the dog clutch key **450** meshes with the second dog teeth of the second transmission gear **440**. Therefore, the drive force from the motor **302** is transmitted to the second circulation drum unit **200** (the drive mechanism of the second circulation drum **35**) via the second transmission gear **440**.

At Step S24, it is judged that the payout operation at Step S23 has been performed for all the banknotes based on the number of banknotes discharged from the feed port **60***a*, and upon completion of discharge, the motor is stopped to end the flow (Step S25).

[Summary of Configurations, Actions, and Effects of Present Invention]

The paper sheet storage unit according to the first invention includes the single motor **302**, the first circulation unit **100** and the second circulation unit **200** that respectively receive a transported paper sheet by operating upon reception of a drive force from the motor and feed the stored paper sheet, the drive transmission switching mechanism **400** that selectively switches and transmits a drive force from the motor to either one of the circulation units, the sorter **310** that sorts the transported paper sheet to either one of the circulation units by changing the posture thereof, and the sorter drive mechanism **300** that drives the sorter. The configuration is characterized such that the drive transmission switching mechanism is activated by changing the posture of the sorter by the sorter drive mechanism, to switch and transmit the drive force from the motor to either one of the circulation units.

Drive of the circulation unit is generally performed by one motor for one circulation unit. However, according to the present invention, by adopting the drive transmission switching mechanism, the two circulation units that accommodate banknotes of a denomination different from each other can be driven by one motor, thereby decreasing the number of motors. Due to the reduction in the number of motors, the hardware configuration is simplified to realize cost reduction, and software control can be also simplified. The circulation unit is not limited to the circulation drum type described in the embodiment, and includes all sorts of units that can accommodate and pay out paper sheets in a circulating manner without using a drum or a tape.

The sorter **310** is a unit that switches the transport route and the transport direction of paper sheets fed from the feed port **60***a* of the paper sheet storage devices **30** and **40** to either one of the circulation units. The paper sheet paid out from the respective circulation units is guided to the feed port by the sorter. At the time of reciprocating the sorter within a predetermined angular range, the drive transmission switching mechanism **400** is activated to perform switching of the transmission direction of the drive force simultaneously.

In this manner, in the circulation-type paper sheet storage unit of a type including two circulation units, switching of a drive force to respective circulation units can be realized by using the sorter for switching the transport route.

The drive transmission switching mechanism according to the second invention is the drive transmission switching mechanism **400** that switches and transmits a drive force from the single motor **302** selectively to either one of a first load (in the embodiment, the first circulation drum unit **100**) and a second load (in the embodiment, the second circulation drum unit **200**). The drive transmission switching mechanism **400** includes the main drive gear **410** driven to be rotated upon reception of a drive force from the output gear **303** of the motor, the fixed shaft **415** that pivotally supports a shaft hole of the main drive gear so as to be able to rotate via the rotary sleeve **420**, the rotary sleeve **420** that is supported immovably in an axial direction but so as to be able to rotate relative to the fixed shaft inserted into the central hole **420***a*, and fixedly supports the shaft core (a shaft hole) of the main drive gear, the first transmission gear **430** in which a shaft hole is pivotally supported so as to be able to rotate relative to the rotary sleeve portion (outer periphery) on the second axial direction side of the main drive gear, to transmit the drive force to the first load side, the second transmission gear **440** in which a shaft hole is pivotally supported so as to be able to rotate relative to the rotary sleeve portion (outer periphery) on the second axial direction side of the first transmission gear, to transmit the drive force to the second load side, and the first dog teeth **432** and the second dog teeth **442** provided on surfaces opposite to each other of the first transmission gear and the second transmission gear. Further, the drive transmission switching mechanism **400** includes the dog clutch key **450** that is supported axially movably by the rotary sleeve portion located between the first transmission gear and the second transmission gear and meshes with the first dog teeth when located at a position biased toward the first axial direction, and meshes with the second dog teeth when located at a position biased toward the second axial direction, the first resilient member **460** arranged between the rotary sleeve portion on the second axial direction side than the dog clutch key and the fixed shaft, the second resilient member **465** arranged between the rotary sleeve portion on the second axial direction side than the dog clutch key and the fixed shaft, and the pressurizing member **470** inserted into a gap between the outer periphery of the fixed shaft and the central hole of the rotary sleeve from the second axial direction side to press the dog clutch key against the second transmission gear via the first resilient member. The configuration is characterized such that when the pressurizing member is not pressing the first resilient member (or is not pressing the first resilient member with a force equal to or larger than a predetermined value), the dog clutch key meshes with the first dog teeth of the first transmission gear by the second resilient member, to transmit the drive force from the main drive gear to the first load. When the pressurizing member presses the first resilient member, the dog clutch key meshes with the second dog teeth of the second transmission gear, to transmit the drive force from the main drive gear to the second load.

If the two loads (objects to be driven) are driven each by one motor, the number of components increases, the hardware configuration becomes complicated, and software control also becomes complicated, thereby increasing the cost.

According to the present invention, by enabling to drive two loads by one motor, the hardware configuration and software control are simplified by reducing the number of motors, thereby enabling to realize cost reduction. Further, since the transmission direction of a drive force can be switched by using the operation of essential components (for example, the paper sheet transport direction switching unit in the two drum-type paper sheet storage device) in the

device in which two loads are driven by one motor, reduction of the number of components, downsizing, and low cost can be realized.

While the drive force from the motor is transmitted to the main drive gear integrated with the rotary sleeve, the first and second transmission gears are supported rotatably relative to the rotary sleeve. The dog clutch configured to be able to move axially by the rotary sleeve and rotate integrally with the rotary sleeve meshes selectively with one of the transmission gears by advancing or retreating axially, to cause the one transmission gear to be integrated with the rotary sleeve temporarily, thereby enabling to transmit the drive force. As means for activating the dog clutch, the pressurizing member is used and the pressurizing member is activated by the activation mechanism.

As a load to become a switching target of the drive force transmission, it is not limited to the paper sheet storage device described in the embodiment, and any kind of targets can be assumed. It is not always necessary to support the pressurizing member by the fixed shaft so as to be able to advance and retreat, and any support structure can be used.

The drive transmission switching mechanism **400** according to the third invention includes the activation mechanism **480** that activates the pressurizing member **470**. The activation mechanism includes the driven gear portion **352** that is moved rotationally by a pivot shaft parallel to the fixed shaft and receives a drive force from another drive gear member **316** in one part of the outer periphery thereof, and the cam gear **350** including the cam portion **354** that activates the pressurizing member by coming into contact with the cam follower **470***b* provided in the pressuring member to rotate, in the other part of the outer periphery. The activation mechanism is characterized such that the cam portion has a shape so as to advance and retreat the pressurizing member in an axial direction via the cam follower in a process in which the cam gear moves rotationally in forward and reverse directions.

As the activation mechanism for biasing the first resilient member by advancing and retreating the pressurizing member in a gap between the external surface of the fixed shaft and the rotary sleeve, for example, the cam gear **350** that operates upon reception of a drive force from the other drive gear member **316** can be used. Accordingly, the activation mechanism can be established only by adding a simple component to an existing component (a flapper).

The paper sheet storage units **30** and **40** according to the fourth invention include the drive transmission switching mechanism **400**. The configuration is characterized such that the first and second loads are respectively the circulation drum units **100** and **200** that receive and accommodate a paper sheet sorted by the sorter **310** respectively in a process of being transported, and the cam gear **350** is moved rotationally in forward and reverse directions via the driven gear portion by moving the sorter rotationally in forward and reverse directions, to move the drive gear member rotationally in forward and reverse directions.

Drive of the circulation drum of a tape (film) winding type is generally performed by one motor for one circulation drum. However, according to the present invention, by adopting the drive transmission switching mechanism, the two circulation drums that accommodate banknotes of a denomination different from each other can be driven by one motor, thereby decreasing the number of motors. Due to the reduction in the number of motors, the hardware configuration is simplified to realize cost reduction, and software control can be also simplified.

The sorter **310** is a unit that switches a paper sheet fed from the feed port **60***a* of the paper sheet storage devices **30** and **40** to either one of the circulation drum units. When the sorter is reciprocally moved within an angular range of, for example, 20 degrees by the swing solenoid, switching of the transmission direction of the drive force is simultaneously performed.

In this manner, switching of a drive force to each circulation-type drum unit can be realized by using a sorter for switching a transport route, which has been conventionally used in a two drum-type circulation-type paper sheet storage unit.

The paper sheet processing device according to the fifth invention is characterized such that the paper sheet storage unit is provided.

According to the paper sheet processing device, it is possible to drive a paper sheet storage unit including two loads by one motor, thereby obtaining an advantage of simplifying and downsizing the configuration, reducing the cost, and the like.

REFERENCE SIGNS LIST

1 banknote processing device, **3** housing, **5** input/output port, **7** return port, **9***a* stored-banknote transport route, **9***b* stored-banknote transport route, **11** collective deposit unit, **13** centering unit, **15** recognition unit, **20** escrow unit, **21** escrow drum, **22** stacking unit, **23** payout drum, **30**, **40** circulation-type banknote storage unit (circulation-type banknote storage device), **31**, **35** circulation drum, **31***a* drum shaft, **41**, **45** circulation drum, **50** collection box, **60** casing, **60***a* feed port, **61** casing body, **62** top panel, **63** side plate, **63***a* opened portion, **63***b* side plate lid, **70** rear-side feed route (transport route), **72**, **74** transport mechanism, **72***a* belt, **72***b* roller, **74***a* belt, **80** front-side feed route (transport route), **100** first circulation drum unit (first circulation unit), **105**, **110** bobbin, **106***a* to **106***c* guide roller, **111***a* to **111***d* guide roller, T**1**, T**2**, T**3**, T**4** tape, **200** second circulation drum unit (second circulation unit), **205**, **210** bobbin, **206***a* to **206***d* guide roller, **211***a* to **211***c* guide roller, **300** flapper drive mechanism (sorter drive mechanism), **302** motor, **303** output gear, **310** flapper, **310***a* claw, **312** pivot shaft, **312** drive shaft, **315** protruding piece, **316** clutch activating piece, **316***a* gear portion, **320** swing solenoid, **350** cam gear, **350***a* shaft portion, **352** driven gear portion, **354** cam portion, **354***a* cam surface, **356** douser, **360** detection sensor, **400** drive transmission switching mechanism, **410** main drive gear, **415** fixed shaft, **420** rotary sleeve, **420***a* central hole, **422** movable support hole, **430** first transmission gear, **430***a* bearing member, **440** second transmission gear, **432**, **442** dog teeth, **432***a*, **442***a* peak, **432***b*, **442***b* valley, **440***a* bearing member, **450** dog clutch key, **450***a* insertion hole, **460** first coil spring (first resilient member), **465** second coil spring (second resilient member), **470** pressurizing member, **470***a* cylindrical portion, **470***b* flange (cam follower), **475**, **476** bearing member, **480** (**350**, **352**, **354**) activation mechanism, **500** rear-side driven gear, **501** rear-side drive shaft, **502** rear-side driven gear, **503** rear-side driven gear, **510** front-side driven gear, **520** drive mechanism, **525** drum gear, **1000** control unit

The invention claimed is:

1. A drive transmission switching mechanism that switches and transmits a drive force from a single motor selectively to either one of a first load and a second load, the drive transmission switching mechanism comprising:

a main drive gear driven to be rotated upon reception of a drive force from an output gear of the motor;

a fixed shaft that pivotally supports the main drive gear so as to be able to rotate via a rotary sleeve;

the rotary sleeve that is supported so as to be able to rotate relative to the fixed shaft inserted into a central hole thereof and fixedly supports a shaft core of the main drive gear;

a first transmission gear that transmits a drive force toward the first load, with a shaft hole being pivotally supported so as to be able to rotate relative to the rotary sleeve on a second axial direction side of the main drive gear;

a second transmission gear that transmits the drive force to the second load, with a shaft hole being pivotally supported so as to be able to rotate relative to the rotary sleeve biased toward a second axial direction of the first transmission gear;

first dog teeth and second dog teeth each provided on opposite surfaces of the first transmission gear and the second transmission gear;

a dog clutch key that is supported axially movably by the rotary sleeve portion located between the first transmission gear and the second transmission gear and meshes with the first dog teeth when located at a position biased toward a first axial direction, and meshes with the second dog teeth when located at a position biased toward the second axial direction;

a first resilient member arranged between the rotary sleeve located closer to the first axial direction than the dog clutch key and the fixed shaft, and a second resilient member arranged between the rotary sleeve located closer to the second axial direction than the dog clutch key and the fixed shaft; and

a pressurizing member inserted into a gap between an outer periphery of the fixed shaft and a central hole of the rotary sleeve from the first axial direction to press the dog clutch key against the second transmission gear via the first resilient member, wherein

when the pressurizing member is not pressing the first resilient member, or is not pressing the first resilient member with a force equal to or larger than a predetermined value, the dog clutch key meshes with the first dog teeth of the first transmission gear by the second resilient member, to transmit the drive force from the main drive gear to the first load, and

when the pressurizing member presses the first resilient member, the dog clutch key meshes with the second dog teeth of the second transmission gear, to transmit the drive force from the main drive gear to the second load.

2. The drive transmission switching mechanism according to claim **1**, further comprising an activation mechanism that activates the pressurizing member, wherein

the activation mechanism is moved rotationally by a pivot shaft parallel to the fixed shaft, and includes a driven gear portion that receives a drive force from another drive gear member, and a cam gear including a cam portion that activates the pressurizing member by coming into contact with a cam follower provided in the pressurizing member to rotate, and

the cam portion has a shape so as to advance and retreat the pressurizing member in an axial direction via the cam follower in a process of moving rotationally in forward and reverse directions.

3. A paper sheet storage unit comprising the drive transmission switching mechanism according to claim **2**, wherein

the first and second loads are respectively a circulation drum unit that receives and accommodates a paper sheet sorted by a sorter respectively in a process of being transported, and

the cam gear is moved rotationally in forward and reverse directions via the driven gear portion, by moving the sorter rotationally in forward and reverse directions to move the drive gear member rotationally in forward and reverse directions.

4. A paper sheet processing device comprising the paper sheet storage unit according to claim **3**.

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