



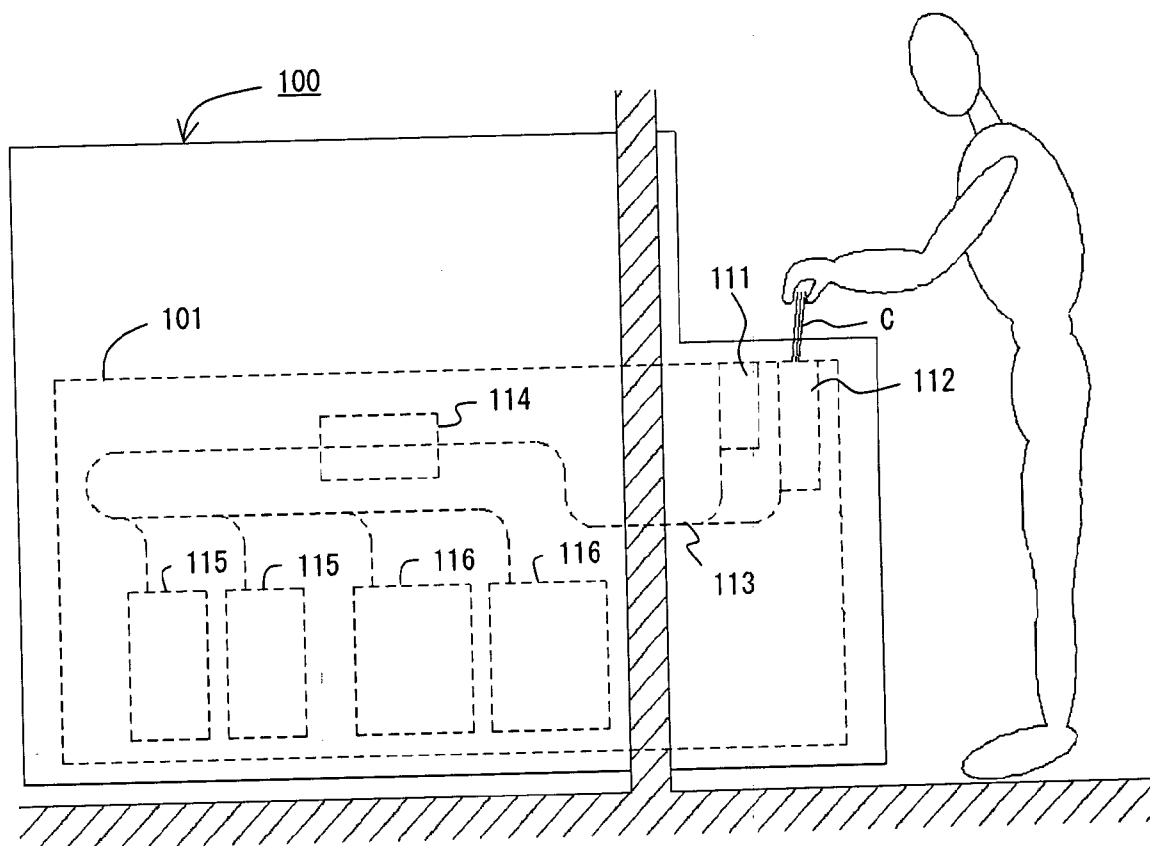
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(19) **United States**(12) **Patent Application Publication**
Minamishin et al.(10) **Pub. No.: US 2005/0116407 A1**(43) **Pub. Date: Jun. 2, 2005**(54) **PAPER SHEETS PROCESSOR****Related U.S. Application Data**(75) Inventors: **Hayato Minamishin**, Tokyo (JP);
Atsunori Kimura, Tokyo (JP); **Akinori Kojima**, Tokyo (JP)(63) Continuation of application No. PCT/JP02/08815,
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Different paper sheets such as banknotes and paper moneys are inserted into a plurality of insertion parts. The paper sheets inserted into the respective insertion parts are run out one by one, and carried on the same carrying route. The run-out paper sheet is judged during the carriage thereof. According to the judgment result, a carrying destination thereof is determined, and then the paper sheet is carried and accommodated into the determined carrying destination.

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Tokyo (JP)(21) Appl. No.: **11/030,056**(22) Filed: **Jan. 7, 2005**

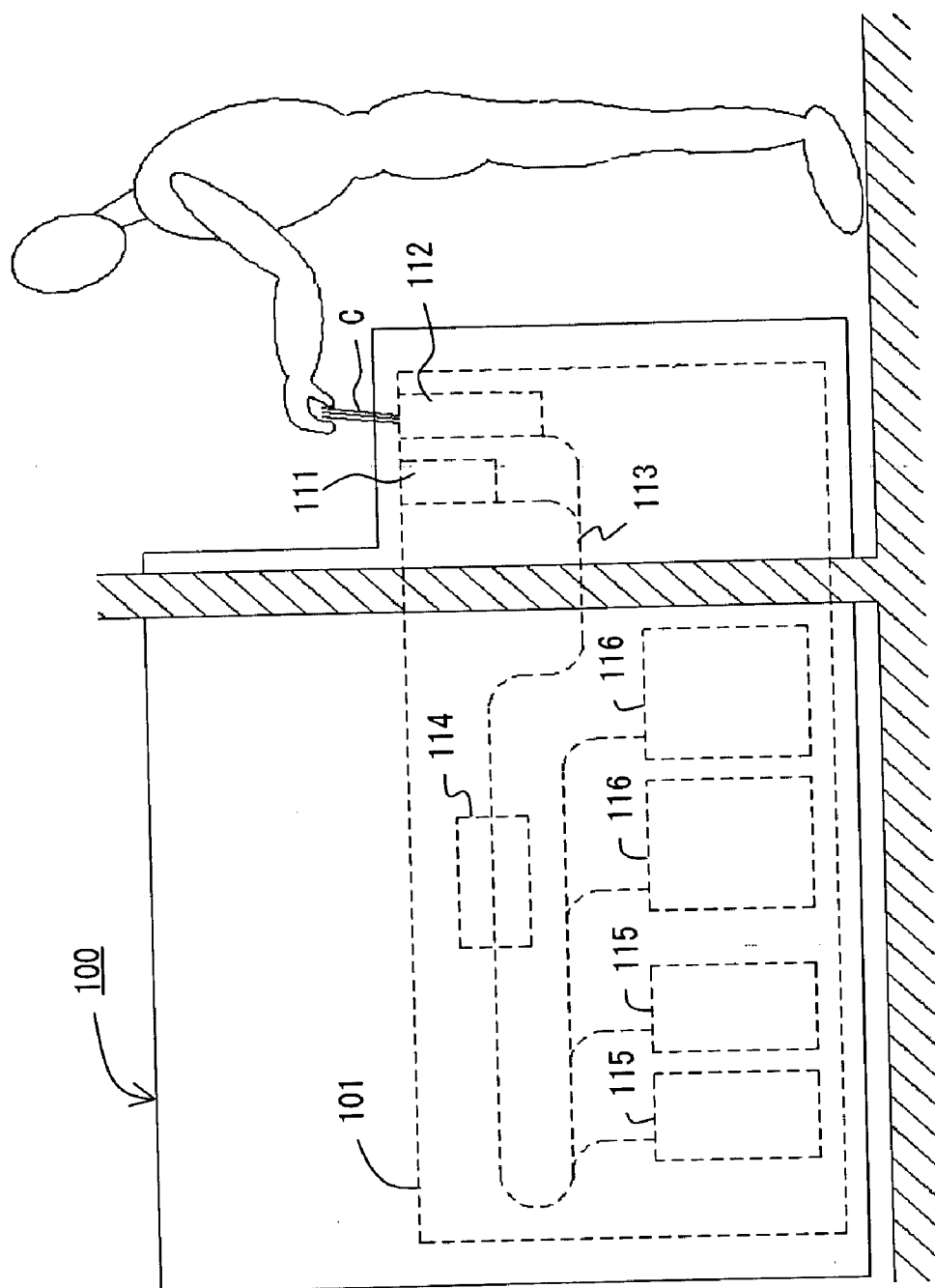


FIG. 1

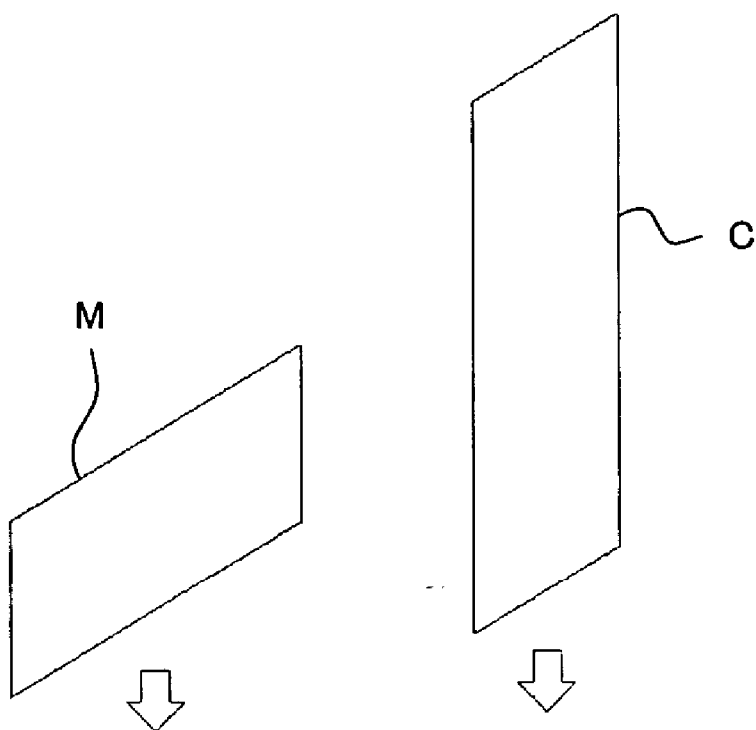


FIG. 2

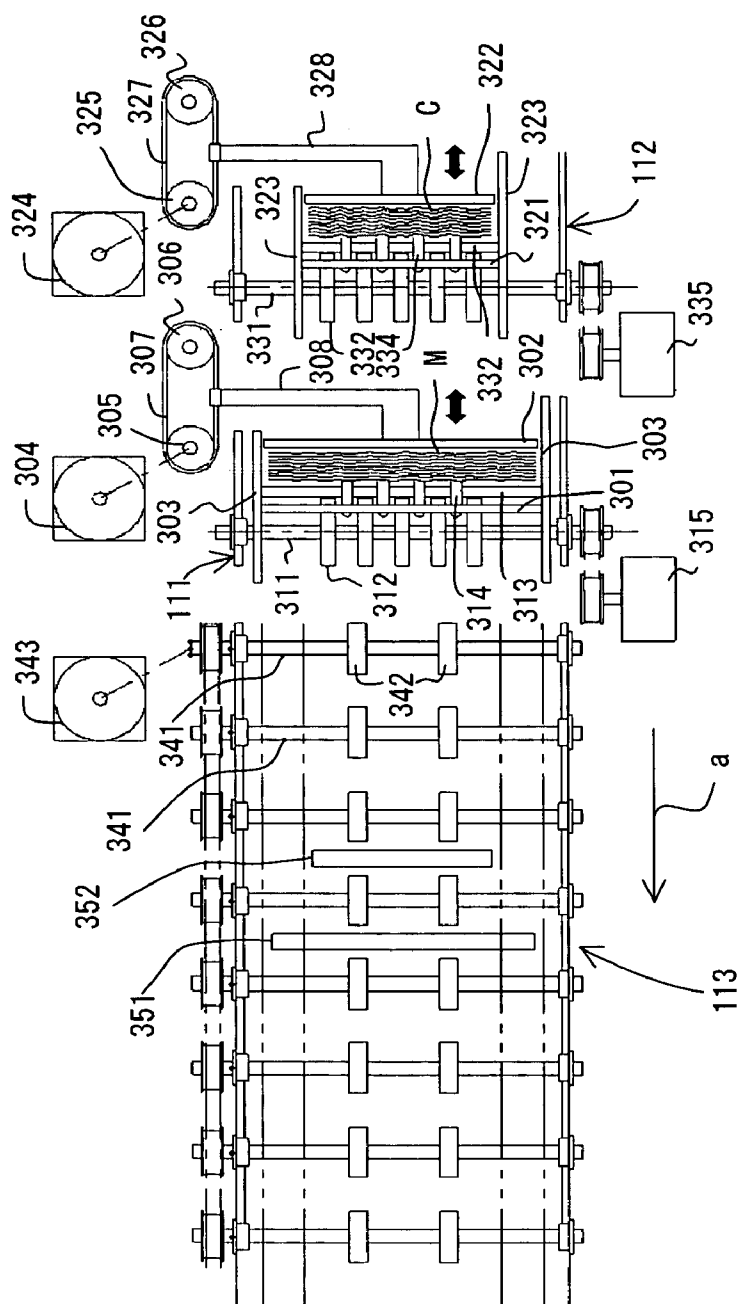


FIG. 3

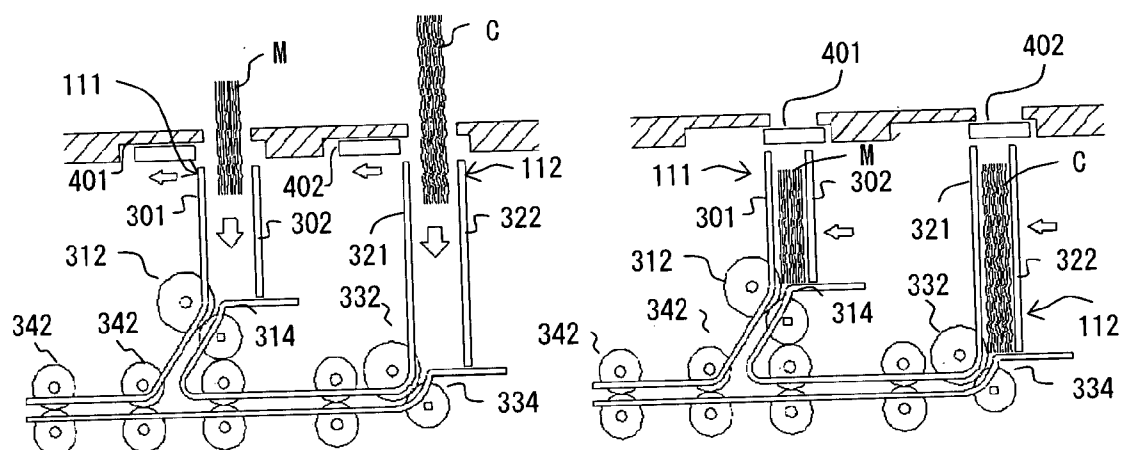


FIG. 4

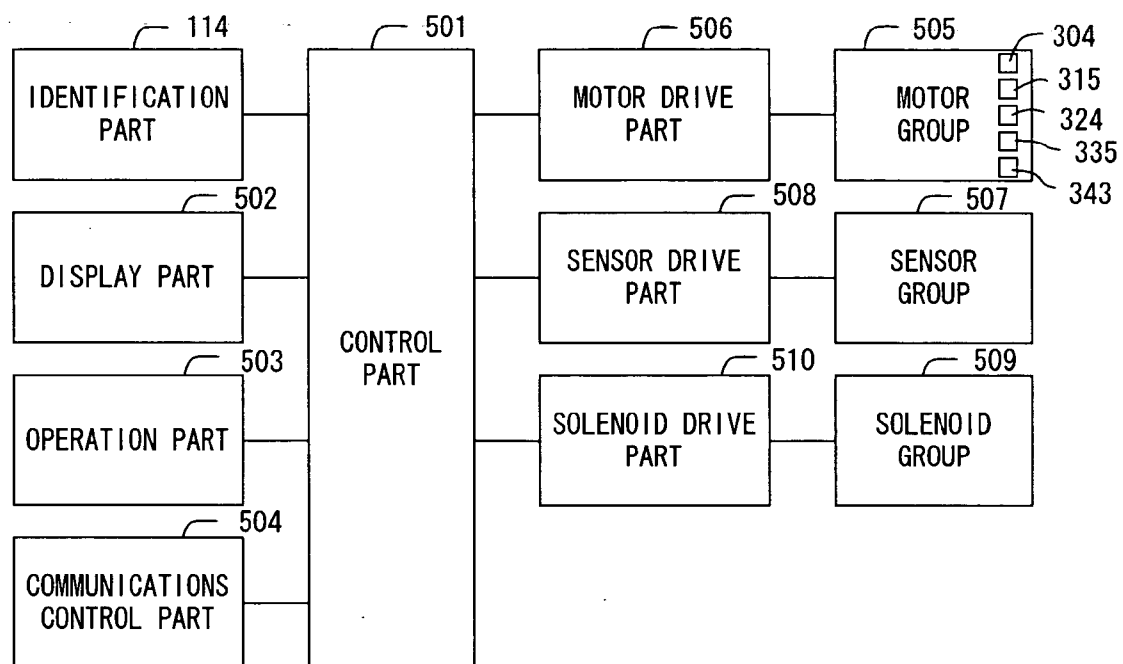


FIG. 5

PAPER SHEETS PROCESSOR

CROSS REFERENCE TO THE RELATED APPLICATION

[0001] This application is a continuation of international PCT application No. PCT/JP02/08815 filed on Aug. 30, 2002.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a paper sheets processor for taking in and processing paper sheets such as a banknote inserted into an insertion part.

[0004] 2. Description of the Related Art

[0005] A paper sheets processor for taking in paper sheets inserted into an insertion slot and providing the paper sheets with a given process is in widespread use in society. For example, a paper sheets processor dealing with banknotes as paper sheets is in widespread use as a cash processor used for teller operation, or as a processor mounted on an automated device such as an automatic depositor (AD) and an automated-teller machine (ATM).

[0006] In the paper sheets processor dealing with banknotes, in general, banknotes to be deposited in bulk are collectively inserted into an insertion slot. The banknotes inserted into the insertion slot are run out one by one and judged. When the banknote is determined to be a true banknote by such a judgment, the banknote is carried to an accommodation part where the banknote should be accommodated, and accommodated. The number of the banknotes accommodated in the accommodation part is counted for each denomination. A deposit amount calculated by using the count result is shown to the customer who deposited the banknotes.

[0007] The banknotes run out from the insertion slot are carried along a carrying route. Therefore, the insertion slot guides the banknotes inserted therein to be located appropriately in relation to the carrying route.

[0008] A conventional paper sheets processor is provided with only one insertion slot mentioned above. However, since the insertion slot needs to guide the banknotes inserted therein, banknotes with highly different sizes cannot be inserted into the insertion slot. A mechanism to run out the banknotes from the insertion slot should be designed by considering a thickness, a medium and the like of banknotes. That is, even when sizes of banknotes are not highly different, the banknotes cannot be run out appropriately from the insertion slot if their thickness or mediums are different. Therefore, the conventional paper sheets processor provided with only one insertion slot can deal with few types of banknotes (paper sheets).

[0009] Currently, as business, anyone can do "exchange of foreign money", that is, buying foreign moneys or travel checks to convert them to domestic currency; or adversely selling the foreign moneys or the travel checks to people in need thereof. Combined with such a background, it is thinkable that future paper sheets processors will be required to deal with more various types of banknotes.

SUMMARY OF THE INVENTION

[0010] It is an object of the present invention to provide a paper sheets processor capable of dealing more various paper sheets.

[0011] The paper sheets processor of the present invention is based on the promise that the paper sheets processor takes in and processes paper sheets such as a banknote inserted into insertion parts. The paper sheets processor comprises: a plurality of insertion parts provided according to differences of outer shapes or materials of the paper sheets, or differences of directions in which the paper sheets should be inserted; and a carrying unit for carrying the paper sheets respectively inserted into the plurality of insertion parts to given carrying destinations.

[0012] In the foregoing construction, it is desirable that part of a carrying route on which the carrying unit carries the paper sheets from the respective plurality of insertion parts to the given carrying destinations is shared in common. Further, it is desirable that a judging unit for judging the paper sheets inserted from the respective plurality of insertion parts is provided on the common carrying route.

[0013] A method of fabricating a paper sheets processor of the present invention is based on the promise that the method of fabricating a paper sheets processor is applied to fabrication of a paper sheets processor for taking in and processing paper sheets such as a banknote inserted into insertion parts. In the method of fabricating a paper sheets processor of the invention, a plurality of insertion parts are provided according to differences of outer shapes or materials of the paper sheets or differences of directions in which the paper sheets should be inserted, and part of a carrying route used for carrying the paper sheets from the respective plurality of insertion parts to given carrying destinations is shared in common.

[0014] In the invention, the plurality of insertion parts are provided according to the differences of outer shapes or materials of the paper sheets or the differences of directions in which the paper sheets should be inserted, and the paper sheets inserted into the respective plurality of insertion parts are carried.

[0015] It becomes possible to take in more various paper sheets through the insertion parts by providing the plurality of insertion parts according to the differences of outer shapes, materials, or directions in which the paper sheets should be inserted. Thereby, it becomes possible to deal with more various paper sheets.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 is an outline cross section of a depositor mounting a paper sheets processor according to this embodiment of the present invention;

[0017] FIG. 2 is a view explaining a method of inserting paper sheets into respective insertion parts;

[0018] FIG. 3 is a view explaining constructions of the respective insertion parts and a carrying route, and a location relationship thereof;

[0019] FIG. 4 is a view explaining operations of the respective insertion parts; and

[0020] FIG. 5 is a construction view of the depositor mounting a paper sheets processor according to this embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Descriptions will be hereinafter given of an embodiment of the present invention with reference to the drawings.

[0022] FIG. 1 is an outline cross section of a depositor mounting a paper sheets processor according to the embodiment.

[0023] A depositor 100 can take in multiple types of paper sheets which cannot be inserted into the same insertion part since these paper sheets have different sizes, thickness, mediums and the like, for example, a combination of banknotes and paper moneys such as checks; a combination of banknotes of different countries; or combination of different types of paper moneys. Here, for convenience, suppose that the multiple types of paper sheets are constructed from the combination of banknotes and paper moneys.

[0024] As shown in FIG. 1, the depositor 100 mounts inside a banknote deposit unit 101 for taking in and accommodating banknotes or paper moneys inserted (deposited) by users. The banknote deposit unit 101 comprises: two insertion parts 111 and 112 for inserting banknotes or paper moneys, a carrying route 113 provided for carrying the banknotes or the paper moneys inserted into the insertion part 111 or 112; a judgment part 114 provided on the carrying route 113 for determining authenticity and damage state of the banknotes or the paper moneys being carried; two accommodation parts 115 prepared for accommodating the banknotes or the paper moneys inserted into the insertion part 111; and two accommodation parts 116 prepared for accommodating the banknotes or the paper moneys inserted into the insertion part 112. The paper sheets processor according to the embodiment is mounted on the depositor 100 as the banknote deposit unit 101.

[0025] For example, banknotes are inserted into the insertion part 111, and paper moneys such as checks and paper similar thereto (for example, "chit" or the like which is circulating in Korea) are inserted into the insertion part 112. As indicated by arrows in FIG. 2, a banknote M is inserted into the insertion part 111 along the direction perpendicular to the longitudinal direction thereof, and a paper money (hereinafter suppose it is a "chit") C is inserted into the insertion part 112 along the longitudinal direction thereof.

[0026] When the banknotes M are inserted into the insertion part 111 or the chits C are inserted into the insertion part 112, and then a user directs the depositor 100 to take in the banknotes M or the chits C, the depositor 100 starts taking in the banknotes M or the chits C. After that, for example, the banknotes M inserted into the insertion part 111 are run out one by one from the insertion part 111 and carried toward the judgment part 114. Regarding the banknotes M which have been carried to the judgment part 114, the accommodation part 115 where the banknotes M should be accommodated is determined according to the judgment result. Then, the banknotes M are carried to the determined accommodation part 115, and accommodated therein.

[0027] The number of the banknotes M accommodated in the accommodation part 115 is counted for each denomination. When accommodation of the banknotes M inserted into the insertion part 111 are finished, the number of the banknotes M counted for each denomination and a total sum (deposit amount) are notified to the user to make the user confirm the notified contents. After that, when the user directs the depositor 100 to continue the process (transaction), a given process is performed and transaction regarding deposit is completed. As for a process regarding the chits C inserted into the insertion part 112 is basically similar thereto.

[0028] FIG. 3 is a view for explaining constructions of the respective insertion parts 111 and 112 and the carrying route 113, and a location relationship thereof. This is an overhead view of these constructions and the location relationship thereof. To be more precise, the physical relationship shown here is a location relationship in the longitudinal direction of the banknote M inserted into the insertion part 111. Regarding the carrying route 113, only the part in the vicinity of the judgment part 114 is excerpted and shown. In such a part, the banknote M and the chit C are carried in the direction indicated by arrow a.

[0029] The banknote M targeted for deposit is inserted into a space (hereinafter referred to as "insertion space") surrounded by a partition plate 301, a pressure plate 302 for pressing the banknote M toward the partition plate 301, and a pair of guide plates 303 facing to each other. Power from a motor 304 is transmitted to the pressure plate 303 through a roller 305, a belt 307 put around the roller 305 and a roller 306 provided in the vicinity thereof, and a part 308 linked with the belt 307. Thereby, the pressure plate 302 is moved toward the partition plate 301 and moved in the opposite direction thereto through drive control of the motor 304.

[0030] A total of five running-out rollers 312 installed on a shaft 311 and a total of four separation rollers 314 installed on a shaft 313 are arranged below the insertion space. The separation roller 314 does not rotate clockwise from point of view of the motor 304 side unless a given force is applied thereto. Power of a motor 315 is transmitted to the shaft 311. The rotation direction shall be hereinafter expressed from point of view of the motor 304 side unless otherwise noted.

[0031] As shown in FIG. 4, a shutter 401 is provided above the insertion space of the insertion part 111. When the banknote M is inserted into the insertion part 111, the shutter 401 is opened. When the insertion is finished, the shutter 401 is closed. After the shutter 401 is closed, the banknotes M inserted into the insertion part 111 pressed by the pressure plate 302.

[0032] When the banknote M pressed by the pressure plate 302 is run out, power from the motor 315 is transmitted to the shaft 311 to rotate the running-out rollers 312 counter-clockwise. Due to this left-handed rotation, power to move objects downward is transmitted to the banknote M located closest to the partition plate 301 side. Even if the banknote M located adjacent to this banknote M located closest to the partition plate 301 side is moved together due to the transmission of power, the banknote M located adjacent to such a banknote M located closest to the partition plate 301 side is stopped in its position due to friction resistance with the separation rollers 314. Thereby, only the banknote M located closest to the partition plate 301 side is run out.

[0033] Meanwhile, similarly to the banknote M, the chit C is inserted into an insertion space surrounded by a partition plate 321, a pressure plate 322 for pressing the banknote M toward the partition plate 321, and a pair of guide plates 323 facing to each other. As in the insertion part 111, power from a motor 324 is transmitted to the pressure plate 323 through a roller 325, a belt 327 put around the roller 325 and a roller 326 provided in the vicinity thereof, and a member 328 linked with the belt 327. Thereby, the pressure plate 322 is moved through drive control of the motor 324.

[0034] A total of five running-out rollers 332 installed on a shaft 331 and a total of four separation rollers 334 installed

on a shaft 333 are arranged below the insertion space. As the separation roller 314, the separation roller 334 does not rotate clockwise unless a given force is applied thereto. Power of a motor 335 is transmitted to the shaft 331.

[0035] As shown in FIG. 4, a shutter 402 is provided above the insertion space of the insertion part 112 as well. When the chit C is inserted into the insertion part 112, the shutter 402 is opened as well. When the insertion is finished, the shutter 402 is closed as well. After the shutter 402 is closed, the chit C inserted into the insertion part 112 pressed by the pressure plate 322. Operation in running out the chit C pressed by the pressure plate 322 is basically the same as the operation in the banknote M.

[0036] As shown in FIG. 3, the carrying route 113 is provided with shafts 341. The respective shafts 341 are provided with two carrying rollers 242 in the vicinity of the center thereof. Power from a motor 344 is transmitted to the respective shafts 341.

[0037] In this embodiment, as shown in FIG. 3, the insertion part 111 is provided so that a center in the longitudinal direction of the banknote M inserted therein corresponds with a center of the carrying route 113. The insertion part 112 is provided so that a center in the direction of the chit C inserted therein corresponds with the center in the longitudinal direction of the banknote M inserted into the insertion part 111. Thereby, both the banknote M and the chit C are carried in the center of the carrying route 113.

[0038] Since the center of the banknote M corresponds with the center of the chit C, it is possible to arrange the carrying rollers 342 on the shaft 341 provided on the carrying route 113 by corresponding to these aligned centers. It is not necessary to prepare the carrying rollers 342 for the banknote M and for the chit C respectively. Therefore, the number of the carrying rollers 342 provided on the shaft 341 can be kept to the minimum. This is the reason why the centers of the banknote M and the chit C correspond with each other. In this embodiment, the banknote M and the chit C can be carried while a construction of the carrying route 113 is prevented from being complicated by making their centers correspond with each other.

[0039] Compared to a case that the banknote M and the chit C are carried on separate carrying routes, when the banknote M and the chit C are carried on the same route 113, a construction of the depositor 100 becomes simplified, and the inner space thereof becomes more utilizable. The number of accommodated banknotes M and the chits C becomes larger, and it becomes enough that the number of the judgment part 113 is one. These are the reasons why the banknote M and the chit C have the carrying route 113 in common.

[0040] 351 and 352 in FIG. 3 are image sensors for reading images provided on the judgment part 114. The image sensor 351 is intended to read an image of the banknote being carried. Meanwhile, the image sensor 352 is intended to read an image of the chit C being carried.

[0041] The image sensor 351 is intended to recognize stain and a damage state of the banknote M. Meanwhile, the image sensor 352 is intended to recognize a damage state of the chit C, and a date and a chit number printed thereon. Since it is not necessary to read the image high-precisely in recognition of the damage state, a low resolution sensor is

adopted for the image sensor 351. Meanwhile, since the image needs to be read high-precisely in recognition of the date and the chit number, a high-resolution sensor is adopted for the image sensor 352.

[0042] The high-resolution image sensor is expensive. However, as evidenced by FIG. 3, when the chit C is carried along the longitudinal direction thereof, a range which should be read by the image sensor becomes narrowed compared to the case wherein the chit C is carried along the direction perpendicular to the longitudinal direction thereof. That is, a more inexpensive image sensor can be adopted. This is also a reason why the chit C is carried along the longitudinal direction thereof in this embodiment.

[0043] It becomes possible to deal with more various types of banknotes M, chits C and the like by providing the two insertion parts 111 and 112. In this embodiment, as described above, the banknote M and the chit C are carried on the same carrying route 113 while the location relationship between the banknote M and the chit C inserted into the insertion parts 111 and 112 is devised. Therefore, a complicated construction of the depositor 100 and rise of manufacturing cost, which are associated with dealing with more various types of banknotes M, chits C and the like are restrained.

[0044] FIG. 5 is a construction view of the foregoing depositor 100.

[0045] As shown in FIG. 5, the depositor 100 comprises: a control part 501 for controlling the whole depositor 100; the judgment part 114 for judging the banknote M or the chit C run out from the insertion part 111 or 112; a display part 502 such as a liquid crystal display (LCD); an operation part 503 with a touch panel or the like installed on a screen of the display part 502; a communications control part 504 for communicating with other devices through, for example, LAN; a motor group 505 having the motors 304, 315, 324, 335, and 343 shown in FIG. 3; a motor drive part 506 for driving the motors constructing the motor group 505 according to directions from the control part 501; a sensor group 507 constructed from various sensors arranged in respective parts of the depositor 100; a sensor control part 508 for controlling the sensors constructing the sensor group 507; a solenoid group 509; and a solenoid drive part 510 for driving the solenoids constructing the solenoid group 509 according to directions from the control part 501. The solenoids constructing the solenoid group 509 are provided in order to switch carrying destinations of the banknote M or the chit C.

[0046] The operation part 503, for example, performs scanning of the touch panel as needed, and outputs the scanning result to the control part 501. The control part 501 analyzes the scanning result, and thereby detects operation conducted by a user and executes control corresponding to the detection result. Thereby, the depositor 100 is operated according to the direction of the user.

[0047] When it is clarified that the user directs deposit after the scanning result is analyzed, the control part 501 makes the display part 502 show a screen to inquire, for example, a deposit method. The user selects any of the following options: only the banknote M; only the chit C; and both the banknote M and the chit C. The shutters 401 and 402 respectively covering the insertion parts 111 and 112 are opened according to the selection result.

[0048] When the user selects both the banknote M and the chit C as a deposit method, the control part 501 directs the

motor drive part **506** to drive the motors for opening and closing the shutters to open the shutters **401** and **402** (refer to **FIG. 4**). On the display part **502**, a message prompting the user to insert the banknote **M** and the chit **C** into the insertion parts **111** and **112** is shown.

[0049] The control part **501** makes the shutters **401** and **402** closed after, for example, the user operates the operation part **503** to direct taking in the banknote **M** and the chit **C** (refer to **FIG. 4**). After the shutters **401** and **402** are closed, the control part **501** directs the sensor control part **508** to make the sensors respectively arranged in the insertion parts **111** and **112** perform sensing to determine presence of the banknote **M** and the chit **C** respectively. When it is determined that the banknote **M** or the chit **C** is inserted into only one of the insertion parts **111** and **112**, taking-in is started for such only one of the insertion parts **111** and **112**. When the banknote **M** or the chit **C** are inserted into both the insertion parts **111** and **112**, taking-in is started in the order of, for example, firstly the banknote **M** and secondly the chit **C**.

[0050] Before the banknote **M** is taken in, the banknote **M** inserted into the insertion part **111** is pressed by the pressure plate **302** based on a direction to the motor drive part **506** to drive the motor **304**. Similarly, before the chit **C** is taken in, the chit **C** inserted into the insertion part **112** is pressed by the pressure plate **302** based on a direction to the motor drive part **506** to drive the motor **304**.

[0051] When the banknote **M** is taken in, the control part **501** makes the motor drive part **506** drive the motor **343**, a power source for the carrying route **113**. The motor **315**, a power source for the running-out rollers **312** is driven intermittently. Thereby, the banknotes **M** are run out one by one from the insertion part **111** as needed.

[0052] The judgment part **114** judges the banknote **M** which is run out from the insertion part **111** and carried on the carrying route **113**, and outputs the judgment result to the control part **501**. Based on this judgment result, the control part **501** determines the accommodation part **115** becoming a carrying destination of the banknote **M** run out from the insertion part **111**. The control part **501** directs the solenoid drive **510** to drive the solenoid corresponding to the accommodation part **115**. Thereby, the judged banknote **M** is accommodated in the accommodation part **115**. In addition, the number of the banknotes **M** run out from the insertion part **111** is counted for each denomination.

[0053] The control part **501** determines whether the banknote **M** remains in the insertion part **111** or not by inputting a detection result of the sensor arranged in the insertion part **111** from the sensor control part **508**. Thereby, running out the banknote **M** from the insertion part **111** is performed until no banknote **M** exists therein. If the chit **C** is inserted into the insertion part **112**, taking in the chit **C** is started after taking in the banknote **M** is finished.

[0054] When the chit **C** is subsequently taken in, the control part **501** intermittently drives the motor **335**, a power source for the running-out rollers **332**, and thereby the chits **C** are run out one by one from the insertion part **112** as needed.

[0055] The judgment part **114** judges the chit **C** which is run out from the insertion part **112** and carried on the carrying route **113**, and outputs the judgment result to the control part **501**. Based on this judgment result, the control

part **501** determines the accommodation part **116** becoming a carrying destination of the chit **C** run out from the insertion part **112**. The control part **501** directs the solenoid drive **510** to drive the solenoid corresponding to the accommodation part **116**. Thereby, the judged chit **C** is accommodated in the accommodation part **116**. The number of the chits **C** run out from the insertion part **112** is counted for each value.

[0056] The control part **501** determines whether the chit **C** remains in the insertion part **112** or not by inputting a detection result of the sensor arranged in the insertion part **112** from the sensor control part **508**. Thereby, running out the chit **C** from the insertion part **112** is performed until no chit **C** exists therein.

[0057] When taking-in is finished by running out the last banknote **M** remaining in the insertion part **111** and accommodating that banknote **M** in the accommodation part **115**, or accommodating the last chit **C** remaining in the insertion part **112** in the accommodation part **116**, the control part **501** directs the motor drive part **506** to stop driving the motor being driven. On the display part **502**, the number of the banknotes **M** or the chits **C** counted for each denomination and deposit amount are shown, and the user is made to confirm these. After that, when the user notifies the confirmation by operating the operation part **503**, a process such as transmitting the deposit amount from the communications control part **504** to an external device (for example, host computer) is performed, and the transaction regarding deposit is completed. On the display part **502**, a menu screen is displayed.

[0058] In this embodiment, the two insertion parts **111** and **112** are provided. However, three or more insertion parts can be provided. It is also possible that a plurality of insertion parts are provided by preparing an expansion unit having an insertion part and a mechanism to run out paper sheets inserted therein, and installing one-or more of the expansion units on a main body according to need.

[0059] As described above, in the present invention, the plurality of insertion parts are provided according to differences of outer shapes or materials of paper sheets, or differences of directions in which the paper sheets should be inserted, and the paper sheets respectively inserted into the plurality of insertion parts are carried.

[0060] It becomes possible to take in more various paper sheets through the insertion parts by providing the plurality of insertion parts according to the differences of outer shapes, materials, or directions in which the paper sheets should be inserted. Therefore, more various paper sheets can be dealt.

What is claimed is:

1. A paper sheets processor for taking in and processing paper sheets such as a banknote inserted into insertion parts, comprising:

a plurality of insertion parts provided according to differences of outer shapes or materials of the paper sheets, or differences of directions in which the paper sheets should be inserted; and

a carrying unit for carrying the paper sheets respectively inserted into the plurality of insertion parts to given carrying destinations.

2. The paper sheets processor according to claim 1, wherein part of a carrying route on which the carrying unit carries the paper sheets from the respective plurality of insertion parts to the given carrying destinations is shared in common.

3. The paper sheets processor according to claim 2, wherein a judgment unit for judging the paper sheets inserted into the respective plurality of insertion parts is provided on the common carrying route.

4. A method of fabricating a paper sheets processor for taking in and processing paper sheets such as a banknote inserted into insertion parts, wherein

a plurality of insertion parts are provided according to differences of outer shapes or materials of the paper sheets or differences of directions in which the paper sheets should be inserted, and

part of a carrying route used for carrying the paper sheets from the respective plurality of insertion parts to given carrying destinations is shared in common.

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