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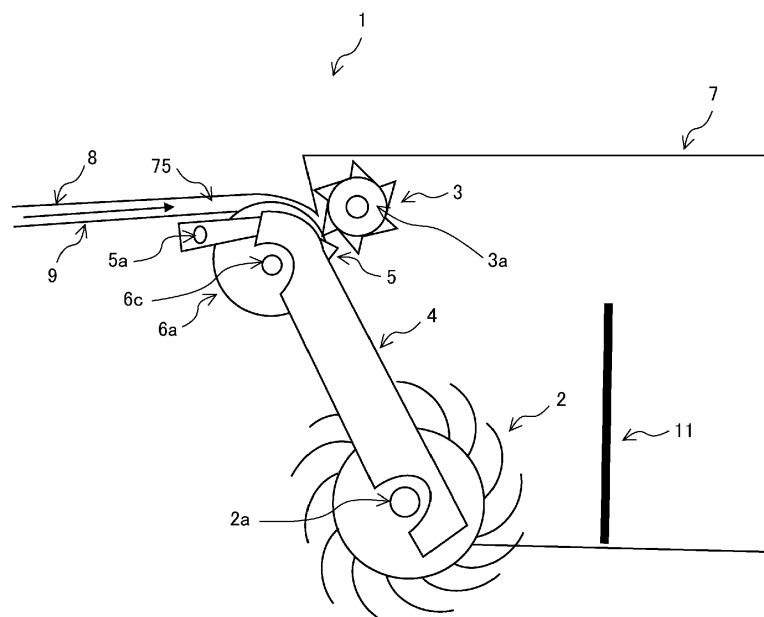
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(54) **BANKNOTE PROCESSING DEVICE AND AUTOMATIC TRANSACTION DEVICE**

(57) The banknote processing device includes: a roller (3) and a lever (5) configured to prevent collision of the banknotes conveyed from an upper side of a deposit/withdrawal port; a wheel (2) configured to convey the

banknotes to the accumulation region (7); and a pressing plate (4) configured to retain the banknotes conveyed into the accumulation region by the wheel (2), the roller (3), and the lever (5) in the accumulation region.

F I G. 3



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a banknote processing device and an automatic transaction device.

2. Description of the Related Art

[0002] For example, a banknote handling device is mounted in an automatic teller machine that is used in a financial institution. The banknote handling device includes a banknote deposit/withdrawal box, a banknote discrimination unit, a temporary storage box, a rejected banknote box, a recycle box, a banknote conveying and branching mechanism, and a banknote conveying path.

[0003] The banknote deposit/withdrawal box releases withdrawal banknotes to a user sheet by sheet or delivers deposit banknotes inserted by a user into a device sheet by sheet. The banknote discrimination unit discriminates deposit banknotes and withdrawal banknotes. The temporary storage box receives the deposit banknotes at once, and moves the deposit banknotes to the recycle box or returns the deposit banknotes to the deposit/withdrawal box after an operation by the user is terminated.

[0004] The rejected banknote box stores rejected banknotes which are determined as banknotes which do not meet a predetermined reference by the banknote discrimination unit. The recycle box stores the received deposit banknotes, and delivers the deposit banknotes as withdrawal banknotes. The banknote conveying and branching mechanism switches a plurality of connection destinations so as to connect respective box to each other. The banknote conveying path includes a conveying guide that guides banknotes. The banknote conveying and branching mechanism is provided in the middle of the banknote conveying path.

[0005] In the related art, the banknote deposit/withdrawal box includes a mechanism that sequentially delivers deposit banknotes put by a user sheet by sheet or receives withdrawal banknotes delivered sheet by sheet and retains the withdrawal banknotes in the deposit/withdrawal box. A mechanism that delivers banknotes by a combination of two or three kinds of rollers, and a mechanism that retains the banknotes conveyed into the deposit/withdrawal box in the box are mounted inside the deposit/withdrawal box.

[0006] When accumulating conveyed banknotes, not only the above-described roller combination mechanism but also an accumulation mechanism using an impeller-shaped wheel, for example, as in Japanese Unexamined Patent Application Publication No. 2011-180732 or Japanese Unexamined Patent Application Publication No. 2015-26118 is disclosed.

[0007] In the banknote accumulation mechanism by the impeller-shaped wheel in the related art, a conveying

path is provided to convey a banknote from above the wheel, the conveyed banknote is pinched in an aspect of being interested into an impeller portion, and a rear end of the pinched banknote is greatly retracted by rotating the wheel by 90° or greater to prevent an accumulation failure due to collision with a trailing banknote.

[0008] In addition, a pressing plate is frequently used in combination with an accumulation mechanism in which two or three kinds of rollers are combined. A banknote conveying path is provided so that a banknote is conveyed from a lower side inside an accumulation box, and a roller accumulation mechanism is provided there. The banknote conveyed to the accumulation box from the lower side by the roller accumulation mechanism is moved to an accumulation region by using the pressing plate, and a trajectory of the pressing plate passes directly above a roller mechanism that delivers the banknote.

[0009] However, in the wheel accumulation mechanism, a suitable space is required to rotate the wheel by 90° or greater, and thus a mounting area may increase or the banknote may be pulled out from the wheel during rotation. The pulled out banknote is apt to stay at a location different from a banknote accumulation region.

[0010] In the trajectory of the pressing plate that passes immediately above the roller mechanism in the related art, a banknote is put into a location different from an accumulation portion range depending on a position of the staying banknote, and thus there is a problem that a corresponding maintenance staff cannot easily find the banknote, and it takes time to recover the failure.

SUMMARY OF THE INVENTION

[0011] An object of the invention is to reduce a size of a mounting space, and to prevent a banknote from staying at a location other than an accumulation region.

[0012] According to an aspect of the invention, there is provided a banknote processing device that conveys banknotes conveyed from an upper side of a deposit/withdrawal port through a conveying path to an accumulation region. The banknote processing device includes: a roller and a lever configured to prevent collision of the banknotes conveyed from the upper side of the deposit/withdrawal port, a wheel configured to convey the banknotes to the accumulation region, and/or a pressing plate configured to retain the banknotes conveyed into the accumulation region by the wheel, the roller, and the lever in the accumulation region.

[0013] According to the aspect of the invention, a size of a mounting space can be reduced, and banknotes can be prevented from staying at a position other than an accumulation region.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is a perspective view illustrating an external appearance of an automatic teller machine;
 Fig. 2 is a side view of a banknote processing device;
 Fig. 3 is a side view of a schematic configuration of a mechanism of the invention;
 Fig. 4 is a perspective view of a schematic configuration of the mechanism of the invention;
 Fig. 5 is a schematic view of a banknote conveying mechanism by a wheel;
 Fig. 6A is a schematic view of a banknote collision prevention mechanism by a lever and a roller;
 Fig. 6B is a schematic view of the banknote collision prevention mechanism by the lever and the roller;
 Fig. 6C is a schematic view of the banknote collision prevention mechanism by the lever and the roller;
 Fig. 6D is a schematic view of the banknote collision prevention mechanism by the lever and the roller;
 and
 Fig. 7 is a schematic view illustrating a movable state of a pressing plate to an accumulation region.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] Hereinafter, an example will be described with reference to the accompanying drawings.

[0016] Fig. 1 is a perspective view illustrating an external appearance of an automatic teller machine.

[0017] In Fig. 1, an automatic teller machine 100 as an example of "automatic transaction device" includes a banknote processing device 101, a card/statement processing device 102, a bankbook processing device 103, a user operation unit 104, and a main body control unit 105 at the inside. The banknote processing device 101 deposits a banknote from a user and withdraws a banknote to a user. The card/statement processing device 102 processes a card inserted by a user, and prints and releases transaction statements.

[0018] The bankbook processing device 103 records transaction details on the banknote inserted by the user. The user operation unit 104 displays an operation guide for the user, and accepts an input of an instruction from the user. The main body control unit 105 monitors and controls the respective devices. Here, the banknote is an example of paper sheets. Hereinafter, description will be given of the banknote processing device 101 that handles the banknote.

[0019] Fig. 2 is a side view of the banknote processing device 101.

[0020] The banknote processing device 101 includes a deposit/withdrawal unit 70, a banknote discrimination unit 71, a temporary retention unit 72, a reject unit 73, a recycle unit 74, a banknote conveying path 75, and a control unit 76. The elements 70 to 76 may be referred as units.

[0021] The deposit/withdrawal unit 70 is a unit that delivers banknotes put by a user to the banknote conveying path 75 sheet by sheet, and accumulates conveyed bank-

notes through the banknote conveying path 75 and emits the banknotes to be taken out by a user. Examples of a mechanism that delivers and accumulates banknotes include a device that is constituted by two or three kinds of rollers. The roller-based accumulation mechanism is provided on a lower side of the deposit/withdrawal unit 70, and the conveying path 75 connected to the deposit/withdrawal unit 70 is also provided on the lower side of the deposit/withdrawal unit 70 in accordance with the accumulation mechanism.

[0022] Banknotes conveyed from the banknote conveying path 75 are conveyed from the lower side of the deposit/withdrawal unit 70 to an accumulation region of the deposit/withdrawal unit 70 by the roller mechanism. Alternatively, banknotes deposited from a user are delivered to the conveying path 75 sheet by sheet by the roller accumulation mechanism. As another mechanism that performs only accumulation of conveyed banknotes, a wheel-based accumulation mechanism (refer to Fig. 3) to be described later is also present. In the wheel-based accumulation mechanism, the conveying path 75 is provided on an upper side of the deposit/withdrawal unit 70, and banknotes conveyed from the conveying path 75 are conveyed from the upper side of the deposit/withdrawal unit 70 by the wheel accumulation mechanism.

[0023] The banknote discrimination unit 71 measures optical and magnetic characteristics of banknotes and discriminates a denomination and authenticity of the banknotes. On the basis of information obtained by the discrimination unit 71, banknotes are distributed to the recycle unit 74, the reject unit 73, and the like.

[0024] The temporary retention unit 72 temporarily stores banknotes until a transaction is completed, and stores the banknotes in the recycle unit 74 in a case where a user approves the transaction. In a case where the user does not approve the transaction, the temporary retention unit 72 conveys the banknotes to the deposit/withdrawal unit 70, and returns the banknotes to the user.

[0025] The reject unit 73 is a safe that stores banknotes for which a deposit transaction is completed, and stores banknotes for only deposit and banknotes which are not appropriate for handing by the banknote processing device 101. The banknotes which are not appropriate for handling by the banknote processing device 101 are banknotes having cuts and folds and banknotes conveyed in a meandering manner.

[0026] The recycle unit 74 includes an accumulation and separation device for deposit and withdrawal. The accumulation and separation device stores banknotes put from a user, and delivers stored banknotes to the banknote conveying path 75 in correspondence with a transaction and withdraws the banknotes to a user. Note that, the banknote processing device 101 in Fig. 2 is an example in which one piece of the reject unit 73 and three pieces of the recycle units 74 are mounted. However, a combination of the reject unit 73 and the recycle unit 74 is free, and the number of mounting can be freely set.

[0027] The conveying path 75 conveys banknotes to each unit. The conveying path 75 includes a conveying roller and a direction switching gate, and can switch a banknote conveying direction for every transaction operation.

[0028] The control unit 76 performs monitoring control for each unit. The control unit 76 is electrically connected to the main body control unit 105 of the automatic teller machine 100. The control unit 76 controls the banknote processing device 101 in accordance with a command transmitted from the main body control unit 105, and reports a state of the banknote processing device 101 to the main body control unit 105.

[0029] Fig. 3 and Fig. 4 are a side view and a perspective view of a schematic configuration of a wheel accumulation mechanism 1 of a banknote processing device that is mounted in the deposit/withdrawal unit 70.

[0030] The wheel accumulation mechanism 1 includes an upper conveying guide 8 that is provided on an upper side of an accumulation mechanism, a lower conveying guide 9, an impeller-shaped wheel 2 that pinches a banknote conveyed from the conveying path 75 constituted by conveying rollers (not illustrated) in an arrow direction, a shuriken-shaped roller 3 and a lever 5 which are mechanisms configured to prevent collision of banknotes which are being conveyed, and a pressing plate 4 that also has a function of a conveying guide.

[0031] An accumulation region 7, and a partition plate 11 that operates in accordance with the number of sheets of banknotes conveyed by the wheel 2 exist in front of the wheel accumulation mechanism 1. Two pieces of the wheels 2 are assembled to the same rotary shaft 2a.

[0032] The shuriken-shaped roller 3 is assembled to the same roller boss as in a conveying path roller 6b. The roller boss is fitted into a rotary shaft 3a that is fixed to sheet metal part (not illustrated), and has a structure capable of rotating in an arbitrary direction. The conveying roller 6b is in contact with a conveying roller 6a located on a lower side. Accordingly, the conveying roller 6b and the shuriken-shaped roller 3 are structured to rotate in accordance with rotation of the conveying roller 6a.

[0033] The lever 5 is assembled to an independent rotary shaft 5a, and is maintained in a state of popping out from a surface of the pressing plate 4 by a spring (not illustrated) when a banknote is not conveyed. The lever 5 is structured to operate to descend in accordance with passage of a banknote when a banknote is being conveyed. The pressing plate 4 is positioned to cover the rotary shaft 2a to which the wheel 2 is assembled and a rotary shaft 6c to which the conveying roller 6a is assembled, and also functions as a banknote conveying path between the conveying roller 6a and the wheel 2. The pressing plate 4 is fixed to a shaft (not illustrated), and is structured to move back and forth in accordance with an operation of the shaft.

[0034] The accumulation region 7 represents a region where a banknote conveyed by the wheel accumulation mechanism 1 is retained, and an upper side is connected

to an open/close port of the deposit/withdrawal unit 70. The partition plate 11 operates in correspondence with transaction details. For example, the partition plate 11 moves to the wheel accumulation side at the time of deposit to secure a deposit port, and moves in an opposite direction at the time of withdrawal to secure a space where withdrawal banknote stays.

[0035] Fig. 5 is a schematic view of the banknote conveying mechanism by the wheel 2.

[0036] A forward side of the upper conveying guide 8 has an arc shape to follow an outer periphery of the conveying roller 6a. According to this, each of banknotes 12 conveyed from the conveying path 75 is pinched by the conveying roller 6a and the conveying roller 6b (not illustrated), and an advancing course is changed to a direction in which a wheel 2 is provided to follow the arc shape of the upper conveying guide 8, and is conveyed to the wheel 2 to follow the surface of the pressing plate 4 that is diagonally assembled.

[0037] The wheel 2 also rotates when the banknote 12 is being conveyed in a similar manner as in the conveying roller 6a, and control of the wheel 2 is performed through the control unit 76 of the device. The banknote 12 conveyed from the conveying roller 6a is pinched in a gap of blade-shaped portions of the wheel 2 sheet by sheet, is separated from the wheel 2 when a longitudinal portion of the banknote 12 comes into contact with a bottom plate 10, and is retained in the accumulation region 7 by the partition plate 11 provided in the accumulation region 7.

[0038] At this time, the partition plate 11 is controlled to move in an arrow direction in the drawing in accordance with the number of sheets of the conveyed banknotes 12, and according to this, it is possible to prevent the conveyed banknotes 12 collide with each other in a space between the wheel 2 and the partition plate 11.

[0039] Each of the banknotes 12 is pinched by blade-shaped portions of the wheel 2 while the wheel 2 is conveying the banknote 12 from the conveying rollers 6a and 6b to the accumulation region 7, and is in a state in which the banknote 12 is easily pulled out from the wheel 2.

[0040] Accordingly, the longer conveyance time by the wheel 2 (the greater a wheel rotation angle), the higher a risk that the banknote 12 is pulled out in the middle. In the related art, since an insertion angle of the banknote 12 to the wheel 2 is 90°, a reduction of the risk was a problem.

[0041] Therefore, in an example of the invention, the wheel 2, the conveying roller 6a, and the pressing plate 4 are provided so that an insertion angle α of the banknote 12 conveyed to the wheel 2 becomes a shallow angle of less than 90°. As a result, the conveyance time by the wheel 2 can be shortened, and an accumulation trouble due to pulling-out of the banknote 12 during conveyance can be reduced.

[0042] Here, the insertion angle α of the banknote 12 conveyed by the wheel 2 is preferably 10° to 60°, and is 30° as an example.

[0043] Fig. 6A to Fig. 6D are schematic views of a ban-

knot collision prevention mechanism by the lever 5 and the shuriken-shaped roller 3. Banknote collision to be solved by this mechanism is collision between a rear end of a banknote positioned on a forward side and a tip end of a banknote subsequent to the banknote. When the banknote collision occurs, a banknote stays around a collision site and becomes a failure. Hereinafter, description will be given of the banknote collision prevention mechanism.

[0044] As illustrated in Fig. 6A, the lever 5 is assembled to the independent rotary shaft 5a (refer to Fig. 3) and a spring (not illustrated), and is positioned to pop out from the surface of the pressing plate 4 before a banknote is conveyed.

[0045] Next, as illustrated in Fig. 6B, when the banknote 12 conveyed from the conveying path 75 passes through the lever 5, the lever 5 rotates around the rotary shaft 5a in a counterclockwise direction due to a force applied from the banknote 12, and enters a state in which of following a surface of the banknote 12.

[0046] Next, as illustrated in Fig. 6C, the shuriken-shaped roller 3 is assembled to the conveying roller 6b (not illustrated) that is in contact with the conveying roller 6a on the same rotary axis, and when a rear end of the banknote 12 passes over the lever 5, the lever 5 is apt to return to the state in Fig. 6A due to a restoring force of the spring assembled to the lever 5. At this time, the rear end of the banknote 12 is lifted up in accordance with movement of the lever 5.

[0047] Specifically, as illustrated in Fig. 6D, it enters a state in which the rear end of the banknote 12 is lifted up with respect to the tip end thereof. The rear end of the banknote 12 lifted up due to the restoring force of the lever 5 is further lifted up by a tip end of the shuriken-shaped roller 3 and is conveyed to the wheel 2.

[0048] With respect to the trailing banknote, lifting-up of a rear end is performed by the lever 5 and the shuriken-shaped roller 3. Due to the series of operations, collision with the tip end of the trailing banknote is prevented, and the banknote staying failure can be reduced.

[0049] Fig. 7 is a schematic view illustrating a movable state of the pressing plate.

[0050] The pressing plate 4 is provided to cover a rotary shaft of the wheel 2 and a rotary shaft of the conveying roller 6a during conveyance of a banknote. After conveyance of the banknote is terminated, as illustrated in Fig. 7, the pressing plate 4 moves across the wheel 2 up to a position of the partition plate 11. Specifically, the pressing plate 4 moves from a position 4a to a position 4b in a direction indicated by an arrow. The banknote retained in the accumulation region 7 is conveyed to the partition plate 11 while the pressing plate 4 is moving from the original position to the position of the partition plate 11.

[0051] In an accumulation mechanism in the related art, a roller that corresponds to the wheel 2 and conveys a banknote to the accumulation region is attached to a lower side of the deposit/withdrawal unit. Therefore, the

pressing plate cannot pass immediately above the roller due to a structure, a banknote that is not accurately conveyed to the accumulation region (for example, an inclined banknote, a damaged banknote due to a deterioration with the passage of time, or a banknote with low rigidity) may deviate from conveyance by the pressing plate, and may be pushed out of the accumulation region. Accordingly, there was a trouble.

[0052] However, as in the invention, when the pressing plate 4 move across the wheel 2 that accumulates a banknote conveyed from an upper side, a banknote that is pulled out from the wheel 2 or a banknote that is not accurately conveyed and stays between the wheel 2 and the partition plate 11 can also be conveyed. As a result, the banknote that is not accurately conveyed is not pushed out of the accumulation region, and thus this leads to securement of quality.

[0053] In the above-described example, the accumulation device that accumulates the conveyed banknotes includes the impeller-shaped wheel 2 that conveys banknotes conveyed from an upper side of the device to an accumulation region, the lever 5 that is assembled by a movable shaft independent from the shuriken-shaped roller 3 for avoiding collision between the conveyed banknotes and includes a mechanism that flips up an end of a banknote by a restoring force due to a spring, and the pressing plate 4 that moves across a wheel or a discharge port so as to retain the banknotes conveyed into the accumulation space in the space.

[0054] According to the example, when a positional relationship between the wheel 2 and the conveying path is set so that an angle of a banknote that enters the wheel becomes shallower than 90° , a necessary wheel rotation angle and a conveying space to be secured during rotation can be reduced, and thus this reads to a reduction in size of the device.

[0055] According to the example, since a rear end of the banknote is flipped up by the shuriken-shaped roller 3 and the lever 5, collision between banknotes can be reduced during conveyance of the banknotes in the wheel 2.

[0056] According to the example, since the pressing plate 4 moves across the wheel 2 or the discharge port, a staying banknote can also be retained in the accumulation region, and occurrence of a trouble due to a lose sight of an abnormally staying banknote can be reduced.

[0057] As described above, according to the example, a reduction in size is realized due to the wheel accumulation. In addition, since the pressing plate moves across the wheel, even when banknote popping that cannot be avoided in the wheel accumulation occurs, the banknote is retained in the accumulation region, and securement of a quality or a reduction in recovery time can be accomplished.

[0058] Note that, the invention is not limited to the example, and includes various modification examples.

[0059] For example, the positional relationship between the conveying path 75 and the wheel 2 may be

changed so that the angle is further shallowed in the space of a mounting site. According to this, the rotation angle of the wheel 2 is reduced, and separation of a banknote can be further reduced during conveyance.

[0060] For example, the number of protrusions in an outer peripheral shape of the shuriken-shaped roller 3 may be increased or decreased in accordance with the space of the mounting site. In addition, a shape may be changed so that a conveying guide has the role of the lever 5. According to this, simplification of a configuration or an improvement of a function can be expected.

[0061] In the above-described example, description has been given with reference to the shuriken-shaped roller 3, but the invention is not limited thereto, and other shapes or members may be employed as long as collision between banknotes can be avoided.

[0062] In addition, in the above-described example, description has been given with reference to the impeller-shaped wheel 2, but the invention is not limited thereto, and other shapes or members may be employed as long as a conveyed banknote can be conveyed to the accumulation region.

Claims

1. A banknote processing device that conveys banknotes conveyed from an upper side of a deposit/withdrawal port through a conveying path to an accumulation region, comprising:

a roller and a lever configured to prevent collision of the banknotes conveyed from the upper side of the deposit/withdrawal port;
a wheel configured to convey the banknotes to the accumulation region; and
a pressing plate configured to retain the banknotes conveyed into the accumulation region by the wheel, the roller, and the lever in the accumulation region.

2. The banknote processing device according to claim 1,
wherein the wheel has an impeller shape capable of holding the banknotes.

3. The banknote processing device according to claim 1,
wherein the roller has a shuriken shape capable of lifting up a rear end of each of the banknotes, and includes an independent rotary shaft configured to follow movement of the banknote that is conveyed.

4. The banknote processing device according to claim 3,

wherein the lever includes a mechanism that includes an independent shaft and flips up the rear

end of the banknote by a restoring force due to a spring that is assembled, and
the lever and the roller operate in cooperation to prevent collision between the banknotes.

5. The banknote processing device according to claim 4,
wherein collision between the banknotes is prevented during conveyance of the banknotes in the wheel by flipping up the rear end of the banknotes through the roller and the lever.

6. The banknote processing device according to claim 4,
wherein the lever and the roller operate in cooperation to prevent collision between a rear end of a preceding banknote positioned on a forward side, and a tip end of a trailing banknote that is subsequent to the preceding banknote as collision between the banknotes.

7. The banknote processing device according to claim 6,

wherein when the rear end of the preceding banknote passes over the lever, the rear end of the preceding banknote is lifted up in accordance with movement of the lever due to a restoring force of the spring, and
the rear end of the preceding banknote is further lifted up by a tip end of the roller that is rotating to prevent collision between the rear end of the preceding banknote and the tip end of the trailing banknote.

8. The banknote processing device according to claim 1,

wherein the pressing plate includes a movable mechanism that moves across a discharge port of the conveying path and the wheel, and the movable mechanism retains the banknote that is staying in the accumulation region.

9. The banknote processing device according to claim 8, further comprising:

a partition plate that operates in accordance with the number of sheets of the banknotes conveyed by the wheel,
wherein the pressing plate,
moves to a position of the partition plate across the wheel after conveyance of the banknote is terminated, and
conveys the banknote retained in the accumulation region to the partition plate during movement up to a position of the partition plate.

10. The banknote processing device according to claim 1,
wherein the wheel and the conveying path are set to a positional relationship in which an insertion angle of the banknote that enters the wheel becomes shallower than 90° . 5
11. The banknote processing device according to claim 10,
wherein the insertion angle of the banknote is 10° to 60° . 10
12. An automatic transaction device, comprising:
the banknote processing device according to claim 1. 15
13. The automatic transaction device according to claim 12,
wherein the banknote is deposited to the banknote processing device from a user or the banknote processing device withdraws the banknote to the user. 20

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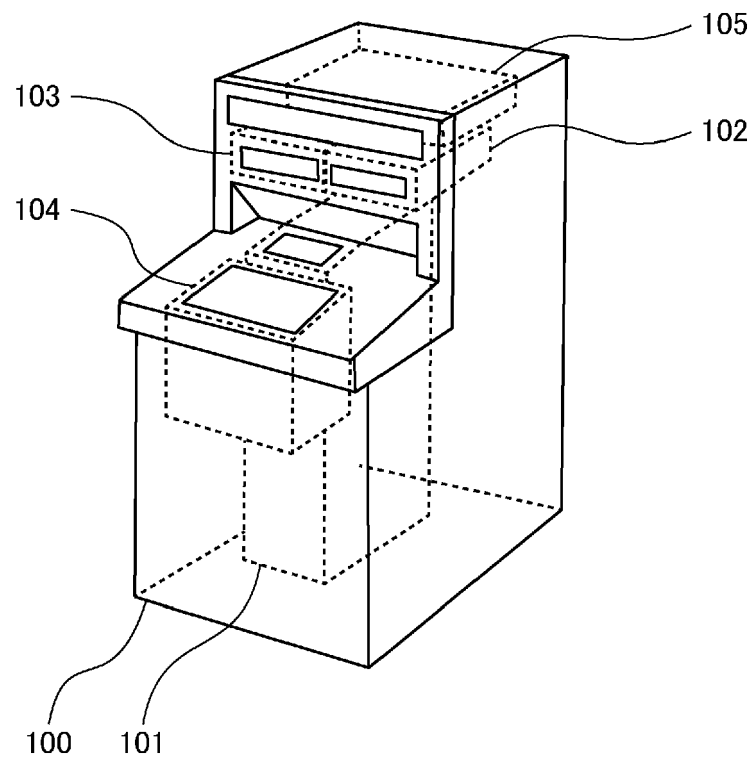
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FIG. 1



F I G. 2

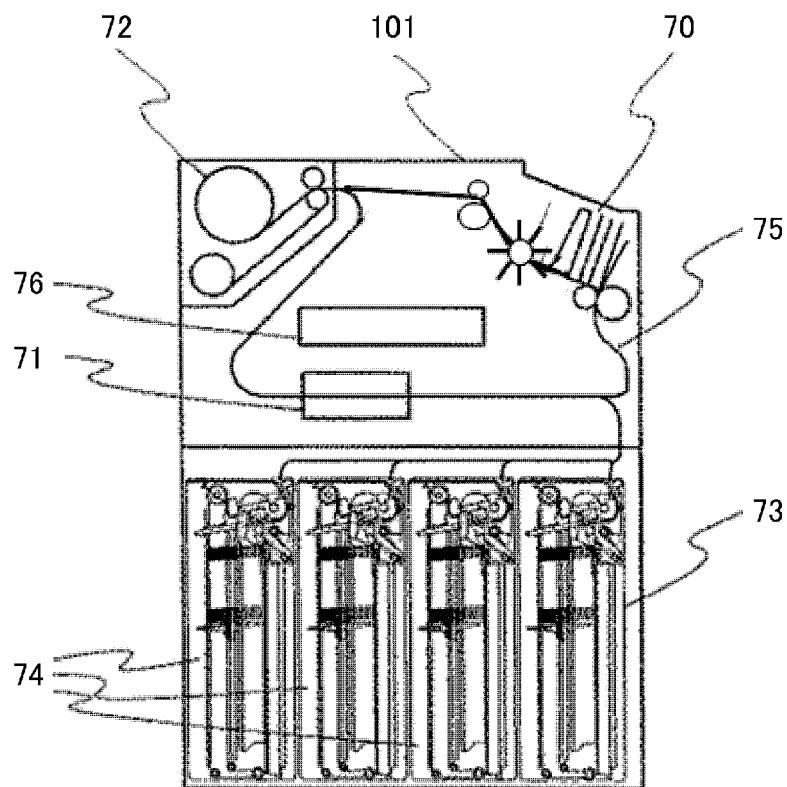
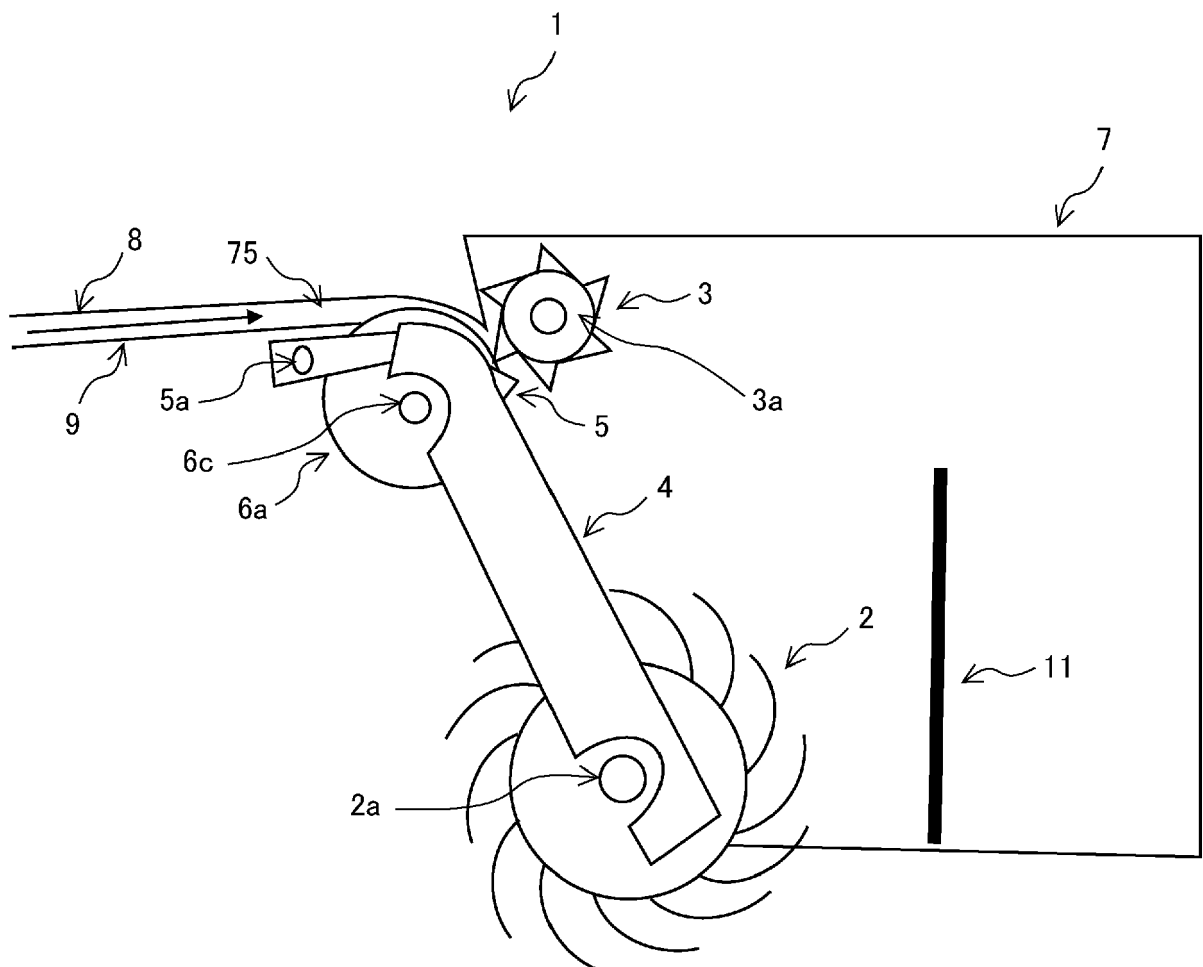


FIG. 3



F I G. 4

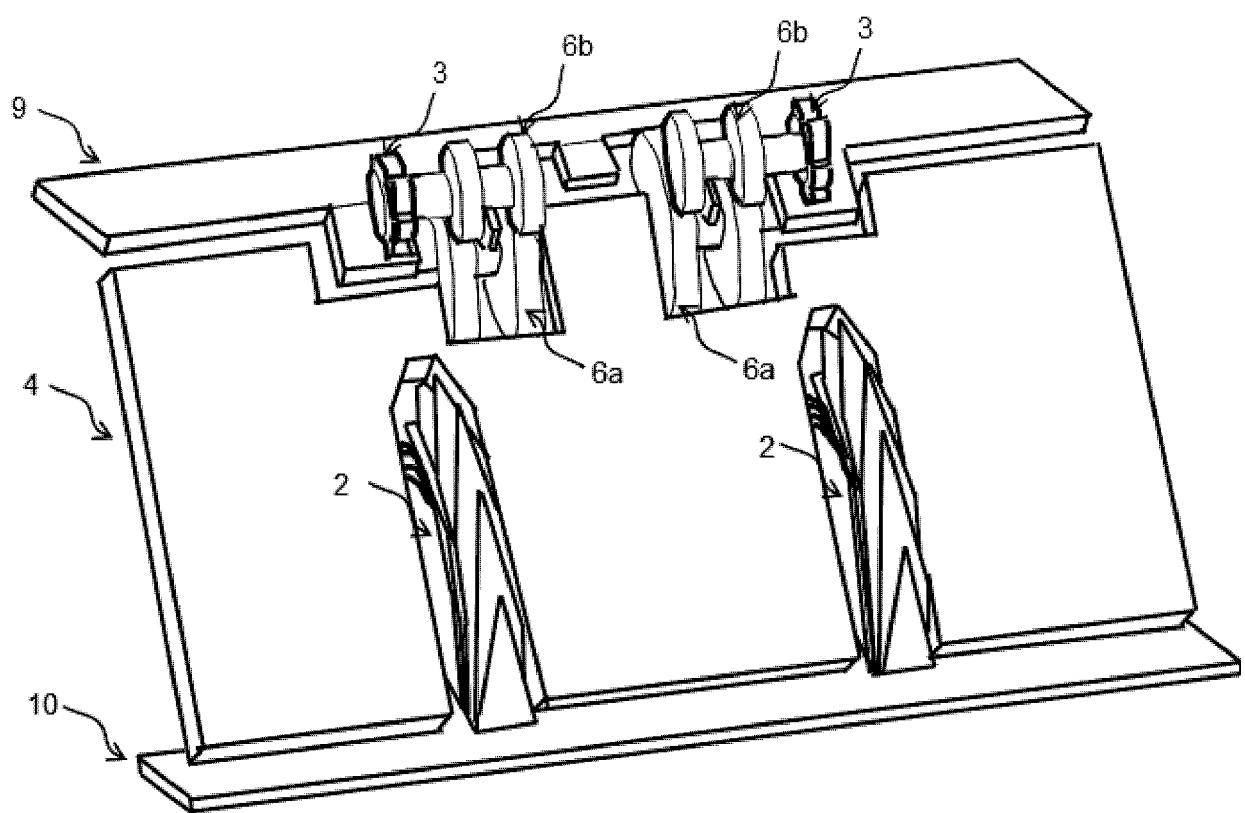


FIG. 5

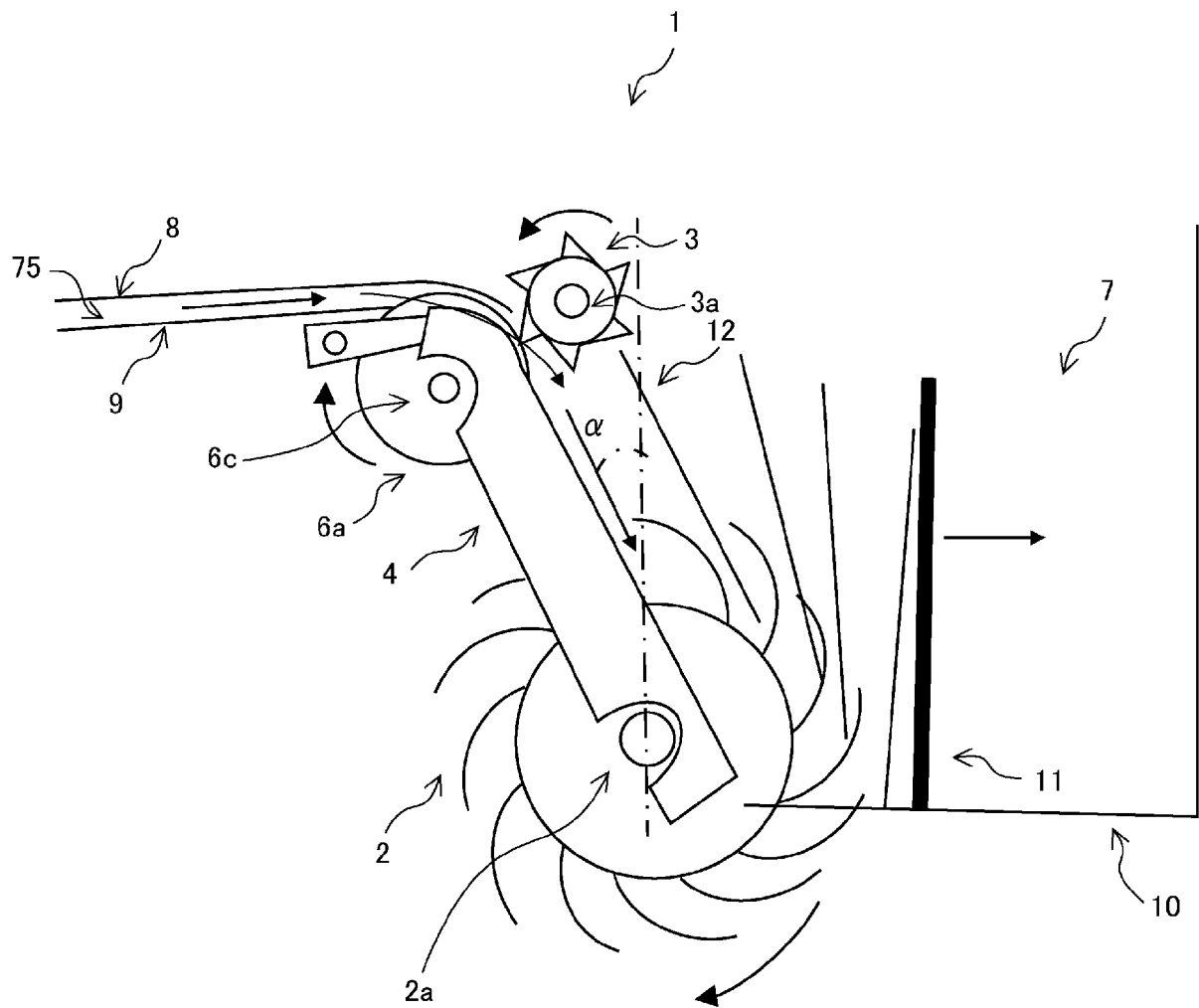


FIG. 6 A

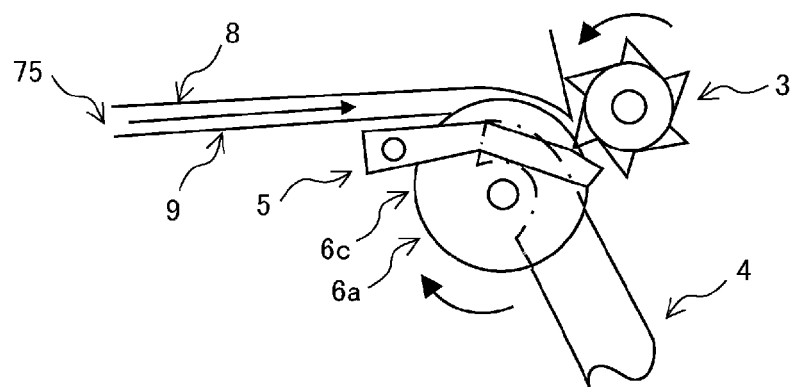


FIG. 6B

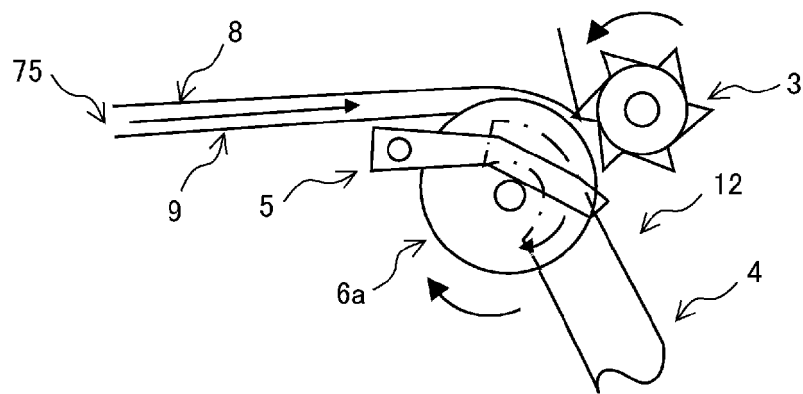


FIG. 6C

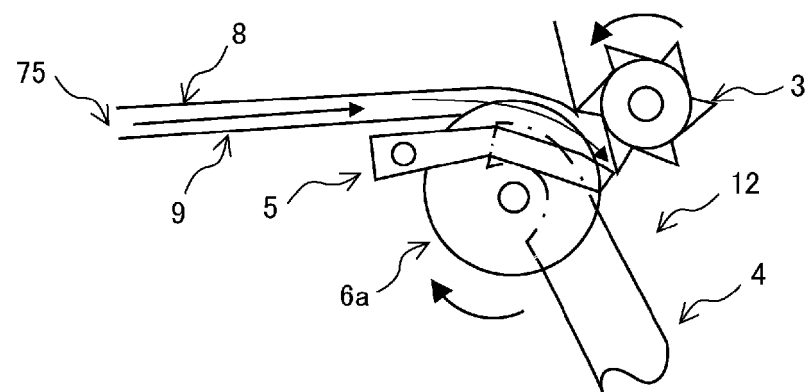


FIG. 6D

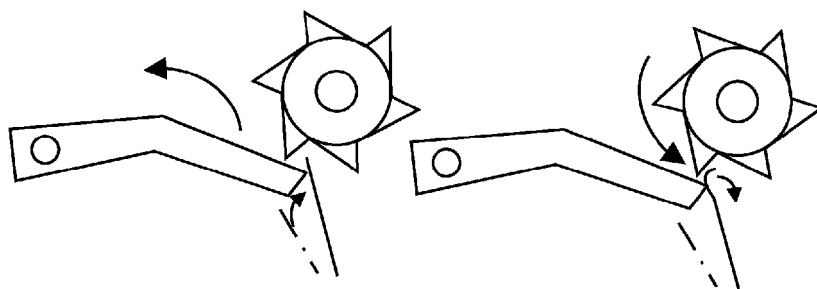
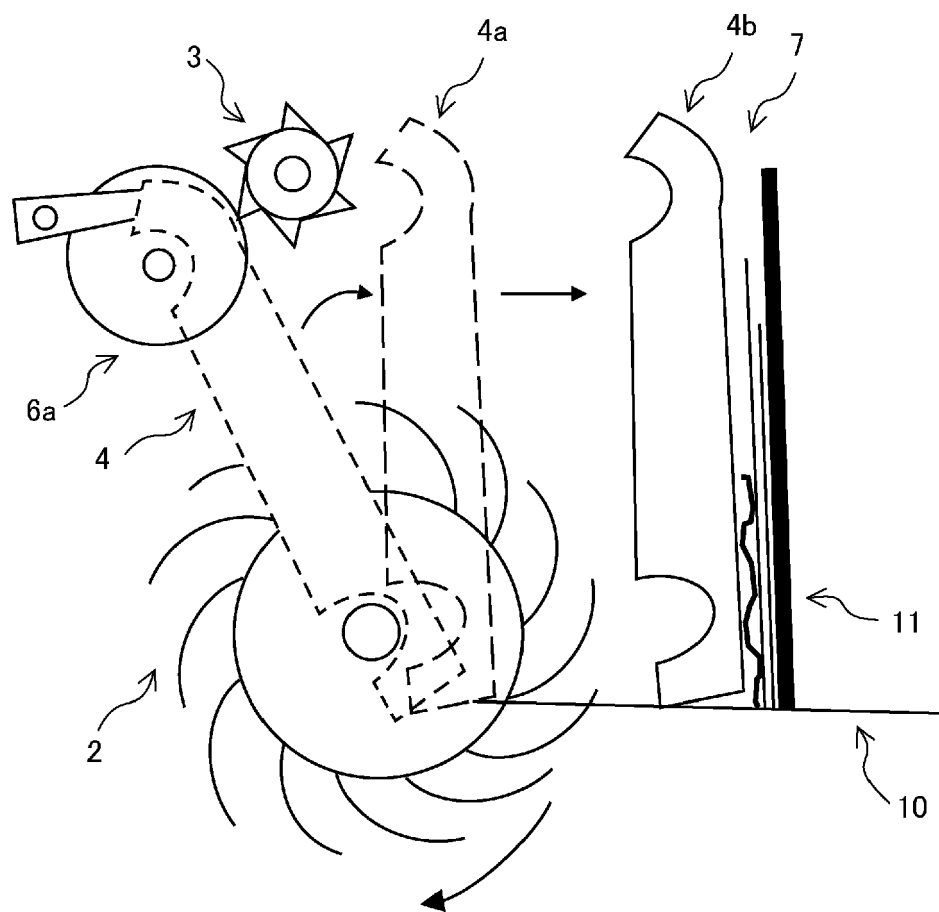


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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