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(54) Paper sheet processing apparatus

(57) A paper sheet processing apparatus comprises a taking-in unit 10 configured to take therein paper sheets one by one, a transport unit 70 configured to transport the paper sheets taken in by the taking-in unit and a storing unit 60a to 60d configured to store a plurality of paper sheets transported by the transport unit 70. The paper sheet processing apparatus further comprises a control unit 50 configured to control the transport unit 70 so as to transport into the storing unit 60a to 60d the paper sheets of a first category determined based on the face/back or the orientation of each of the paper sheet, and to transport into the storing unit the paper sheets of a second category determined based on the face/back or the orientation of each of the paper sheets when the number of the paper sheet or sheets of the first category stored in the storing unit reaches a predetermined number.

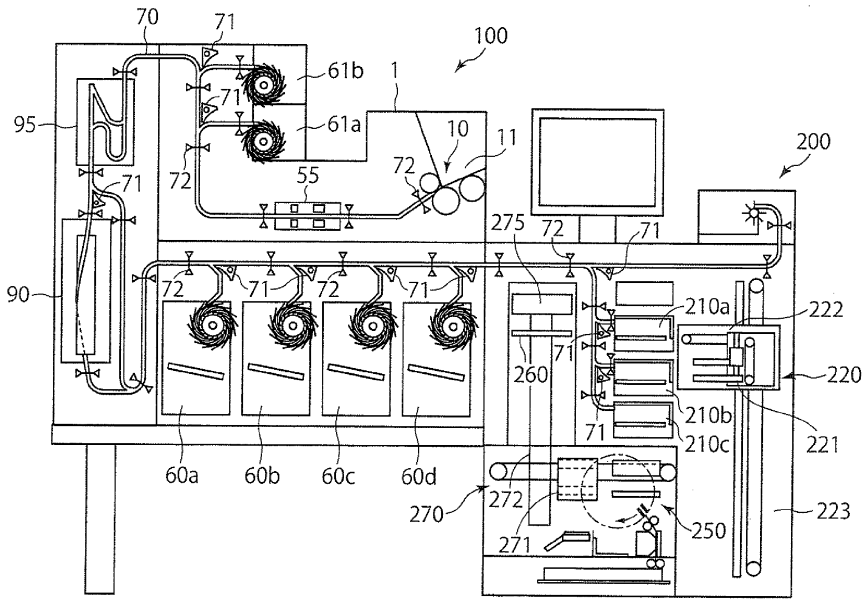

FIG. 2

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Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of priority from the prior Japanese Patent Application No. 2012-123600 filed on May 30, 2012, the entire contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to a paper sheet processing apparatus which stores a plurality of paper sheets in a storing unit.

BACKGROUND ART

[0003] Hitherto, there is known a banknote processing apparatus that includes a banknote reversing unit with a short edge reversing unit capable of turning over a transported banknote in a short edge direction and a long edge reversing unit capable of turning over a transported banknote in a long edge direction (see WO 2010/097954). According to the banknote processing apparatus, a plurality of banknotes may be stacked on a stacking unit while the face/back sides and the orientations thereof are uniformly arranged.

[0004] However, even in a case where the banknote processing apparatus disclosed in WO 2010/097954 is used, all face/back sides and all orientations of the plurality of banknotes placed on a placing unit may be uniformly arranged. Accordingly, for example, when there is a need to uniformly arrange the face/back sides and the orientations of the banknotes by the unit of one hundred sheets, there is a need to employ a configuration in which the transportation of the banknote is stopped at the time point when one hundred banknotes are stacked on the stacking unit so as to change the face/back sides and the orientations of the stacked banknotes and the transportation thereof is started again so as to stack the banknotes on the stacking unit. Alternatively, there is a need to employ a configuration in which the plurality of stacking units are respectively set to stack the banknotes having different face/back sides or different orientations, the transportation of the banknote is stopped at the time point when one hundred banknotes are stacked on the stacking unit, and an operator takes the banknotes by one hundred sheets out of the stacking unit using his or her hand.

[0005] Incidentally, in a case where a paper sheet having a security thread or raised printing is stored in a storing unit, when the paper sheets are stored while the face/back sides and the orientations thereof are uniformly arranged, the security threads or the raised printings of the respective paper sheets overlap in the storing unit. As a result, the thicknesses of the paper sheets stored in the storing unit are partially increased, so that various problems arise. For example, in a case where the storing unit is configured as a stacking unit that stacks the paper sheets thereon, the paper sheets are stacked on the stacking unit while the thicknesses thereof are partially increased. When such paper sheets are directly loaded inside a paper sheet delivering device such as ATM, there is a case in which the paper sheets may not be smoothly fed from the paper sheet delivering device such as ATM. Further, in a case where the storing unit is configured as a tape reel type storing unit, a tape portion of the tape reel type storing unit that holds the paper sheet is partially thickened in the width direction.

SUMMARY OF THE INVENTION

[0006] In order to solve the above-described problem, an object of the invention is to provide a paper sheet processing apparatus capable of automatically changing face/back sides or orientations of paper sheets (or a face/back or an orientation of a paper sheet) stored in a storing unit by a predetermined number.

[0007] A paper sheet processing apparatus according to the present invention comprises:

a taking-in unit configured to take therein paper sheets one by one;
a transport unit configured to transport the paper sheets taken in by the taking-in unit;
a storing unit configured to store a plurality of paper sheets transported by the transport unit; and
a control unit configured to control the transport unit so as to transport into the storing unit the paper sheets of a first category determined based on the face/back or the orientation of each of the paper sheet, and to transport into the storing unit the paper sheets of a second category determined based on the face/back or the orientation of each of the paper sheets when the number of the paper sheet or sheets of the first category stored in the storing unit reaches a predetermined number.

[0008] The paper sheet processing apparatus according to the present invention may further comprise a recognition sensor configured to acquire information on the face/back or the orientation of each of the paper sheets transported by the transport unit,
wherein the control unit may be configured to control the transport unit based on the information acquired by the recognition sensor so as to transport into the storing unit the paper sheets of the first category and the paper sheets of the second category.

[0009] In the paper sheet processing apparatus according to the present invention,
the control unit may be configured to control the transport unit so as to transport into the storing unit the paper sheets of the first category determined based on the face/back of the paper sheet, and to transport into the storing unit the paper sheets of the second category determined based on the face/back of the paper sheet when the

number of the paper sheet or sheets of the first category stored in the storing unit reaches the predetermined number.

[0010] In the paper sheet processing apparatus according to the present invention,
the control unit may be configured to control the transport unit so as to transport into the storing unit the paper sheets of the first category determined based on the orientation of the paper sheet, and to transport into the storing unit the paper sheets of the second category determined based on the orientation of the paper sheet when the number of the paper sheet or sheets of the first category stored in the storing unit reaches the predetermined number.

[0011] In the paper sheet processing apparatus according to the present invention,
the control unit may be configured to control the transport unit so as to transport into the storing unit the paper sheets of the first category determined based on the face/back and the orientation of the paper sheet, and to transport into the storing unit the paper sheets of the second category determined based on the face/back and the orientation of the paper sheet when the number of the paper sheet or sheets of the first category stored in the storing unit reaches the predetermined number.

[0012] In the paper sheet processing apparatus according to the present invention,
the paper sheet processing apparatus may be configured to process a paper sheet having a security thread, and
the paper sheets of the first category and the paper sheets of the second category may be stored in the storing unit so that the positions of the security threads of the paper sheets of each of the first and second categories do not overlap each other.

[0013] In the paper sheet processing apparatus according to the present invention,
the paper sheet processing apparatus may be configured to process a paper sheet having a raised printing, and
the paper sheets of the first category and the paper sheets of the second category may be stored in the storing unit so that the positions of the raised printings of the paper sheets of each of the first and second categories do not overlap each other.

[0014] In the paper sheet processing apparatus according to the present invention,
the storing unit may be a tape-reel-type storing unit configured to store the respective paper sheets so as to be held between tapes.

[0015] In the paper sheet processing apparatus according to the present invention,
the storing unit may be a stacking unit configured to stack the respective paper sheets.

[0016] In the paper sheet processing apparatus according to the present invention,
the stacking unit may be a to-be-bundled paper sheets stacking unit configured to stack paper sheets to be bundled.

[0017] A paper sheet processing apparatus according to another aspect of the present invention comprises:

a bundling unit configured to make a paper sheet bundle by bundling paper sheets uniformly arranged by at least face/back or orientation;
a post-bundling transport unit configured to transport the paper sheet bundles made by the bundling unit;
a paper sheet bundle stacking unit configured to store the paper sheet bundles transported by the post-bundling transport unit; and
a control unit configured to control the post-bundling transport unit so as to transport into the paper sheet bundle stacking unit the paper sheet bundles of a first category determined based on the face/back or the orientation of the paper sheets, and to transport into the paper sheet bundle stacking unit the paper sheet bundles of a second category determined based on the face/back or the orientation of the paper sheets when the number of the paper sheet bundle or bundles of the first category stored in the paper sheet bundle stacking unit reaches a predetermined number.

[0018] According to the invention, the control unit controls the transport unit so that the paper sheets are stored in the storing unit in a posture included in the first category determined by the condition of the face/back or the orientation of the paper sheet, and that the paper sheets are stored in the storing unit in a posture included in the second category determined by the condition of the face/back or the orientation of the paper sheet when the number of the paper sheet or sheets stored in the storing unit in the posture included in the first category becomes a predetermined number. For this reason, it is possible to automatically change the face/back sides or the orientations of the paper sheets (or the face/back or the orientation of the paper sheet) to be stored in the storing unit by a predetermined number.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 is a perspective view of a paper sheet processing apparatus according to an embodiment of the invention;
FIG. 2 is a schematic configuration diagram illustrating a configuration of the paper sheet processing apparatus according to the embodiment of the invention;
FIG. 3 is a functional block diagram of the paper sheet processing apparatus according to the embodiment of the invention;
FIG. 4 is cross-sectional views illustrating a structure provided with an extruding unit in the paper sheet processing apparatus according to the embodiment of the invention;
FIG. 5 is diagrams illustrating a category when

processing a paper sheet having a linear security thread in a short edge direction;

FIG. 6 is diagrams illustrating a category when processing a paper sheet having a linear security thread in a long edge direction;

FIG. 7 is side views illustrating a state where paper sheets having security threads are stacked by the paper sheet processing apparatus according to the embodiment of the invention;

FIG. 8 is a side view illustrating a state where paper sheets having security threads are stacked by a paper sheet processing apparatus of the related art;

FIG. 9 is a plan view illustrating the inside of a tape reel type storing unit which may be used as the paper sheet processing apparatus according to the embodiment of the invention;

FIG. 10 is a side view illustrating the inside of the tape reel type storing unit which may be used as the paper sheet processing apparatus according to the embodiment of the invention; and

FIG. 11 is a main perspective view of the tape reel type storing unit which may be used as the paper sheet processing apparatus according to the embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments

<<Configuration>>

[0020] Hereinafter, embodiments of a paper sheet processing apparatus according to the invention will be described with reference to the drawings. Here, FIGs. 1 to 11 are diagrams for describing the embodiments of the invention. Incidentally, the "paper sheet" in the present application indicates a banknote, a check, a coupon, and the like, but typically indicates the banknote.

[0021] As illustrated in FIG. 2, a paper sheet processing apparatus 100 of the embodiment includes a casing 1, a placing unit 11 which is provided in the casing 1 so as to place a plurality of paper sheets thereon, a taking-in unit 10 which takes therein the paper sheets placed on the placing unit 11 one by one, a transport unit 70 which transports the respective paper sheets received by the taking-in unit 10 into the casing 1, a plurality of stacking units 60a to 60d which stack the paper sheets transported by the transport unit 70, and rejecting units 61a and 61b which reject the paper sheets that are not stacked on the stacking units 60a to 60d. Furthermore, in the embodiment, a structure will be described in which the storing unit is configured as the stacking units 60a to 60d that store the respective paper sheets in a stacked state.

[0022] Further, as illustrated in FIG. 2, the transport unit 70 is provided with a plurality of dividing members 71 that appropriately divide the paper sheets transported by the transport unit 70. Further, the transport unit 70 is provided with a plurality of tracking sensors 72 which detect the paper sheets passing through the transport unit 70.

[0023] The paper sheet processing apparatus 100 of the embodiment also includes paper sheet reversing units 90 and 95 that reverse the paper sheet. In the paper sheet reversing units 90 and 95, the short edge reversing unit 95 reverses the face and back sides of the transported paper sheet so that the short edge direction thereof is reversed when the paper sheet is transported in the short edge direction by the transport unit 70, and the long edge reversing unit 90 reverses the face and back sides of the paper sheet transported by the transport unit 70 so that the long edge direction thereof is reversed. Furthermore, since the specific method of reversing the paper sheet by the short edge reversing unit 95 and the long edge reversing unit 90 is disclosed in WO 2010/097954, the specific description thereof will not be repeated here.

[0024] Further, the paper sheet processing apparatus 100 of the embodiment also includes a paper sheet bundling device 200. The paper sheet bundling device 200 includes to-be-bundled paper sheets stacking units 210a to 210c which stacks paper sheets to be bundled transported by the transport unit 70, a bundling unit 250 which bundles the paper sheets to be bundled so as to make a paper sheet bundle, a pre-bundling transport unit 220 which transports the paper sheets to be bundled from the to-be-bundled paper sheets stacking units 210a to 210c to the bundling unit 250, a paper sheet bundle stacking unit 260 which stores the paper sheet bundle, and a post-bundling transport unit 270 which transports the paper sheet bundle from the bundling unit 250 to the paper sheet bundle stacking unit 260. Furthermore, the paper sheet bundle which is stored in the paper sheet bundle stacking unit 260 may be dispensed to a bundle discharging port 280 to be described later by the paper sheet bundle stacking unit 260.

[0025] As illustrated in FIG. 1, the paper sheet bundling device 200 includes the bundle discharging port 280 which dispenses the paper sheet bundle toward an operator and a fraction returning port 285 which dispenses the fractional paper sheets stacked on the to-be-bundled paper sheets stacking units 210a to 210c to the operator when ending the deal.

[0026] As illustrated in FIG. 2, the pre-bundling transport unit 220 includes a hand portion 221 which grips the paper sheets stacked on the to-be-bundled paper sheets stacking units 210a to 210c, a horizontal moving mechanism 222 which moves the hand portion 221 in the front to rear direction (the horizontal direction), and a vertical moving mechanism 223 which moves the hand portion in the up to down direction (the vertical direction).

[0027] The post-bundling transport unit 270 includes a gripping and transporting unit 271 which grips and transports the paper sheet bundle made by the bundling unit 250, a paper sheet bundle lifting unit 272 which transports the paper sheet bundle gripped and transported by the

gripping and transporting unit 271 upward, and an extruding mechanism 275 which extrudes the paper sheet bundle transported by the paper sheet bundle lifting unit 272 in a direction toward the bundle discharging port 280 (a direction toward the front surface of the apparatus).

[0028] The bundling unit 250 wraps, for example, one hundred paper sheets gripped by the gripping and transporting unit 271 by a bundling band and ties up the bundling band, so that the paper sheet is bundled as the paper sheet bundle.

[0029] The paper sheet processing apparatus of the embodiment also includes a control unit 50 (see FIG. 3) which controls the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d in a posture included in a first category determined by the condition of the face/back or the orientation of the paper sheet, and the paper sheets are stacked on the stacking units 60a to 60d in a posture included in a second category determined by the condition of the face/back or the orientation of the paper sheet when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category becomes a predetermined number (for example, one hundred sheets).

[0030] As illustrated in FIG. 2, the paper sheet processing apparatus of the embodiment further includes a recognition sensor 55 which acquires information on the face/back or the orientation of the paper sheet transported by the transport unit 70. Then, the control unit 50 controls the transport unit 70 based on the information acquired by the recognition sensor 55 so that the paper sheets are stacked on the stacking units 60a to 60d in a posture included in the first category and the paper sheets are stacked on the stacking units 60a to 60d in a posture included in the second category. Furthermore, in the embodiment, a structure equipped with the recognition sensor 55 is described. However, in a case of the structure in which the paper sheets are stacked on the placing unit 11 while the face/back and/or the orientation are determined, the recognition sensor 55 is not essentially needed.

[0031] There are various method of determining the first category and the second category. However, as a first aspect, the first category and the second category may be determined by the condition of the "face/back" of the paper sheet. In this case, the control unit 50 controls the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d in a posture (for example, a posture in which the face of the paper sheet faces the upside) included in the first category determined by the condition of the face/back of the paper sheet, and the paper sheets are stacked on certain stacking units 60a to 60d in a posture (for example, a posture in which the back of the paper sheet faces the upside) included in the second category determined by the condition of the face/back of the paper sheet when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category becomes a predetermined number (for example, one hundred sheets).

[0032] In such a first aspect, the control unit 50 may control the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d again in a posture (for example, a posture in which the face of the paper sheet faces the upside) included in the first category when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category becomes a predetermined number (for example, one hundred sheets).

[0033] As a second aspect, the first category and the second category may be determined by the condition of the "orientation" of the paper sheet. In this case, the control unit 50 controls the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d in a posture (for example, a posture in which the upside of the paper sheet faces the right side in a case where the paper sheets are stacked so that the short edges thereof become parallel to the left to right direction of the stacking units 60a to 60d) included in the first category determined by the condition of the orientation of the paper sheet, and the paper sheets are stacked on the stacking units 60a to 60d in a posture (for example, a posture in which the upside of the paper sheet faces the left side) included in the second category determined by the condition of the orientation of the paper sheet when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category becomes a predetermined number (for example, one hundred sheets).

[0034] In such a second aspect, the control unit 50 may control the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d again in a posture (for example, a posture in which the upside of the paper sheet faces the right side) included in the first category when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category becomes a predetermined number (for example, one hundred sheets).

[0035] As a third aspect, the first category and the second category may be determined by the condition of the "face/back and the orientation" of the paper sheet. In this case, the control unit 50 controls the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d in a posture (for example, a posture in which the face of the paper sheet faces the upside and the upside faces the right side) included in the first category determined by the condition of the face/back and the orientation of the paper sheet, and the paper sheets are stacked on the stacking units 60a to 60d in a posture (for example, a posture in which the back of the paper sheet faces the upside and the upside faces the left side) included in the second category determined by the condition of the face/back and the orientation of the paper sheet when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category becomes a predetermined number (for example, one hundred sheets).

[0036] In such a third aspect, the control unit 50 may control the transport unit 70 so that the paper sheets are

stacked on the stacking units 60a to 60d again in a posture (for example, a posture in which the face of the paper sheet faces the upside and the upside faces the right side) included in the first category and may control the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d in a posture included in a different category when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category becomes a predetermined number (for example, one hundred sheets).

[0037] Specifically, the control unit 50 may control the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d in a posture (for example, a posture in which the face of the paper sheet faces the upside and the upside faces the left side) included in the third category when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category becomes a predetermined number (for example, one hundred sheets).

[0038] Then, the control unit 50 may control the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d again in a posture included in the first category or in the second category and may control the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d in a posture included in the further different category when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the third category becomes a predetermined number (for example, one hundred sheets).

[0039] Specifically, the control unit 50 may control the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d in a posture (for example, a posture in which the back of the paper sheet faces the upside and the upside faces the right side) included in the fourth category when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the third category becomes a predetermined number (for example, one hundred sheets).

[0040] Then, the control unit 50 may control the transport unit 70 so that the paper sheets are stacked on the stacking units 60a to 60d again in a posture included in the first category, the second category, or the third category when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the fourth category becomes a predetermined number (for example, one hundred sheets).

[0041] The paper sheet processing apparatus of the embodiment may process a paper sheet having a security thread. Then, in a case where the paper sheet having the security thread is processed in this way, the first category and the second category may be determined so that the positions of the security threads of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category do not overlap the positions of the security threads of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category.

[0042] Further, in the paper sheet processing apparatus of the embodiment, the paper sheet processing apparatus may also process a paper sheet having a raised printing. Then, in a case where the paper sheet having the raised printing is processed in this way, the first category and the second category may be determined so that the positions of the raised printings of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category do not overlap the positions of the raised printings of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category in the stacking units 60a to 60d.

[0043] Furthermore, as illustrated in FIG. 3, the control unit 50 is connected with a category setting unit 51 capable of freely setting the number of the paper sheets assigned to each category or the content of the category to be set.

[0044] In the embodiment, the front sides of the stacking units 60a to 60d are opened. However, as illustrated in FIGs. 4(a) to 4(c), an extruding unit 65 capable of displacing the positions of the paper sheets by extruding a predetermined number of the paper sheets stacked inside the stacking units 60a to 60d toward the front side may be provided inside the stacking units 60a to 60d. The extruding unit 65 is positioned at a retraction position in which the extruding unit is retracted from the paper sheet when the paper sheets are stacked (see FIGs. 4 (a) and 4(c)), and is positioned at an extrusion position when the paper sheets are extruded toward the front side (see FIG. 4(b)). In a structure provided with the extruding unit 65, the positions of the paper sheets may be displaced in a manner such that the paper sheets stacked inside the stacking units 60a to 60d are extruded whenever the category changes. Furthermore, in a case where the extruding units 65 may be positioned at a plurality of positions in the horizontal direction, the paper sheets may be stacked in a stair shape of three stages or more.

[0045] Incidentally, in the embodiment, a structure is described in which the front sides of the stacking units 60a to 60d are opened, but the invention is not limited thereto. A structure may be employed in which the stacking units 60a to 60d are completely covered by the casing 1 and are not opened.

[0046] Furthermore, the "predetermined number" of the present application may be plural number such as "one hundred" as described above, but may be "one".

<<Operation and effect>>

[0047] Next, an operation and an effect according to the embodiment with the above-described configuration will be described.

[0048] The control unit 50 of the embodiment controls the transport unit 70 so that the paper sheets are stacked on any one of the stacking units 60a to 60d in a posture included in the first category, and the paper sheets are stacked on the stacking units 60a to 60d in a posture included in the second category different from the first

category when the number of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category becomes a predetermined number. For this reason, the face/back or the orientation of the paper sheets stacked on the stacking units 60a to 60d may be automatically changed by a predetermined number of sheets.

[0049] That is, in the banknote processing apparatus of the related art disclosed in WO 2010/097954, all face/back and all orientations of the plurality of banknotes placed on the placing unit may be uniformly arranged. Accordingly, for example, in a case where the face/back and the orientations of the banknotes need to be uniformly arranged by the unit of one hundred sheets, there is a need to employ a configuration in which the transportation of the banknote is stopped at the time point when one hundred banknotes are stacked on the stacking unit so as to change the face/back and the orientations of the stacked banknotes and the transportation is started again so as to stack the banknotes on the stacking unit or a configuration in which the respective stacking units are set to stack the banknotes having different face/back or different orientations thereon, the transportation of the banknote is stopped at the time point when for example, one hundred banknotes are stacked on the stacking unit, and the operator takes out the banknotes from the stacking units by his or her hand so as to tie up the banknotes.

[0050] On the contrary, according to the embodiment, the transport unit 70 is controlled so that the paper sheets are stacked on the stacking units 60a to 60d in a posture included in the first category, and the paper sheets are stacked on the stacking units 60a to 60d in a posture included in the second category when the number of the paper sheets stacked on certain stacking units 60a to 60d in a posture included in the first category becomes a predetermined number (for example, one hundred sheets). Then, the first category and the second category are determined by the condition of the face/back or the orientation of the paper sheet, and respectively include different contents. For this reason, the face/back or the orientations of the paper sheets stacked on the stacking units 60a to 60d may be automatically changed by a predetermined number of sheets (for example, one hundred sheets).

[0051] Further, in the embodiment, the recognition sensor 55 is provided which acquires the information on the face/back or the orientation of the paper sheet transported by the transport unit 70. Then, the control unit 50 controls the transport unit 70 so that the paper sheets take a posture included in the first category inside certain stacking units 60a to 60d and controls the transport unit 70 so that the paper sheets take a posture included in the second category inside the stacking units 60a to 60d based on the information acquired by the recognition sensor 55. For this reason, according to the embodiment, even in a case where the paper sheets are placed on the placing unit 11 while the face/back or the orientations are not uniformly arranged, the paper sheets taking a posture included in the first category may be stacked on certain stacking units 60a to 60d by a predetermined number and the paper sheets taking a posture included in the second category may be stacked on the paper sheets by a predetermined number.

[0052] Further, in a case where the first category and the second category are determined by the condition of the face/back of the paper sheet (in a case of the "first aspect"), the face/back of the paper sheet may be changed every predetermined number of sheets, and hence the number of the paper sheets may be easily recognized. Specifically, when a case is considered in which a predetermined number of sheets are stacked by the same number of sheets for each of the first category and the second category (for example, one hundred sheets), for example, the paper sheets are stacked by a predetermined number of sheets (for example, one hundred sheets) so that the faces face the upside and are stacked by one hundred sheets so that the backs face the upside. For this reason, when the operator takes out only the paper sheets stacked so that the faces face the upside, one hundred paper sheets may be taken out. When the paper sheets with the faces facing the upside and the paper sheets with the backs facing the upside are all extracted, two hundred paper sheets may be taken out.

[0053] Further, in a case where the first category and the second category are determined by the condition of the orientation of the paper sheet (in a case of the "second aspect"), the orientation of the paper sheet may be changed every predetermined number of sheets. Even in this case, the operator may recognize the number of the paper sheets easily although in this aspect the recognition is not so easy as in the "first aspect".

[0054] Further, in a case where the first category and the second category are determined by the condition of the face/back and the orientation of the paper sheet (in a case of the "third aspect"), the face/back and the orientations of the paper sheets may be changed by a predetermined number of sheets. Even in this case, the operator may easily recognize the number of the paper sheets.

[0055] Further, in the "third aspect", a method may be employed in which the paper sheets are stacked in the first category, the paper sheets are stacked in the second category, and then the paper sheets are stacked in the first category again by a predetermined number of sheets. However, the paper sheets may be stacked by a predetermined number of sheets in the third category different from the first category and the second category. Furthermore, a method may be employed in which the paper sheets are stacked by a predetermined number of sheets in the third category and the paper sheets are stacked again by a predetermined number of sheets in the first category or the second category. However, the paper sheets may be stacked by a predetermined number of sheets in a fourth category different from the first category, the second category, and the third cate-

gory.

[0056] Furthermore, in the "first aspect" and the "second aspect", the predetermined number of the paper sheets stacked in the first category and the predetermined number of the paper sheets stacked in the second category may be equal to or different from each other.

[0057] Further, in the "third aspect", the predetermined number of the paper sheets stacked in the first category, the predetermined number of the paper sheets stacked in the second category, the predetermined number of the paper sheets stacked in the third category, and the predetermined number of the paper sheets stacked in the fourth category may be different from one other. Also, the predetermined number of the paper sheets in two categories among these may be equal to each other, the predetermined number of the paper sheets in three categories among these may be equal to one another, or the predetermined number of the paper sheets in all categories may be equal to one another.

[0058] According to the embodiment, in a case where the paper sheet processing apparatus processes the paper sheet having the security thread, the first category and the second category may be determined and set so that the positions of the security threads of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category do not overlap the positions of the security threads of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category inside the stacking units 60a to 60d.

[0059] For example, in a case where the linear security thread is provided in the short edge direction at a place other than the center position of the paper sheet, a posture included in the first category and a posture included in the second category may be determined and set so that the positions of the security threads are different from one another when the paper sheet is viewed in the long edge direction in the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category and the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category. More specifically, as illustrated in FIGs. 5(a) and 5(b), a posture in which the security thread is positioned at the right side of the paper sheet in the long edge direction may be set as the first category. Then, as illustrated in FIGs. 5(c) and 5(d), a posture in which the security thread is positioned at the left side of the paper sheet in the long edge direction may be set as the second category. With such sorting, the security threads of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category do not overlap the security threads of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category.

[0060] Further, for example, in a case where the linear security thread is provided in the long edge direction at a place other than the center position of the paper sheet, a posture included in the first category and a posture included in the second category may be determined and set so that the positions of the security threads when the paper sheet is viewed in the short edge direction are different from one another in the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category and the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category. More specifically, as illustrated in FIGs. 6(a) and 6(b), a posture in which the security thread is positioned at the upper side of the paper sheet in the short edge direction may be set as the first category. Then, as illustrated in FIGs. 6(c) and 6(d), a posture in which the security thread is positioned at the lower side of the paper sheet in the short edge direction may be set as the second category. With such sorting, the security threads of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category do not overlap the security threads of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category.

[0061] With such sorting, even when the paper sheets stacked on the stacking units 60a to 60d are loaded inside a paper sheet delivering device such as ATM, the paper sheets may be smoothly drawn out of the paper sheet delivering device such as ATM.

[0062] That is, in a case where the paper sheet having the security thread is processed, when the paper sheets are stacked so that the face/back and the orientations thereof are uniformly arranged as in the paper sheet processing apparatus of the related art, the security threads of the respective paper sheets overlap each other inside the stacking units 60a to 60d, so that the thicknesses of the paper sheets stacked on the stacking units 60a to 60d are partially increased (see FIG. 8). For this reason, when the paper sheets stacked on the stacking units 60a to 60d are directly loaded inside the paper sheet delivering device such as ATM, a disadvantage occurs in which the paper sheets may not be smoothly drawn out of the paper sheet delivering device such as ATM.

[0063] On the contrary, according to the embodiment, even when the paper sheet having the security thread is processed, the paper sheets may not be stacked inside the stacking units 60a to 60d while the thicknesses thereof are partially increased. That is, according to the embodiment, the paper sheets are stacked by a predetermined number of sheets in a posture included in the first category inside certain stacking units 60a to 60d, and the thicknesses of the stacked paper sheets are partially increased (see FIG. 7(a)). However, since the paper sheets are subsequently stacked inside the stacking units 60a to 60d in a posture included in the second category, the thicknesses thereof are increased in a portion different from the above-described portion. Thus, the thicknesses of the paper sheets stacked inside the stacking units 60a to 60d become uniform on the whole (see FIG. 7(b)). Accordingly, even when the paper sheets stacked on the stacking units 60a to 60d are loaded inside the paper sheet delivering device such as ATM, the paper sheets may be smoothly drawn out of the paper sheet delivering device such as ATM.

[0064] The same applies to the case where the paper sheet having the raised printing is processed. That is, according to the embodiment, in a case where the paper sheet processing apparatus processes the paper sheet having the raised printing, the first category and the second category may be determined and set so that the positions of the raised printings of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the first category do not overlap the positions of the raised printings of the paper sheets stacked on the stacking units 60a to 60d in a posture included in the second category inside the stacking units 60a to 60d.

[0065] Even in this case, the same effect as that of the case of processing the paper sheet having the security thread may be obtained. That is, according to the embodiment, even when the paper sheet having the raised printing is processed, the paper sheets may not be easily stacked inside the stacking units 60a to 60d while the thicknesses thereof are partially increased, and the thicknesses of the paper sheets stacked on the stacking units 60a to 60d become uniform on the whole. For this reason, even when the paper sheets stacked on the stacking units 60a to 60d are loaded inside the paper sheet delivering device such as ATM, the paper sheets may be smoothly drawn out of the paper sheet delivering device such as ATM.

[0066] Incidentally, in a case where the paper sheet having the security thread or the raised printing is processed, it is preferable that the "predetermined number" stacked on the stacking units 60a to 60d in a posture included in the first category and the "predetermined number" stacked on the stacking units 60a to 60d in a posture included in the second category be stacked by the same number of sheets. According to such a configuration, the thicknesses of the paper sheets stacked on the stacking units 60a to 60d may become further uniform.

[0067] Furthermore, in a case where the paper sheet is the banknote, the banknotes may be stacked inside the stacking units 60a to 60d depending on the type of denomination. In this case, regarding the banknotes as various denominations stacked on the stacking units 60a to 60d, the banknotes may be stacked on the stacking units 60a to 60d according to the above-described methods.

[0068] That is, regarding the banknotes as various denominations stacked on the stacking units 60a to 60d, the first category and the second category may be determined by the condition of the face/back of the banknote, the first category and the second category may be determined by the condition of the orientation of the banknote, the first category and the second category may be determined by the condition of the face/back and the orientation of the banknote, or the first category and the second category may be determined so as not to overlap the security threads or the raised printings.

[0069] Further, a case is considered in which the paper sheet is the banknote having the security thread or the raised printing and the banknotes stacked inside the stacking units 60a to 60d are loaded in ATM. According to the embodiment, it is possible to easily perform an operation in which the banknote is loaded in ATM and to shorten the time.

[0070] That is, in the banknote processing apparatus of the related art disclosed in WO 2010/097954, in order to prevent the overlapping of the security threads or the raised printings of the banknotes loaded in the ATM by the unit of, for example, one hundred sheets, there is a need to employ a configuration in which the transportation of the banknote is stopped at the time point when one hundred banknotes are stacked on the stacking unit so as to change the face/back and/or the orientation of the banknote so that the security threads or the raised printings of the stacked banknotes do not overlap and the transportation is started again so as to stack the banknotes on the stacking unit or a configuration in which the respective stacking units are set to stack the banknotes having different face/back and/or different orientations thereon even when the banknotes are stacked, the transportation of the banknote is stopped at the time point, for example, when one hundred banknotes are stacked on the stacking unit, and the operator takes out the banknotes from the stacking units by his or her hand so as to tie up the banknotes.

[0071] Then, two thousand to two thousand five hundred banknotes are generally loaded in the ATM for one denomination. For this reason, in a case where the banknotes having the security thread or the raised printing are loaded in the ATM, there is a need to perform the above-described operation with respect to two thousand to two thousand five hundred banknotes only for one denomination. Thus, in the paper sheet processing apparatus of the related art, a large amount of operation and much time are needed.

[0072] On the contrary, according to the embodiment, the banknotes may be automatically stacked on the stacking units 60a to 60d so that the security threads or the raised printings of the banknotes loaded in the ATM by the unit of, for example, one hundred sheets do not overlap. For this reason, it is possible to easily perform an operation of loading the banknote in the ATM and to shorten the time.

Modified example 1

[0073] In the above-described embodiment, a structure has been used in which the storing unit is configured as the stacking units 60a to 60d that simply store the respective paper sheets in a stacked state, but the invention is not limited thereto. For example, the storing unit may be configured as the to-be-bundled paper sheets stacking units 210a to 210c for storing the paper sheets to be bundled. In this case, the paper sheets which are taken in by the taking-in unit 10 are stacked on the to-be-bundled paper sheets stacking units 210a to 210c instead of the stacking units 60a to 60d.

[0074] That is, when the paper sheets taken in by the taking-in unit 10 are stacked on the to-be-bundled paper sheets stacking units 210a to 210c in a posture included in the first category determined by the condition of the face/back and/or the orientation of the paper sheet and the number of the paper sheets stacked on the to-be-bundled paper sheets stacking units 210a to 210c in a posture included in the first category becomes a predetermined number (for example, one hundred sheets), the paper sheets taken in by the taking-in unit 10 are stacked on the to-be-bundled paper sheets stacking units 210a to 210c in a posture included in the second category determined by the condition of the face/back and/or the orientation of the paper sheet.

Modified example 2

[0075] Further, as another example, the storing unit may be the paper sheet bundle stacking unit 260 which stores the paper sheet bundle. Furthermore, in a case where the storing unit is the paper sheet bundle stacking unit 260, at least the face/back sides or the orientations of the paper sheets bundled as the paper sheet bundle need to be uniformly arranged.

[0076] In this modified example, the control unit 50 controls the post-bundling transport unit 270 so that the paper sheet bundle is stored in the paper sheet bundle stacking unit 260 in a posture included in the first category determined by the condition of the face/back sides and/or the orientations of the paper sheets, and the paper sheet bundle is stored in the paper sheet bundle stacking unit 260 in a posture included in the second category determined by the condition of the face/back sides and/or the orientations of the paper sheets when the number of the paper sheet bundle or bundles stored in the paper sheet bundle stacking unit 260 in the posture included in the first category becomes a predetermined number (for example, one batch).

[0077] As in the above-described embodiment, it is possible to appropriately select whether to store the paper sheet bundle in the paper sheet bundle stacking unit 260 in a posture included in the first category or to store the paper sheet bundle in the paper sheet bundle stacking unit 260 in a different posture included in the third category or the fourth category after the paper sheet bundle is stored in the paper sheet bundle stacking unit 260 in a posture included in the second category.

[0078] In this modified example, for example, the gripping and transporting unit 271 may simply move in the horizontal direction, may be turned over while moving in the horizontal direction, and may rotate within the horizontal plane and/or the vertical plane. In a case where the gripping and transporting unit 271 simply moves in the horizontal direction, the paper sheet bundle which is gripped by the gripping and transporting unit 271 is placed on the paper sheet bundle lifting unit 272 without changing the face/back and the orientation thereof. In a case where the gripping and transporting unit 271 may be turned over while moving in the horizontal direction, when the gripping and transporting unit 271 is turned over while moving in the horizontal direction, the paper sheet bundle which is gripped by the gripping and transporting unit 271 is placed on the paper sheet bundle lifting unit 272 while only the face/back thereof is changed. In a case where the gripping and transporting unit 271 may rotate within the horizontal plane, when the gripping and transporting unit 271 rotates within the horizontal plane, the paper sheet bundle which is gripped by the gripping and transporting unit 271 is placed on the paper sheet bundle lifting unit 272 while only the orientation thereof is changed. In a case where the gripping and transporting unit 271 may rotate within the vertical plane, when the gripping and transporting unit 271 rotates within the vertical plane, the paper sheet bundle which is gripped by the gripping and transporting unit 271 is placed on the paper sheet bundle lifting unit 272 while both the face/back and the orientation thereof are changed.

[0079] In a case where the face/back sides of the paper sheets included in the paper sheet bundle are uniformly arranged, when the gripping and transporting unit 271 is simply slid in the horizontal direction (the left to right direction of FIG. 2), or the gripping and transporting unit 271 is turned over while moving in the horizontal direction or the gripping and transporting unit 271 is rotated within the vertical plane, the face/back of the paper sheet bundle stacked inside the paper sheet bundle stacking unit 260 is changed. Specifically, in a case where the face of the paper sheet bundle faces the upside, when the paper sheet bundle needs to be placed on the paper sheet bundle lifting unit 272 while the face thereof faces the upside, the gripping and transporting unit 271 may be simply slid in the horizontal direction so that the paper sheet bundle is placed on the paper sheet bundle lifting unit 272. Then, when the paper sheet bundle needs to be placed on the paper sheet bundle lifting unit 272 while the back thereof faces the upside, the gripping and transporting unit 271 may be turned over while moving in the horizontal direction or the gripping and transporting unit 271 may be rotated within the vertical plane so that the paper sheet bundle is placed on the paper sheet bundle lifting unit 272.

[0080] Further, in a case where the orientations of the paper sheets included in the paper sheet bundle are uniformly arranged, when the gripping and transporting unit 271 is simply slid in the horizontal direction (the left to right direction of FIG. 2), or the gripping and transporting unit 271 rotates within the horizontal plane or the gripping and transporting unit 271 rotates within the vertical plane, the orientation of the paper sheet bundle stacked inside the paper sheet bundle stacking unit 260 is changed. Specifically, in a case where the paper sheet bundle faces one side, when the paper sheet bundle needs to be placed on the paper sheet bundle lifting unit 272 while facing one direction, the gripping and transporting unit 271 may be simply slid in the horizontal direction so that the paper sheet bundle is placed on the paper sheet bun-

dle lifting unit 272. Then, when the paper sheet bundle needs to be placed on the paper sheet bundle lifting unit 272 while facing the other direction opposite to the one direction, the gripping and transporting unit 271 may be rotated within the horizontal plane or the gripping and transporting unit 271 may be rotated within the vertical plane so that the paper sheet bundle is placed on the paper sheet bundle lifting unit 272.

[0081] Incidentally, in a case where the paper sheets of a posture included in the first category and the paper sheets of a posture included in the second category are separately stacked on different to-be-bundled paper sheets stacking units 210a to 210c, a configuration is sufficient in which the gripping and transporting unit 271 may simply move in the horizontal direction. Accordingly, there is no need to employ a configuration in which the gripping and transporting unit 271 may be turned over while moving in the horizontal direction, or may rotate within the horizontal plane or the vertical plane. In this case, a configuration may be employed in which the paper sheets of the necessary category are selected from the to-be-bundled paper sheets stacking units 210a to 210c and are transported by the pre-bundling transport unit 220 to the bundling unit 250 so as to make the paper sheet bundle of the category necessary for the bundling unit 250.

Modified example 3

[0082] Further, the storing unit may be configured as a tape reel type storing unit 360 which stores the respective paper sheets while being held between tapes instead of the stacking units 60a to 60d, the to-be-bundled paper sheets stacking units 210a to 210c, the paper sheet bundle stacking unit 260, and the like that store the respective paper sheets in a stacked state. Furthermore, the tape reel type storing unit 360 is adapted to store the paper sheets one by one by holding the paper sheet between two tapes. This configuration will be described with reference to FIGs. 9 to 11. Furthermore, since the specific configuration of the tape reel type storing unit 360 is disclosed in Japanese Patent Application Laid-Open JP 2008-123093 A, the specific description thereof will not be repeated here.

[0083] As illustrated in FIGs. 9 and 10, the tape reel type storing unit 360 includes a first lower tape winding roller 311, an upper tape winding roller 321, and a second lower tape winding roller 331. As illustrated in FIG. 9, the upper tape winding roller 321 is disposed between the first lower tape winding roller 311 and the second lower tape winding roller 331. Furthermore, the first lower tape winding roller 311, the upper tape winding roller 321, and the second lower tape winding roller 331 are disposed within a tape casing 361.

[0084] The first and second lower tape winding rollers 311 and 331 and the upper tape winding roller 321 are rotated together by a common tape winding shaft 341. As illustrated in FIG. 9, the tape winding shaft 341 is rotationally driven by a driving shaft MS which is rotationally driven in the forward rotation direction and the reverse rotation direction by the motor M and various existing rotational driving and transmitting units G.

[0085] The first lower tape winding roller 311 is adapted to feed a first lower tape 310 when the tape winding shaft 341 rotates in the tape feeding direction (the paper sheet storing direction) and is adapted to wind the first lower tape 310 when the tape winding shaft 341 rotates in the tape winding direction (the paper sheet feeding direction).

[0086] The upper tape winding roller 321 is adapted to feed an upper tape 320 when the tape winding shaft 341 rotates in the tape feeding direction (the paper sheet storing direction) and is adapted to wind the upper tape 320 when the tape winding shaft 341 rotates in the tape winding direction (the paper sheet feeding direction).

[0087] The second lower tape winding roller 331 is adapted to feed a second lower tape 330 when the tape winding shaft 341 rotates in the tape feeding direction (the paper sheet storing direction) and is adapted to wind the second lower tape 330 when the tape winding shaft 341 rotates in the tape winding direction (the paper sheet feeding direction).

[0088] As illustrated in FIG. 10, the tape casing 361 is provided with a paper sheet entrance and exit port P. Then, the end of the transport unit 70 is present at a position facing the paper sheet entrance and exit port P. Further, upper belts 350 and 355 and lower belts 370 and 375 are provided at a position facing the paper sheet entrance and exit port P inside the tape casing 361. Then, the paper sheets may be fed into the tape casing 361 or the paper sheets may be fed out of the tape casing 361 by the transport unit 70, the upper belts 350 and 355, and the lower belts 370 and 375.

[0089] As illustrated in FIGs. 9 and 10, the first and second lower tapes 310 and 330 respectively extend from the peripheral surfaces of the first and second lower tape winding rollers 311 and 331 to the peripheral surface of the paper sheet winding roller 314 through the guide rollers 312 and 332 and the final guide rollers 313 and 333. Further, the upper tape 320 extends from the peripheral surface of the upper tape winding roller 321 to the peripheral surface of the paper sheet winding roller 314 through the guide roller 322 and the final guide roller 323. The paper sheet winding roller 314 is adapted to be rotated by a paper sheet winding shaft 344. The paper sheet winding shaft 344 is rotationally driven by the driving shaft MS which is rotationally driven by the motor M in the forward rotation direction and the reverse rotation direction and various existing rotational driving and transmitting units G.

[0090] In this way, according to the embodiment, in a case where the storing unit is the tape reel type storing unit 360 and the paper sheet having the security thread or the raised printing is processed, it is possible to prevent the winding diameter formed by the tape (for example, the first lower tape 310) and the winding diameter formed

by the other tape (for example the second lower tape 330) holding the paper sheet therebetween from being different from each other.

[0091] That is, in a case where the paper sheet having the security thread or the raised printing is stored in the tape reel type storing unit 360, when the paper sheet is stored without considering the position of the security thread or the raised printing, there is a case in which the winding diameter formed by a certain tape (for example, the first lower tape 310) becomes larger than the winding diameter formed by the other tape (for example, the second lower tape 330) (see FIG. 11). That is, when the security threads or the raised printings of the paper sheets are disposed at the same side in the width direction of the tape reel type storing unit 360 (see FIG. 9), the winding diameter formed by a certain tap becomes larger than the winding diameter formed by the other tape. For example, the winding diameter formed by the first lower tape 310 becomes larger than the winding diameter formed by the second lower tape 330. In this way, when the winding diameter formed by the first lower tape 310 is different from the winding diameter formed by the second lower tape 330, a difference in the feeding length or the winding torque occurs between the first lower tape 310 and the second lower tape 330, and hence a problem arises in that the paper sheet may not be normally wound or the input of the wound paper sheet is disturbed.

[0092] On the contrary, in the embodiment, the position of the security thread of the paper sheet stored in the tape reel type storing unit 360 in a posture included in the first category and the position of the security thread of the paper sheet stored in the tape reel type storing unit 360 in a posture included in the second category may be determined and set so as not to overlap each other in the width direction of the tape reel type storing unit 360. Further, the position of the raised printing of the paper sheet stored in the tape reel type storing unit 360 in a posture included in the first category and the position of the raised printing of the paper sheet stored in the tape reel type storing unit 360 in a posture included in the second category may be determined and set so as not to overlap each other in the width direction of the tape reel type storing unit 360. For this reason, even in a case where the paper sheet having the security thread or the raised printing is processed in this way, it is possible to prevent the winding diameter formed by a certain tape from being different from the winding diameter formed by the other tape. As a result, according to the embodiment, it is possible to prevent a problem in which the paper sheet may not be normally wound on the tape reel type storing unit 360 or the feeding of the wound paper sheet from the tape reel type storing unit 360 is disturbed.

[0093] Incidentally, in a case where the paper sheet having the security thread or the raised printing is processed, it is preferable that the "predetermined number" stored in the stacking units 60a to 60d in a posture included in the first category be equal to the "predetermined number" stored in the stacking units 60a to 60d in a posture included in the second category. According to this configuration, it is possible to further reliably prevent the tapes holding the paper sheet from being partially thickened. Furthermore, as described above, the "predetermined number" of the present application may be "one", and the category of the paper sheet held between the tapes may be alternately changed.

[0094] Incidentally, the description of the embodiments and the disclosure of the drawings above are merely examples for explaining the invention described in claims, and the invention described in claims is not limited to the description of the embodiment or the disclosure of the drawings above.

Claims

1. A paper sheet processing apparatus comprising:

a taking-in unit configured to take therein paper sheets one by one;
a transport unit configured to transport the paper sheets taken in by the taking-in unit;
a storing unit configured to store a plurality of paper sheets transported by the transport unit; and
a control unit configured to control the transport unit so as to transport into the storing unit the paper sheets of a first category determined based on the face/back or the orientation of each of the paper sheet, and to transport into the storing unit the paper sheets of a second category determined based on the face/back or the orientation of each of the paper sheets when the number of the paper sheet or sheets of the first category stored in the storing unit reaches a predetermined number.

2. The paper sheet processing apparatus according to claim 1, further comprising:

a recognition sensor configured to acquire information on the face/back or the orientation of each of the paper sheets transported by the transport unit,
wherein the control unit is configured to control the transport unit based on the information acquired by the recognition sensor so as to transport into the storing unit the paper sheets of the first category and the paper sheets of the second category.

3. The paper sheet processing apparatus according to claim 1 or 2,
wherein the control unit is configured to control the transport unit so as to transport into the storing unit the paper sheets of the first category determined based on the face/back of the paper sheet, and to

transport into the storing unit the paper sheets of the second category determined based on the face/back of the paper sheet when the number of the paper sheet or sheets of the first category stored in the storing unit reaches the predetermined number.

4. The paper sheet processing apparatus according to claim 1 or 2,
wherein the control unit is configured to control the transport unit so as to transport into the storing unit the paper sheets of the first category determined based on the orientation of the paper sheet, and to transport into the storing unit the paper sheets of the second category determined based on the orientation of the paper sheet when the number of the paper sheet or sheets of the first category stored in the storing unit reaches the predetermined number.

5. The paper sheet processing apparatus according to claim 1 or 2,
wherein the control unit is configured to control the transport unit so as to transport into the storing unit the paper sheets of the first category determined based on the face/back and the orientation of the paper sheet, and to transport into the storing unit the paper sheets of the-second category determined based on the face/back and the orientation of the paper sheet when the number of the paper sheet or sheets of the first category stored in the storing unit reaches the predetermined number.

6. The paper sheet processing apparatus according to any one of claims 1 to 5,
wherein the paper sheet processing apparatus is configured to process a paper sheet having a security thread, and
wherein the paper sheets of the first category and the paper sheets of the second category are stored in the storing unit so that the positions of the security threads of the paper sheets of each of the first and second categories do not overlap each other.

7. The paper sheet processing apparatus according to any one of claims 1 to 6,
wherein the paper sheet processing apparatus is configured to process a paper sheet having a raised printing, and
wherein the paper sheets of the first category and the paper sheets of the second category are stored in the storing unit so that the positions of the raised printings of the paper sheets of each of the first and second categories do not overlap each other.

8. The paper sheet processing apparatus according to any one of claims 1 to 7, wherein the storing unit is a tape-reel-type storing unit configured to store the respective paper sheets so as to be held between tapes.

9. The paper sheet processing apparatus according to any one of claims 1 to 7, wherein the storing unit is a stacking unit configured to stack the respective paper sheets.

10. The paper sheet processing apparatus according to claim 9, wherein the stacking unit is a to-be-bundled paper sheets stacking unit configured to stack paper sheets to be bundled.

11. A paper sheet processing apparatus comprising:

a bundling unit configured to make a paper sheet bundle by bundling paper sheets uniformly arranged by at least face/back or orientation;
a post-bundling transport unit configured to transport the paper sheet bundles made by the bundling unit;
a paper sheet bundle stacking unit configured to store the paper sheet bundles transported by the post-bundling transport unit; and
a control unit configured to control the post-bundling transport unit so as to transport into the paper sheet bundle stacking unit the paper sheet bundles of a first category determined based on the face/back or the orientation of the paper sheets, and to transport into the paper sheet bundle stacking unit the paper sheet bundles of a second category determined based on the face/back or the orientation of the paper sheets when the number of the paper sheet bundle or bundles of the first category stored in the paper sheet bundle stacking unit reaches a predetermined number.

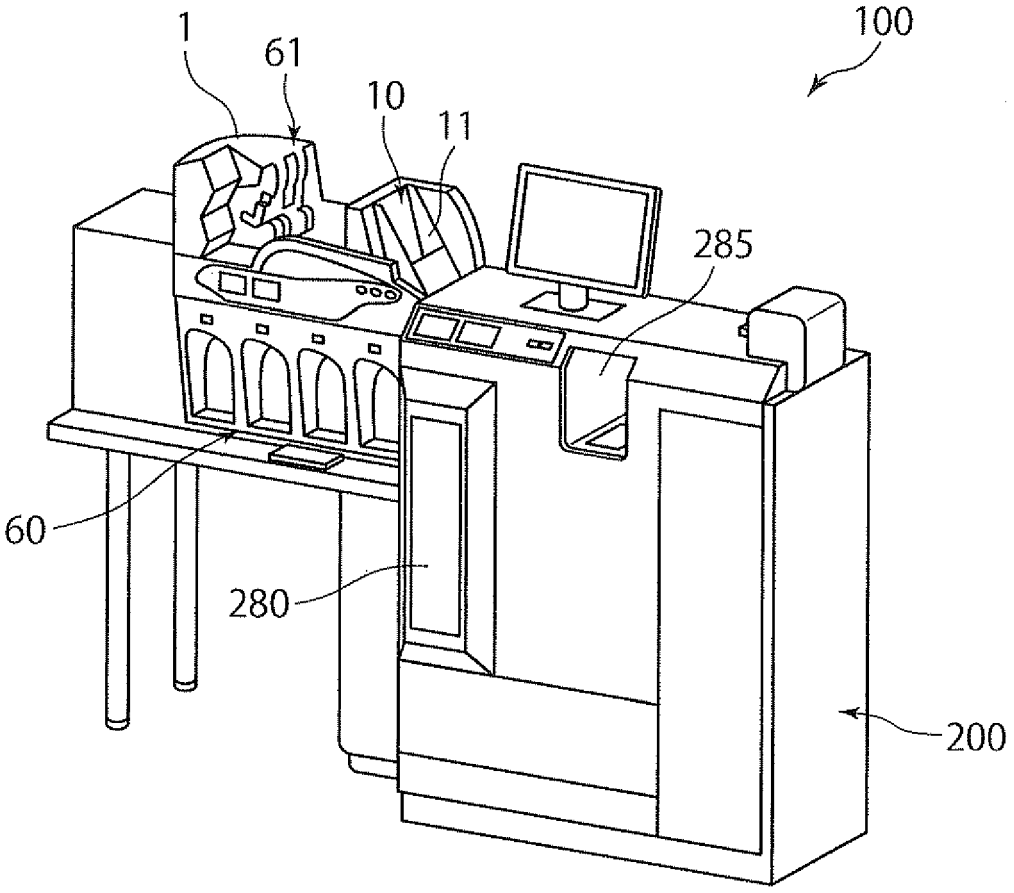
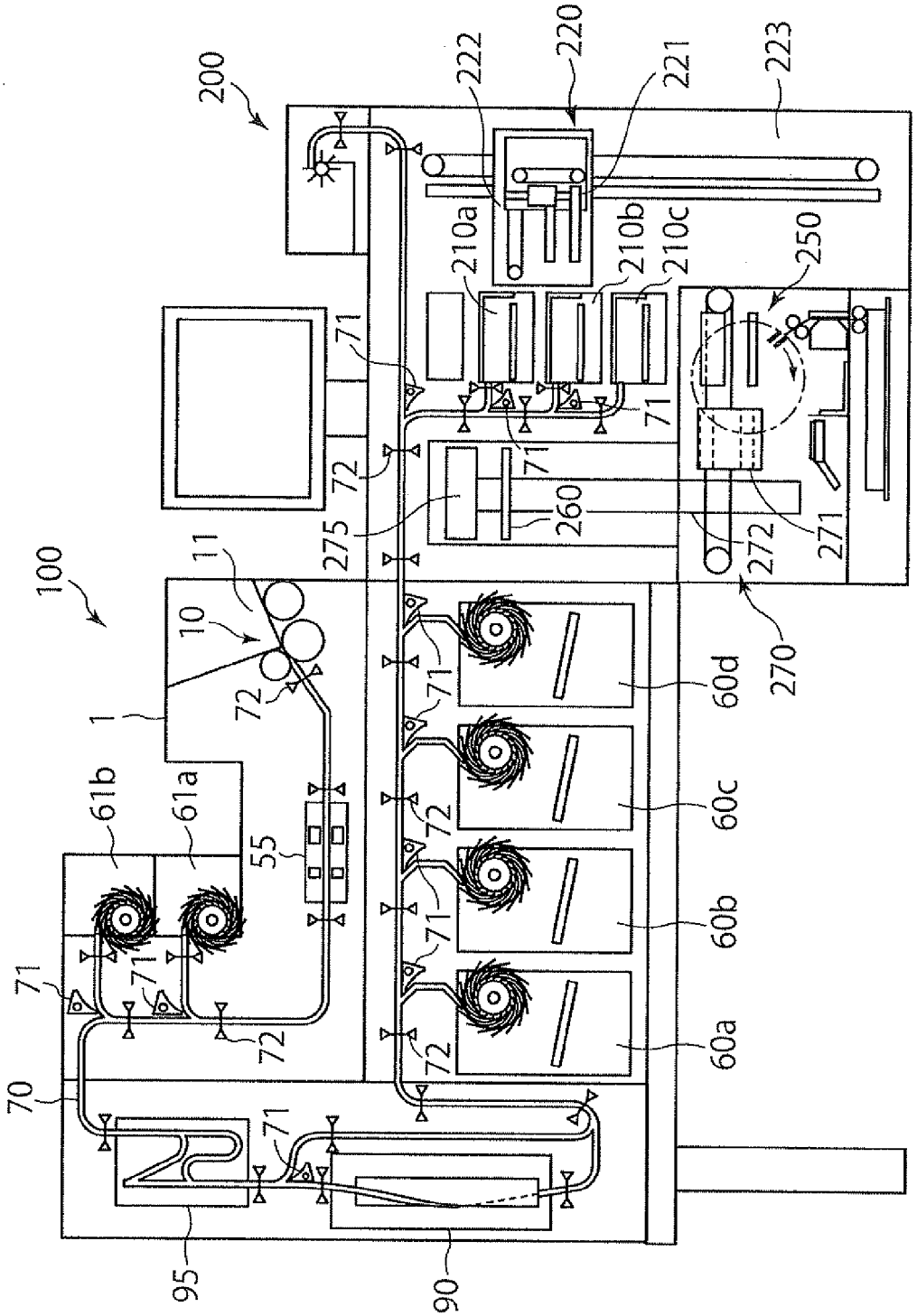


FIG. 1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210b
210c
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72
275
260
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271
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55
70
95
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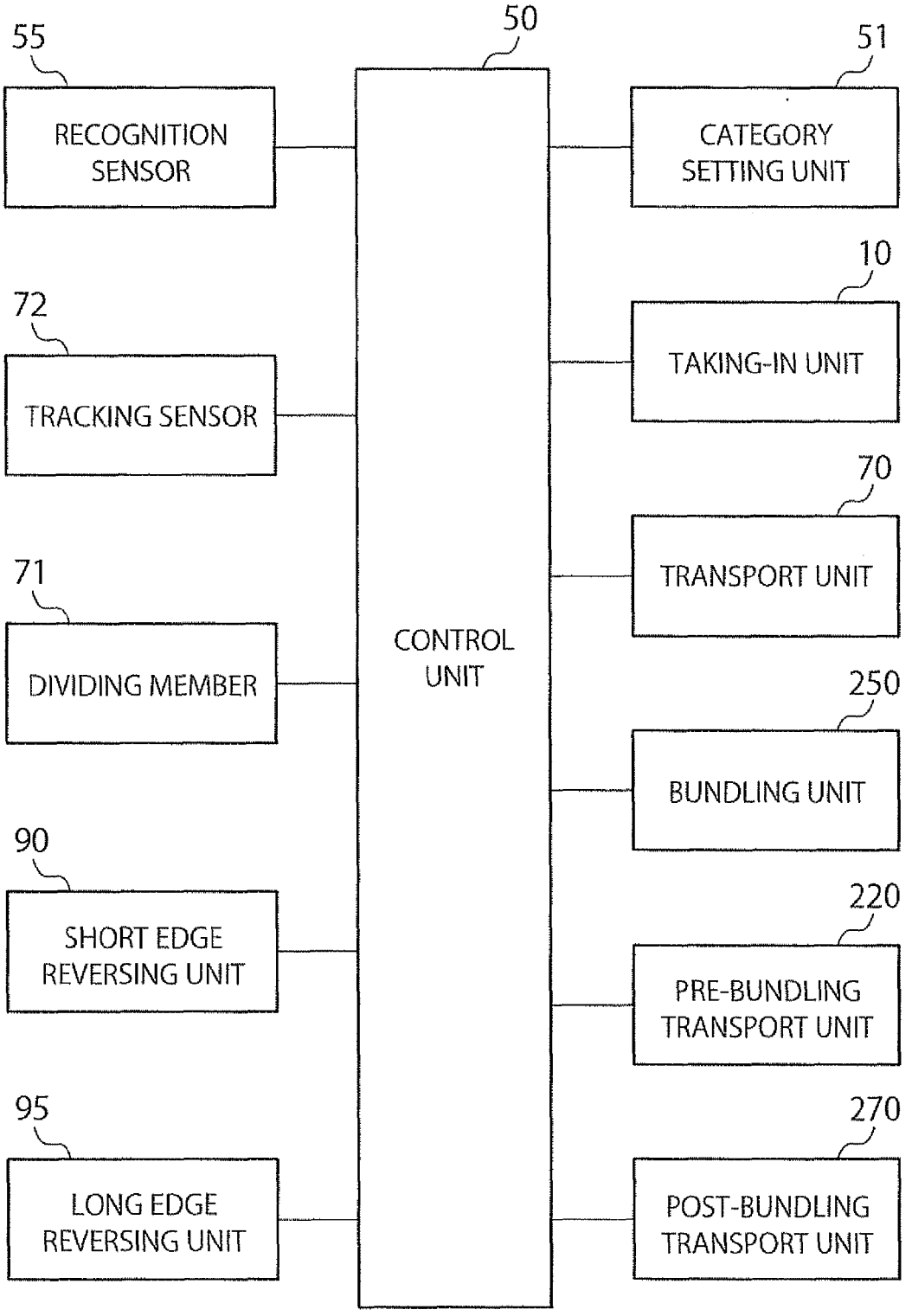
FIG. 2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72
TRACKING SENSOR
71
DIVIDING MEMBER
90
SHORT EDGE REVERSING UNIT
95
LONG EDGE REVERSING UNIT
50
CONTROL UNIT
51
CATEGORY SETTING UNIT
10
TAKING-IN UNIT
70
TRANSPORT UNIT
250
BUNDLING UNIT
220
PRE-BUNDLING TRANSPORT UNIT
270
POST-BUNDLING TRANSPORT UNIT

FIG. 3

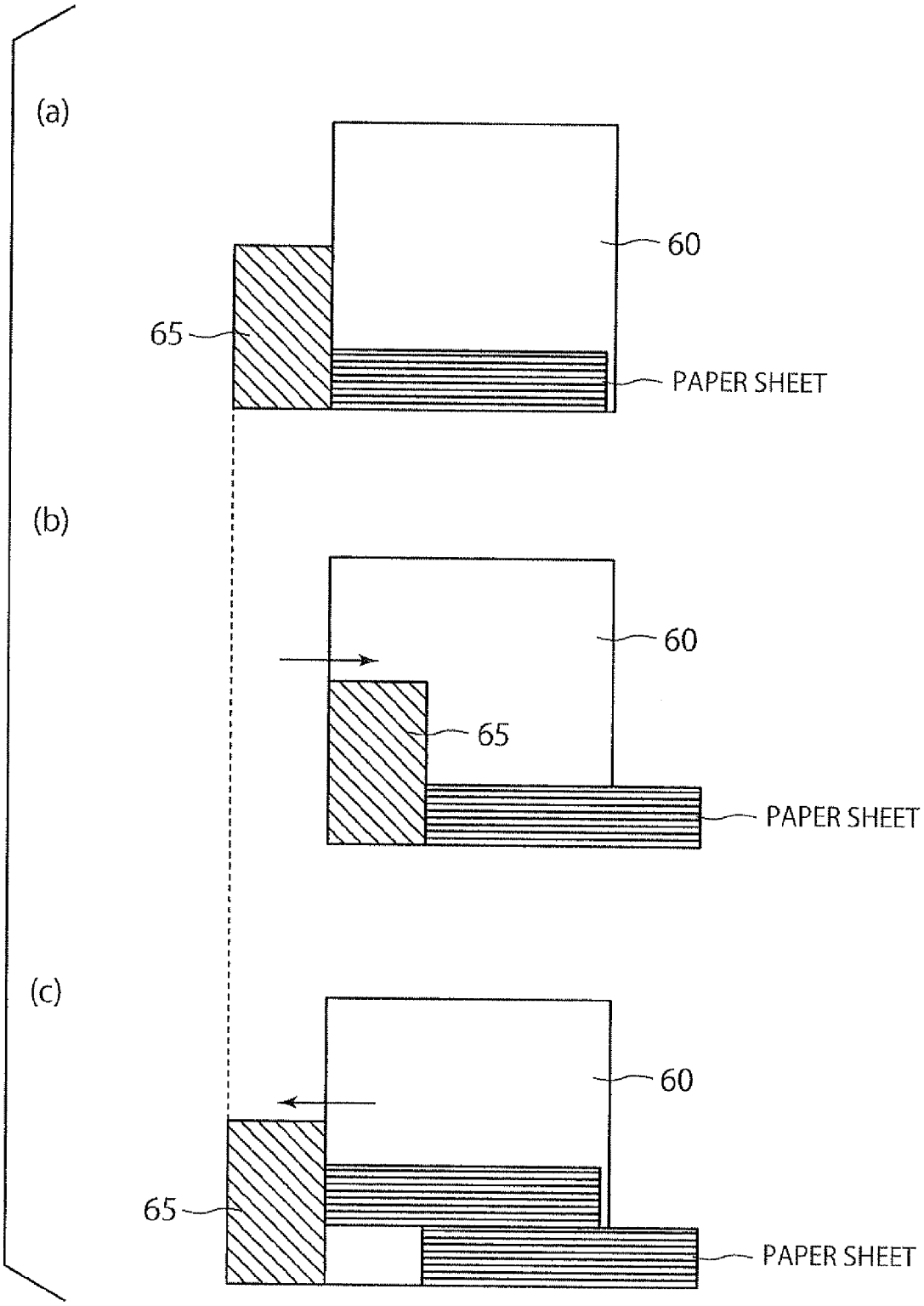

FIG. 4

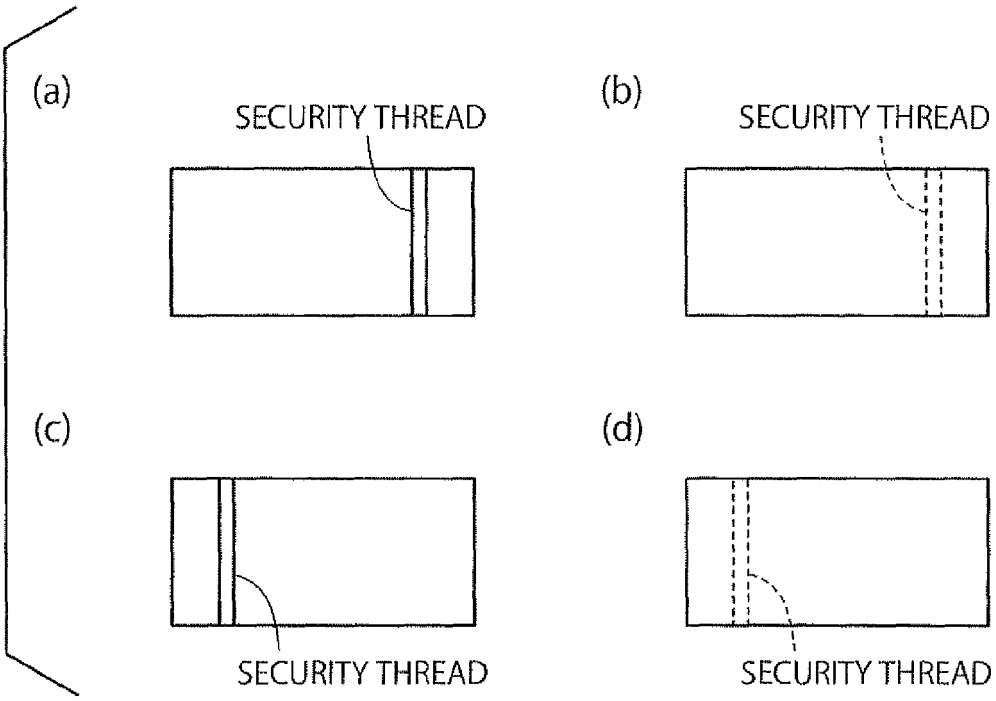
(a)
SECURITY THREAD
(b)
SECURITY THREAD
(c)
SECURITY THREAD
(d)
SECURITY THREAD

FIG. 5

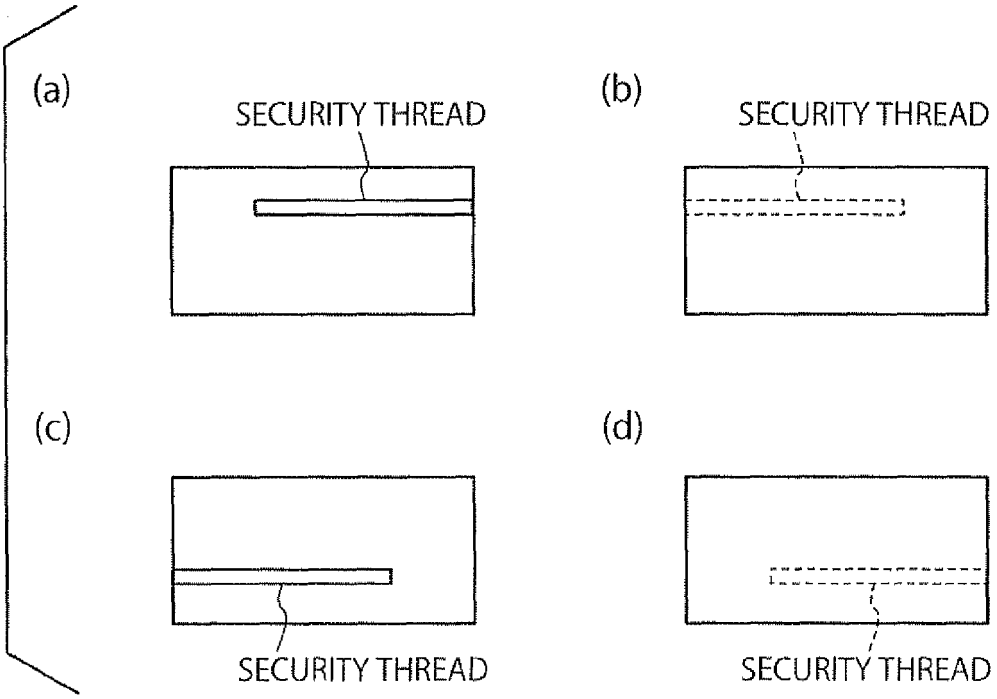
(a)
SECURITY THREAD
(b)
SECURITY THREAD
(c)
SECURITY THREAD
(d)
SECURITY THREAD

FIG. 6

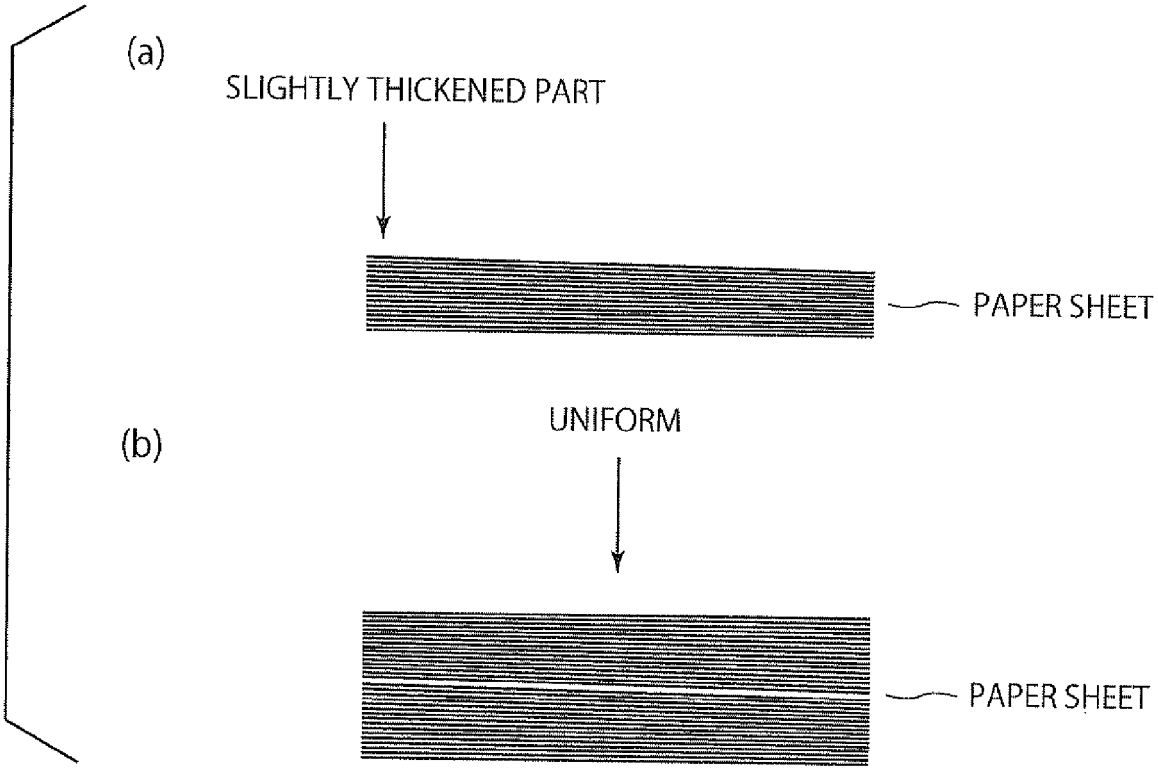
(a)
SLIGHTLY THICKENED PART
PAPER SHEET
(b)
UNIFORM
PAPER SHEET

FIG. 7

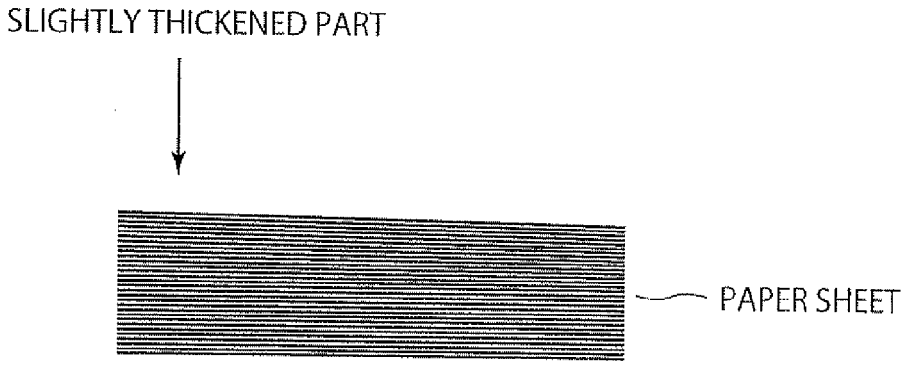
SLIGHTLY THICKENED PART
PAPER SHEET

FIG. 8

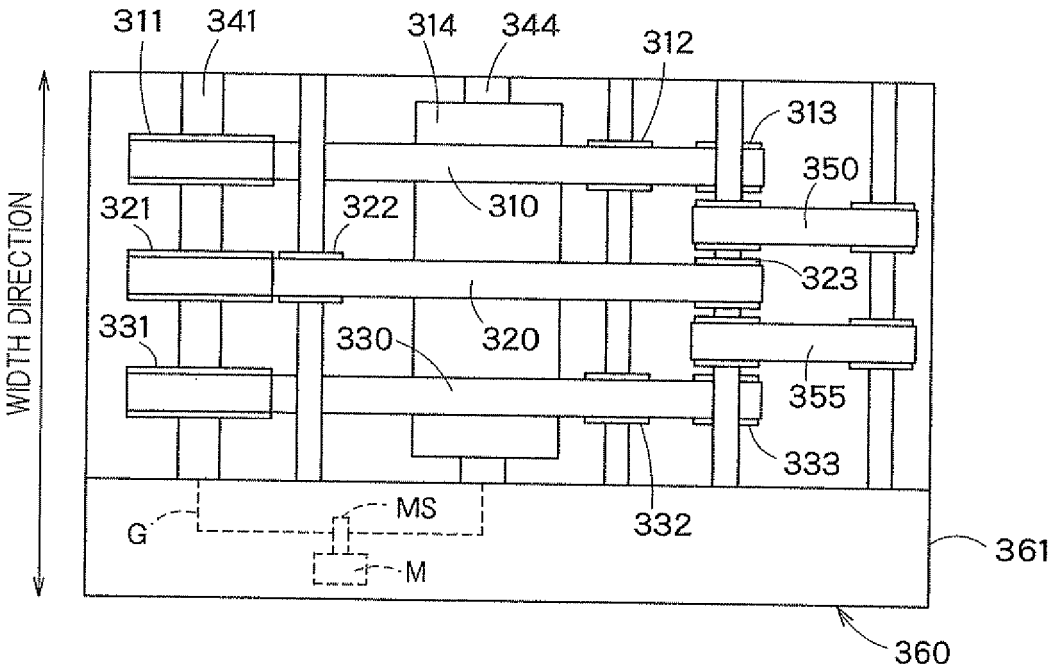
311
341
314
344
312
313
350
321
322
310
323
331
330
320
355
333
WIDTH DIRECTION
G
MS
M
332
361
360

FIG. 9

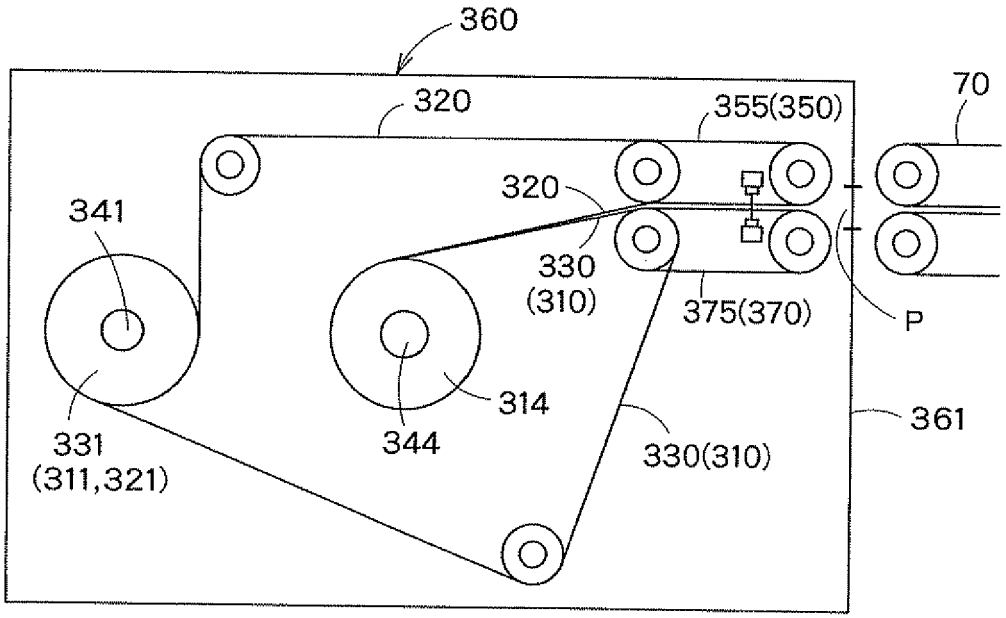
360
320
355(350)
70
320
341
330
(310)
375(370)
P
314
361
331
(311,321)
344
330(310)

FIG. 10

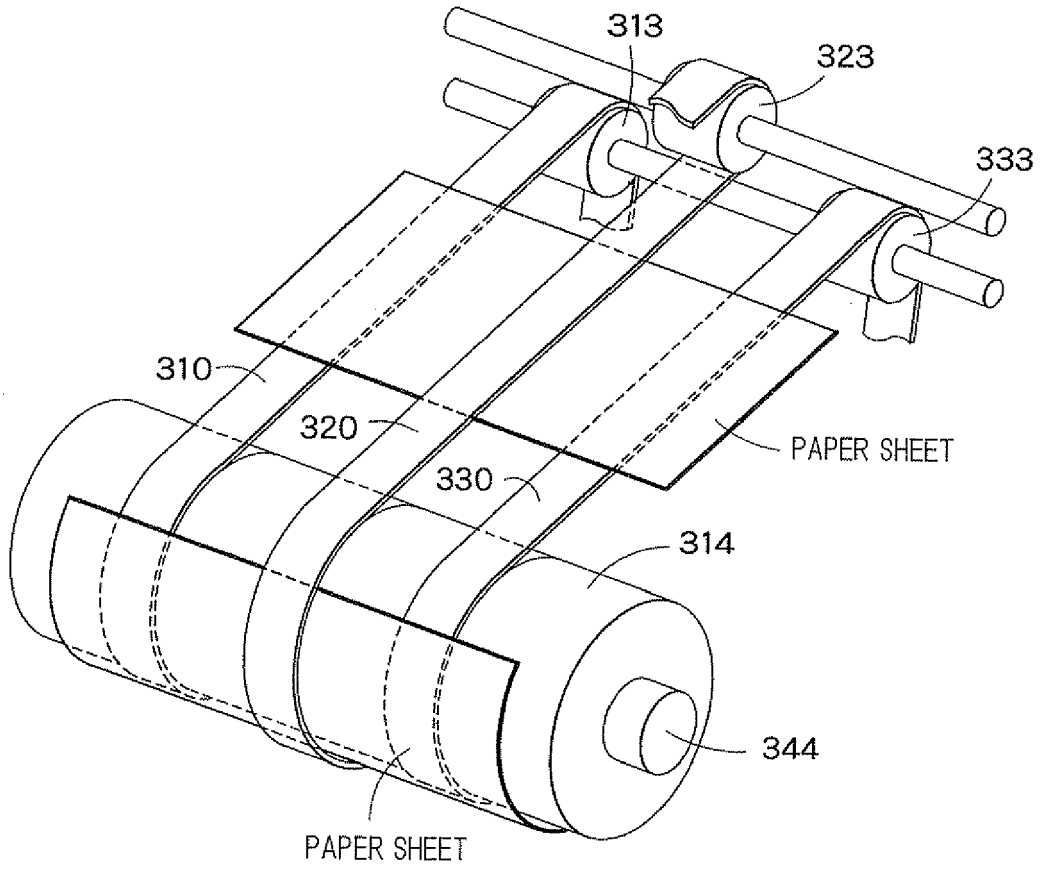

FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- JP 2008123093 A **[0082]**