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(54) **Self-service mail accepting machine**

(57) A self-service mail-accepting machine is disclosed for accepting and storing various kinds of mail pieces: a mixed batch of letters and flats which can be processed with a high-speed and a high-degree of automation; a large or heavy individual mail piece which can be processed one at a time; and a mail container filled with franked mail pieces. The machine comprises a feeding unit, a scanning unit, a weighing unit, an indicia printing unit, a diverting unit and a storing unit for high-speed batch mail acceptance. The machine further comprises an individual mail acceptance platform for large-sized or heavy mail pieces including small parcels and further comprises a multitude of auto-locking drawers for accepting mail containers filled with franked mail items. The feeding unit is characterized by a constant-force pressuring mechanism to feed a mixed input of mails and flats with various sizes and weights. The image of a mail piece captured by the scanning unit is used to confirm the correct orientation of the mail piece, and to measure the lengths of long side and short side of the mail piece, and to recognize barcode attached on the mail piece and to detect a double feed. If incoming mail piece orientation is not correct for printing indicia or an error is occurred during weighing, capturing image and measuring size or a double feed is detected, the mail piece is discharged out for retrying without printing indicia. The mail piece processed successfully is stored to one of the several mail storages according to a predetermined criterion

such as registered mail or ordinary mail.

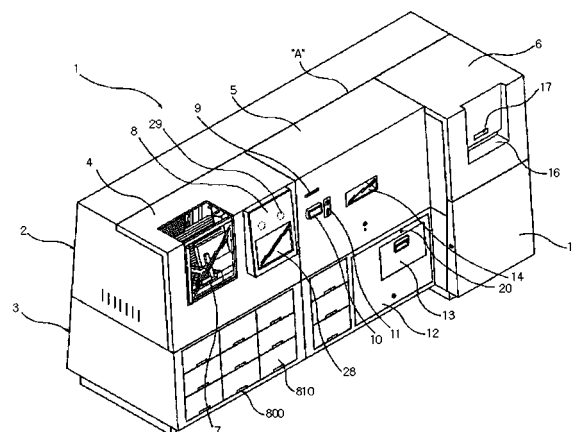


Fig 1

Description

Field of the Invention

[0001] The invention relates to a self-service mail-accepting machine for accepting and storing various kinds of mail pieces: a mixed batch of letters and flats which can be processed with a high-speed and a high-degree of automation; a large or heavy individual mail piece which can be processed one at a time; and a mail container filled with franked mail pieces.

Background of the invention

[0002] Recently, the volume of person-to-person letters decreases fast owing to wide spread of e-mail using the internet and the majority of letters are produced by public organizations such as companies, banks, governments and etc. Specifically, a majority of mails are sent to a person by a public organization, and most of such mails have the same contents. Meanwhile, the volume of the special mail such as registered mail is increasing fast owing to the need of its safety and fast delivery. There are some kinds of mail accepting machines such as automatic postal teller machine and franking machine for accepting incoming mails.

[0003] Automatic postal teller machine is used for accepting and storing mail pieces one at a time in a self-service manner like automatic teller machine used by the banks. Referring to a recent version of the automatic postal teller machine, the machine accepts a mail piece through an automatic shutter from the customer and measures the weight and size of the mail piece. The weight, size of the mail piece and the postal service selected by the customer through a user interface are used to calculate the postage by the computer included in the machine.

[0004] The calculated postage amount is displayed on a user interface and the customer pays the postage with some coins and bills or using a card. The Automatic postal teller machine then prints a postage label used instead of stamp and discharges it to the customer. If the customer selects a special mail service such as registered mail, which needs an additional barcode label to attach on the mail piece, the machine also prints and discharges it. After receiving the labels, the customer takes out the mail piece from the machine and attaches the labels on the mail piece and put the mail piece into the machine again. The machine then verifies the identity of the mail piece before and after attaching labels and stores it into a secure storage. After finishing the acceptance process, the machine prints out a receipt the customer.

[0005] As a typical prior art relating to the automatic postal teller machine, refer to the U.S. patent no. 6105014 entitled as "Automated Package Shipping Machine".

[0006] The franking machine is a desktop apparatus for fast processing of incoming letters and lightweight flats at the customer's place through a network commu-

nication. The machine has no secure automatic storage for mail pieces. Referring to a recent high-class version of the franking machine, the machine accepts a batch input of letters and flats on its input stacker from the customer. The customer should use a dedicated card for using the franking machine, which has a unique ID. After inserting his card, the customer should enter his personal ID and password. The card information and the customer's personal information are sent to a remote server and the server verifies the information. If the bank account connected to the card does not have enough balance or the personal ID is not correct, the customer is not permitted to use the machine. On successful verifying, the customer selects the postal service he wants to use and arranges the orientation of the mail pieces to put them on the input stacker of the franking machine. The stacked mail pieces are separated one by one and then fed to the weighing and sizing station, where the mail weight and size are measured while the mail piece is moving. The CPU of the franking machine then calculates the postage by the kind of postal service, mail weight and size information. The mail piece is then moved to indicia printing station and digital indicia are printed on a predetermined position of the address side of the mail piece while the mail piece is moving. Finished mail pieces are stacked on an output stacker.

[0007] As typical prior arts relating to the franking machine, refer to the U.S. patent no. 6241235 entitled as "Apparatus for Separating Printed Media", the U.S. patent no. 6265675 entitled as "Apparatus for Weighing Moving Postal Matter", the U.S. patent no. 6178410 entitled as "Arrangement for Communication Between Stations of a Mail Processing Machine".

[0008] The two typical prior arts described above have some merits and shortcomings. The automatic postal teller machine can be used even outdoor for 24-hour use after the post office is closed without special user identification. And also the machine can accept small parcels as well as letters and flats, and the customer can select a large number of postal services provided by the machine. But the automatic postal teller machine cannot accept a batch of mails at one time with high-speed and therefore the user spends a long time to process the mails one by one interactively with the machine.

[0009] The franking machine can process a batch of mails with a high speed without the coins or bills. But the customer should be careful to arrange the orientation of the input mail pieces in order not to print the postal indicia on the wrong place on the envelope. Furthermore, the machine cannot accept a heavy or thick mail pieces and has no barcode recognition function and automatic safe storage for the finished mail pieces.

Summary of the Invention

[0010] Accordingly, it is an object of the present invention to provide a self-service mail-accepting machine, which can accept and store a mixed batch of ordinary

letters/flats of different sizes with high-speed, and can also accept and store an individual letter or flat with large weight/size or a small parcel, and can further accept and store mail containers filled with franked letters and flats.

[0011] It is another object of this invention to provide a self-service mail-accepting machine, which can separate and feed a mail piece from a mixed batch of different sizes and weights in a batch mail acceptance.

[0012] It is a further an object of this invention to provide a self-service mail-accepting machine, which can calculate the correct postage in accordance with the size and weight of the mail piece and the selected service and print indicia by an automated method in a batch mail acceptance, and which can print and discharge a postage label for an individual mail acceptance.

[0013] It is still a further object of this invention to provide a self-service mail-accepting machine, wherein the customer can pay the postage using a dedicated card for authentication and debiting by network communication in a batch mail acceptance or using money in an individual mail acceptance and a receipt is printed out to the customer.

[0014] It is still a further object of this invention to provide a self-service mail-accepting machine, which can capture the image of a mail piece in a batch mail acceptance.

[0015] It is still a further an object of this invention to provide a self-service mail-accepting machine, which can detect the orientation, measure the length of long side and short side of a mail piece, detect double feed error and recognize barcodes the mail piece by processing the image captured in a batch mail acceptance.

[0016] It is still a further object of this invention to provide a self-service mail-accepting machine, which can eject a mail piece to the customer without printing indicia in a batch mail acceptance if the mail piece is not in the correct orientation to print the indicia on its address side.

[0017] It is still a further object of this invention to provide a self-service mail-accepting machine, which can eject a mail piece to the customer without printing indicia in a batch mail acceptance if two mail pieces are fed simultaneously without an appropriate gap between them.

[0018] It is still a further object of this invention to provide a self-service mail-accepting machine, which can eject a mail piece to the customer without printing indicia in a batch mail acceptance if the mail piece is failed in weighing or measuring size or recognizing barcode.

[0019] It is still a further object of this invention to provide a self-service mail-accepting machine, which can store mail pieces into an appropriate storage between the two storages according to a predetermined classification criterion in a batch mail acceptance.

[0020] It is still a further object of this invention to provide a self-service mail accepting machine, which can accept an individual mail with a large size or heavy weight by weighing, reading barcode, capturing a digital image of the address side of the mail piece in case of accepting

a registered mail, receiving size information from the customer, printing a postage label and accepting money for postage.

[0021] It is still a further object of this invention to provide a self-service mail accepting machine, which provides a plurality of secure storage such as an automatic locking drawer for acceptance of mail container filled with franked mail pieces.

[0022] In order to achieve the above and other objects of the invention, a self-service mail-accepting machine of the present invention comprises a series of apparatus for a batch mail acceptance with a high-speed and a high degree of automation as following: a feeding unit for loading a batch of mail pieces by the customer and for separating and feeding a mail piece from the mail stack; a scanning unit for capturing an image of address side of the mail piece; a weighing unit for measuring weight of the mail piece; a printing unit for printing a postal indicia on the address side of the mail piece, a diverting unit for ejecting a failed mail piece to an external outlet; and a storing unit for storing the finished mail piece into a classified storage.

[0023] The self-service mail accepting machine of the present invention may comprises common-use devices as a self-service machine including; a computer for running the machine operation program, image processing program and implementing user interface; a controller for direct control of internal hardware and receiving signals from the sensors; a power supply unit; a video and audio user interface for interacting with the customer; and a receipt issuing unit for printing and discharging a receipt to the customer; some payment units.

[0024] Further, the self-service mail-accepting machine of the present invention includes a separate platform for individual mail pieces of heavy weight or large size, which cannot be accepted by the apparatus for batch mail acceptance. The platform for individual mail acceptance includes a door, which is opened automatically on loading a mail piece by a customer and closed during weighing and barcode reading; an electronic scale for weighing the mail piece; a motor-driven belt conveyor unit which is installed on the loading plate of the electronic scale and serves the place for loading the mail piece by the customer; a pair of barcode readers for reading barcodes attached on the address side of the mail piece; a postage label supplying unit for printing and discharging a postage label to the customer; and a stamp supplying unit for printing and discharging a stamp to the customer.

[0025] Furthermore, the self-service mail-accepting machine of the present invention includes a multitude of storages for mail container acceptance, which includes auto-locking drawers.

Brief description of the drawing

[0026] In order that the present invention may be fully understood and readily put into practical effect, now there shall be described as non-limitative example only pre-

ferred embodiments of the present invention, the description being reference to the accompanying illustrative drawing in which:

FIG. 1 is a perspective view of the self-service mail-accepting machine according to a preferred embodiment of the present invention.
 FIG. 2 is a perspective view of the machine without the upper case in FIG. 1.
 FIG. 3 is a perspective view of the feeding unit in FIG. 2.
 FIG. 4 is a partial plan view of the feeding unit taken along the line A-A' designated in FIG. 3.
 FIG. 5 is a perspective view of the pushing part in FIG. 3.
 FIG. 6 is a side view of the pushing part in FIG. 5.
 FIG. 7 is a perspective view of the scanning unit in FIG. 2.
 FIG. 8 is a side view of the scanning unit in FIG. 7.
 FIG. 9 is a partial plan view of the scanning unit taken from the viewpoint "A" in FIG. 8.
 FIG. 10 is a perspective view of the weighing unit in FIG. 2.
 FIG. 11 is a side view of the weighing unit in FIG. 10.
 FIG. 12 is a perspective view of the indicia-printing unit in FIG. 2.
 FIG. 13 is a side view of the indicia-printing unit in FIG. 12.
 FIG. 14 is a perspective view of the indicia-printing unit taken from front side in FIG. 12.
 FIG. 15 is a perspective view of the diverting unit in FIG. 2.
 FIG. 16 is a dissected view of the diverting unit in FIG. 15.
 FIG. 17 is a perspective view of the storing unit in FIG. 2.
 FIG. 18 is a dissected view of the storing unit taken along the line A-A' designated in FIG. 17.
 FIG. 19 is a dissected view of the storing unit taken along the line B-B' designated in FIG. 17 illustrating classified storing
 FIG. 20 is a perspective view of the individual accepting part in FIG. 2.
 FIG. 21 is a dissected side view of the individual accepting part in FIG. 20 showing the conveyor unit and electronic scale.
 FIG. 22 is a dissected side view of the individual accepting part in FIG. 20 showing the front and rear doors.
 FIG. 23 is a perspective view of the mail container storage part in FIG. 2.
 FIG. 24 is a partial perspective view of the mail container storage part in FIG. 23.
 FIG. 25 is a side view of the mail container storage part in FIG. 23.
 FIG. 26 is a flow diagram of the batch mail acceptance.
 FIG. 27 is a flow diagram of the individual acceptance

and mail container acceptance.

Detailed Description of the Preferred Embodiments

[0027] A preferred embodiment of the present invention will now be described in detail with reference to the accompanying drawings.
 [0028] Referring now to FIG. 1, a self-service mail-accepting machine 1 comprises an upper part 2 and a lower part 3. At the front side - customer's side - of the upper part 2, the machine includes a left door 4, a center door 5 and a right door 6. The three doors 4, 5 and 6 can be opened respectively for maintenance by lifting them up about internal hinges attached along the line A.
 [0029] On the left door 4, the machine comprises an auto-locking slide door 7 with transparent cover, and a user interface unit 8, which comprises a LCD monitor 28 with a touch screen attached on it and two speakers 29 for visual and vocal interaction between the user and the machine.
 [0030] On the center door 5, the machine includes a receipt outlet 9, a card input slot 10, a coin input slot 11, and a common outlet 14 for materials such as postage labels, stamps and airmail labels. Though not shown in the figures, the machine 1 includes behind the center door 5: a small unit for printing and dispensing receipts and transaction reports; a special-purpose unit for printing and dispensing stamps; a small unit for printing and dispensing postage labels; a small unit for dispensing airmail labels; a card reader for postage payment; and a coin acceptor.
 [0031] On the right door, the machine 1 includes an opening 16 for loading an individual mail piece and a small LCD panel 17 for showing the status of the accepting process of individual mail piece by a few lines of text.
 [0032] At the front side - customer's side - of the lower part 3, the machine 1 includes a mail container storage unit 800, which comprises a plurality of auto-locking drawers 810 for storing mail containers; a door 12 which can be opened by lifting it about its upper hinges; a compartment 13 for accepting discharged mail pieces which are failed in mail processing. The compartment 13 can be open by pulling it about its lower hinges. A small lamp 20 blinks when there are some discharged mail pieces in the compartment 13. The lower part 3 also includes a door 15 below the right door 6 of the upper part 2. The door 15 can be opened about its right-side hinges.
 [0033] As shown later in FIGS. 15-16, the lower part 3 further includes a central computer 21, a central controller 22, power box 23, and an uninterrupted power supply unit 24 behind the door 12, and includes two mail storage units, which can be pulled out to the front of the machine during emptying them for delivery, behind the door 15.
 [0034] Referring now to FIG. 2, the lower part 3 has a flat surface 18 on the top to attach the mail processing apparatus. A series of the apparatus - a feeding unit 100, a scanning unit 200, a weighing unit 300, an indicia printing unit 400 and a diverting unit 500 mounted on the flat

surface 18 and a storing unit 600 mounted on the flat surface 19 - is used for high-speed acceptance of mixed input of letters and flats with different sizes and weights. An individual mail acceptance platform 700 mounted on the flat surface 19 is used for accepting only one mail piece at one time which cannot be processed by the apparatus for batch mail acceptance due to large sizes and heavy weights.

[0035] Referring now to FIGS. 3-4, the feeding unit 100 receives a mixed input of letters and flats as a one-batch stack from the customer and separates a mail piece one by one from the stack and moves it to downstream. The feeding unit 100 comprises an unstacking part 110, a separating part 120 and a stack pushing part 130. The base 101 is mounted on the flat surface 18 of the lower part 3. The feeding unit 100, scanning unit 200 and weighing unit 300 are all mounted on the base 101. The base 101 can be pulled out to the front of the machine 1 by attaching a pair of rail units (not shown) for maintenance work.

[0036] The unstacking part 110 includes a loading base 111, a rear wall 115, two small unstacking rollers 116, two large unstacking rollers 117, a motor 118 and the belt mechanism 119 to drive the rollers 116 and 117 simultaneously. The mail pieces are stacked on the top face loading base 111 standing on their edge and facing the rear wall 115 by their address side and turned upside down as shown in FIG. 3. The top surfaces of the loading base 111 and rear wall 115 form the right angle. Preferably, they are inclined to the rear by an angle e.g. 15 degrees, and embossed to form a plurality of beads 113 parallel to the moving direction of mail pieces for easy moving. Stacked mail pieces are pushed against the rear wall 115 by the push bar 141. The push bar moves through a groove 114 formed on the loading base 111 until it touches the rear wall 115. If no mail piece is present, the push bar is pulled to the front and turned counterclockwise by 90 degrees to rest on the support face 112 of the loading base 111.

[0037] The foremost mail piece m1 is moved to downstream by the friction force between the rollers 116, 117 and the address side of the foremost mail piece m1 overcoming the friction force between the foremost mail piece m1 and the 2nd mail piece m2. The friction force is generated by the thrust force to the rear wall transmitted by the push bar 131. The push bar 131 is driven by stack pushing part 130 which will be described later in detail.

[0038] The unstacked mail piece m1 moves to the separating unit 120, more specifically to the gap formed by the forward feeding belt unit 122 and the specially shaped plate spring 123 and reverse rotating rollers 125. The plate spring 123 generates a normal force to the mail piece m1 against the forward feeding belts and thus generates friction force between the address side of the mail piece m1 and the forward feed belts. This friction force makes the mail piece m1 move to downstream. The reverse rotating rollers 125 prevent the 2nd mail piece from moving downstream together with foremost mail piece

m1 and thus prevents double-feed. The reverse rotating rollers 125 are attached to the link 124, which is biased by a spring (not shown) to rotate and to be pushed to the forward feeding belts as shown by the arrow B in FIG. 4. The motor 121 drives the forward feeding belt unit 122 and the reverse rotating rollers 125 through a belt mechanism.

[0039] After being separated, the mail piece m1 moves to the gap formed by a pick-up roller 126 which is driven also by the motor 121 through a belt mechanism and an idle roller 128 attached on the link 128, which is biased by a spring (not shown) to rotate and pushed to the pick-up roller 126 as shown by the arrow C in FIG. 4. The pick-up roller 126 feeds the mail piece m1 to downstream by the friction generated by the spring force. The thickness of the mail piece m1 is measured by a displacement sensor unit e.g., linear scale (not shown), which detects the change of the distance between the idle roller 127 and pick-up roller 126.

[0040] The feeding unit 100 described hereto is well known in the related fields of industry such as franking machines. For more detailed information, refer to previous art U.S. patent no. 6241235 entitled as "Apparatus for Separating Printed Media".

[0041] Referring now to FIGS. 5-6, the stack pushing part 130 of the feeding unit 100, which is one of the distinctive characteristics of this invention, will be described in detail. The role of the stack pushing part 130 is to push the mail pieces stacked on the top face of the loading base 111 by the push bar 131 and thus to give the normal thrust force to generate the friction force between the unstacking rollers 116, 117 and the foremost mail piece m1.

[0042] In the franking machine of the above-mentioned previous art, the sum of the thickness of the stacked mail pieces cannot exceed a limit e.g. 150mm. Owing to such small loading capacity, the push bar can be biased by a spring though its force varies according to its displacement. The spring force reaches a maximum when the mail stack is just loaded by the customer and becomes smaller as the mail pieces are fed to the downstream one by one and finally becomes a minimum value when just one mail piece is left in the mail stack. When the weight of a mail piece is heavier than a critical value, the spring force around the minimum value is too weak to move the mail piece. In this invention, to overcome this weak point in the previous art, the push bar 131 is biased by a constant gravitational force regardless of the remaining number of mail pieces on the loading base 111. The loading capacity of the feeding unit 100 is expanded to 300mm in this invention by virtue of new mail pushing unit 130 without causing the problems occurred in the previous art franking machine.

[0043] The push bar 131 is attached to one face of the sliding block 133, which moves along the guided bar 132 provided inside the loading base 111. The opposite face of the sliding block 133 is connected to an end of an inextensible wire 139. The other end of the wire 139 is

connected to the rod 141 via the idle pulleys 137 and 138, which are rotatably supported by the brackets 140 and 141. The rod 142 is inserted into a hole of the adjustable weight 143 and fastened to the sliding block 135, which is guided by the shafts 136 during its up-down movement. The sum of the weights of slider block 135 and adjustable weight 140 and rod 141 generates a constant thrust force exerted by the push bar 131 to the mail stack regardless of remaining number of mail pieces on the loading base 111. The adjustable weight 140 is consist of several number of the small unit weights e.g. 100g and can be easily adjusted by loosening the bolt 142 and inserting additional weights or removing weights. By virtue of this structure, the loading capacity of feeding unit 100 can be easily expanded without causing errors in mail feeding.

[0044] Referring now to FIGS. 7-9, the scanning unit 200, which is also one of the distinctive characteristics of this invention, will be described in detail. The scanning unit 200 captures an image of the address side of a mail piece while moving the mail piece with a constant speed slightly faster than the pick-up roller 126 of the upstream feeding unit 100. The captured image is transmitted to the central computer 21 and used by a computer program to measure the lengths of the long side and short side of the mail piece and to determine whether the orientation of the mail piece is correct for printing postal indicia on it and further used to recognize the barcodes attached on the mail piece and to detect a double feed error by using the measured sizes of the mail piece.

[0045] The scanning unit comprises a feeding part 210, a camera part 230 and an illumination part 240. The feeding part 210 comprises a main base 213 which is mounted on the base 101; a motor 214 which drives feeding roller 215 through timing pulleys 222, 224 and timing belt 223; a bracket 212 to attach the feeding roller 215; an idle roller 216 which is attached on a rotatable link 217 about a pivot 227; a rotary encoder 218 which is also attached on the link 217 by a bracket 225 and driven by the idle roller 215 through timing pulleys 219, 221 and a timing belt 220. The rotatable link 217 is biased by a tension spring 226 and thus pushes the idle roller 216 to the feeding roller 215 and this pushing force generates friction force between the feeding roller 215 and the mail piece.

[0046] As shown in FIG. 9, the mail piece "M" fed by the upstream pick-up roller 126 moves to the gap between the feeding roller 215 and idle roller 216 and further fed by the feeding roller 215 to the downstream with a constant speed slightly faster than the pick-up roller 126 along the arrow direction "D". The idle roller 216 rotates by the friction between itself and the mail piece and rotates the input shaft of rotary encoder 218 though the timing belt 220 and timing pulleys 219, 221. The bracket 211 provides clean black background for capturing image at the position "C" and guides the address side of the mail piece during movement.

[0047] An image of the mail piece "M" is captured by a digital line scan camera 233 during the time span from

the instant when the leading edge of the mail piece "M" just comes out of the feeding roller to the instant when the trailing edge just pass out the feeding roller. This timing is detected by a photo-sensor 228. The image is captured in such a way that an image line of one-pixel width is captured at a time. During the image capture, the rotary encoder 218 with a high resolution, e.g. 2000 pulses/sec, gives the synchronizing signal to the line scan camera for the line-by-line capturing. For example, if the desired resolution of the image is 300dots/inch, a line captured by a camera should be 1/300 inch in the mail piece and the encoder gives an appropriate timing signal to obtain such an image.

[0048] The camera part 230 comprises a bracket 231, which is fastened to the base 101; a camera bracket 232 by which the pan and tilt of the camera can be easily adjusted; and a digital line scan camera 233. The distance from the camera lens 234 to the mail piece m can be determined in such a way that the sight of the camera 233 covers the largest size of the short side of all acceptable mail pieces.

[0049] The illumination part 240 comprises a lamp unit 243 which emits a rectangle-shaped light to the mail piece; a main bracket 241 which is fastened to the base 101; a lamp-mounting bracket 242 which is attached to the main bracket 241. The position of illuminated area in the mail piece is easily adjusted by adjusting the attaching angle of the lamp-mounting bracket 242 to the main bracket 241.

[0050] Referring now to FIGS. 10-11, the weighing unit 300 of the preferred embodiment of the invention, which is well known in some fields of industry such as franking machines, will be briefly described.

[0051] The weighing unit 300 measures the weight of the mail piece "M" without stopping it. The weighing unit 300 is mounted on the base 101 and comprises a weighing sensor part 310 which is attached inside the case 301 and measures the weight of moving mail piece; a transport part 320 which moves the mail piece to downstream.

[0052] The floating rear wall 303 is floated in a large groove formed at the fixed rear wall 302 and mounted on a specially structured load plate unit of the weight sensor part 310. The mail piece "M" is moved by the transport part 320 along the fixed rear wall 302 and floating rear wall 303 and its weight are measured by the weight sensing part 310 when it is at the position around the center of the floating rear wall 303 not touching the fixed wall 302. The weight sensor part 310 comprises a weight sensor e.g. a load cell and a load plate unit specially structured to avoid any touch with fixed parts in the machine, and thus guarantees precise weighing.

[0053] The motor-driven transport part 320 is also mounted on the load plate of the weight sensor part 310. While there is no mail piece on the transport unit 320, the weight sensor detects the total weight of the load plate and the parts mounted on it. If a mail piece is moved into the floating rear wall 303, the detected weight is changed and this change gives the weight of the mail piece. The

leading edge and trailing edge of the mail piece is detected using the sensors 305 and 306 while moving the mail piece to downstream "D".

[0054] Referring now to FIGS. 12-14, the indicia-printing unit 400 of the preferred embodiment of the invention, which is well known in some fields of industry such as franking machines, will be briefly described.

[0055] The indicia printing unit 400 prints a digital indicia "P" instead of a stamp on the address side of the mail piece "M" without stopping it. The digital indicia are printed on the predetermined area of the address side of the mail piece. The digital indicia include the postage amount, 1-D or 2-D barcodes, mail acceptance date and place, the post office logo, the kind of postal service and etc.

[0056] The indicia printing unit 400 is mounted on a base 405 which can be pulled out to the machine front from a pair of base 404 guided by a pair of rails 406. A pair of bases 404 is fastened on the top face 18 of the lower part 3 in FIG. 2. The rear wall 402 is mounted on the base 405 using a bracket 409.

[0057] The indicia printing unit 400 comprises a transport part 410, a printing part 420, a controller 423 as well as other structural components not shown in the figures.

[0058] The printing part 420 includes a kind of digital inkjet-printing unit used in many recent franking machines. Therefore the detailed structure of said printing unit is not shown here. The printing part 420 is mounted behind the rear wall 402, which guides the address side of the mail piece "M". On the lower portion of the rear wall 420, a low friction plate 407 is attached to guide and support the indicia printing region of the mail piece and an opening 421 is provided for an inkjet head of the printing part 420. The inkjet printing head moves back and down to a waiting position for cleaning when a batch mail acceptance is finished and moves up and forward to the position of the opening 421 on starting a new batch mail acceptance.

[0059] The transport part 410 comprises a motor 411; a special type belt conveyor unit including a belt 413; a plurality of belt attachments 414 which are movably attached to the belt 413 and biased by an elastic force to slide back and forth along the direction 415 on the belt 413; an encoder 412 which generates pulses according to the rotation of the motor 411. A front cover 415 is further provided to protect the moving parts of the transport part 420. A transparent guide 403 mounted on the front cover 415 guides the mail piece. Two sensors 407, 408 are provided on the rear wall 402 to detect the leading edge and trailing edge of the mail piece while moving it to downstream "D".

[0060] On entering the indicia printing unit 400, the mail piece "M" is moved downstream by the belt conveyor unit driven by the motor 411 and pushed to the plate 407 by the attachments 414 for high-resolution indicia printing. After the leading edge of the mail piece "M" is detected by the sensor 407, the indicia printing is started at the time when the pulses from the encoder 412 reaches a

predetermined value. The exact printing position can be obtained by this approach. The next mail piece is controlled not to enter the indicia printing unit 400, until the trailing edge of the mail piece "M" is detected by the sensor 408.

[0061] A mail pieces is determined to be failed in the cases: miss-oriented loading and double feed at the feeding unit 100; fail in image capturing at the scanning unit 200, fail in recognizing barcodes in the case of registered mail; fail in measuring sizes; fail in weighing at the weighing unit 300. For these failed mails, the indicia should not be printed since the contents of indicia are not completely determined. Therefore, these failed mail pieces should bypass the indicia-printing unit 400 without being printed and should be ejected out at the next diverting unit 500.

[0062] Referring now to FIGS. 15-16, the diverting unit 500, which is also one of the distinctive characteristics of this invention, will be described in detail. The diverting unit 500 moves a successful mail piece downstream to the storing unit 600 and ejects said failed mail pieces to a compartment 13.

[0063] The diverting unit 500 is mounted on the top face 18 of the lower part 3 by the base brackets 501, 502 and comprises a belt conveyor unit 503 which is mounted on the bracket 501 and driven by a motor 504 to feed a mail piece "M"; a rear wall 507 mounted on a bracket 513 which is mounted on the bracket 502 and front guide 506; an ejector 511 which pushes the mail piece out of the conveyor unit 503; a pair of guide shafts 508 and guide blocks 510 to guide the motion of the ejector 511; a push-type solenoid 509 which actuates the ejector 511; a bracket 505 to connect the rear wall 507 and front guide 506; a plate 512 to guide a dropped mail piece from the conveyor unit 503 to the opening 513.

[0064] The ejector 511 remains in the retracted position when a mail piece, which is successfully processed in upstream units, enters the diverting unit 500. When a failed mail piece enters the diverting unit 500 and its leading edge is detected by a sensor 514, the solenoid 509 is actuated and the ejector 511 moves forward up to the end of belt conveyor unit 503 and thus the mail piece is dropped to the compartment 13 via the opening 513 guided by the plate 512. The dropped mail pieces are stacked at the compartment 13 and since the compartment 13 includes a hinge 26 at its low end, the customer can takes out the mail pieces by pulling the compartment 13 to the front using a catch 25. The sensor 27 detects the mail piece and the lamp 20 blinks when there is at least a mail piece in the compartment.

[0065] Referring again to FIGS. 15-16, the mechanical arrangement of control apparatus of the preferred embodiment of the invention will now be briefly described. The present invention comprises a control unit that has a central PC 21, a central controller 22, a power box 23 and an uninterrupted power supply unit 24 is mounted behind the compartment 13 in the lower part 3. The central PC 21 is mounted on a drawer-type shelf to be pulled out to the machine front.

[0066] Referring now to FIGS. 17-19, the storing unit 600, which is also one of the distinctive characteristics of this invention, will be described in detail. The storing unit 600 stores a mail piece to one of the several mail storages - two storages in this embodiment - according to a pre-determined criterion determined by the machine administrator.

[0067] The storing unit 600 is mounted on a base 601, which is fastened on the top face 19 of the lower part 3. The storing unit 600 comprises a distributor 602 which has an opening 603 on its left side to receive a mail piece from the upstream diverting unit 500; a plate 604 to change the falling direction of the mail piece and an opening at the bottom. The distributor 602 is attached to the slide rails 612 using the plates 606. The lower part of the distributor 602 extended below the base 601 through the large opening 608. The slide rails 612 are attached to a pair of brackets 605, which is fastened to the base 601.

[0068] On the right side of the distributor 602, a long rack gear 609 is attached to the plate 606, and a motor 611 is attached to the bracket 618, which is fastened to the base 601. A pinion gear 610 engaging with the rack gear 609 is attached on the output shaft of the motor 611. Thus the distributor 602 can be moved back and forth by driving the motor 611 and guided by the slide rails 612.

[0069] In the lower part 3, two mail storages 616 and 617 are mounted on a hanger 615, which is in turn mounted on a pair of rails 614. The rails 614 are attached to the brackets 613, which are fastened to lower part 3.

[0070] The mail piece transported from the diverting unit 500 drops to the front mail storage 616 by moving the distributor 602 to a rear position as shown by hidden lines in FIG. 19. The mail piece drops to the rear mail storage 617 by moving the distributor 602 to a front position due to the plate 604. Further, a mail piece accepted by the individual mail acceptance platform 700 is always dropped to the front mail storage 616 from the opening 619.

[0071] On emptying the mail storages for delivery, the delivery man opens the door 15 with a key and then pulls out the hanger 615 to the front then takes out the filled mail storages e.g. a mail sack from the hanger 615, and hangs a new vacant one.

[0072] Referring now to FIGS. 20-22, the individual mail acceptance platform 700, which is also one of the distinctive characteristics of this invention, will be described in detail. The platform 700 is used by customers to deliver a large-sized or heavy mail piece, which cannot be treated automatically by the batch mail process apparatus, in a fashion that only one mail piece can be accepted at a time.

[0073] The individual mail acceptance platform 700 is mounted on the base 601 just in front of the large opening 608 of the storing unit. The platform 700 includes a frame 701, which forms its skeleton.

[0074] On the front portion 702 of the frame 701, the platform 700 comprises a pair of barcode readers 706, which is attached to the top face of the front portion 702

by the brackets 707; and a front door unit. The front door unit comprises a driving motor 708; a pinion gear 709 attached to the motor shaft engaging with an intermediate pinion gear 710; a rack gear 711 engaging with the intermediate pinion gear 710; a door plate 713 attached to the rack gear 711 which moves up and down by the motor 708; a pair of slide guides 712 which guides the up-down movement; a locking unit 714 which is actuated by a solenoid and prevents the user from opening the door manually; a safety sensor unit 703 which have a light transmitting unit and a receiving unit and prevents a damage of customer's hand on closing the door plate 713 by stopping the door plate 713 immediately if anything is detected; and an optical sensor 723 which detects the incoming mail piece.

[0075] On the rear portion 703 of the frame 701, the platform 700 includes a rear door unit, which has the same structure as the front door unit. The rear door unit comprises a motor 715, a pinion gear 716 attached to the motor shaft, an intermediate pinion gear 717, a rack gear 718, a pair of slide guides 719, a door plate 720; and an optical sensor 724 which detects the mail piece.

[0076] In the bottom of the frame 701, the platform 700 comprises a belt conveyor unit 705, which is driven by a motor 721. The conveyor unit 705 is mounted on the load plate of an electronic scale 725, which is fastened to the bottom of the frame 701. The electronic scale 725 weighs the mail piece placed on the belt conveyor unit 705.

[0077] The barcode readers 706 recognizes the barcode attached on the mail piece by emitting a laser beam 722 while the mail piece is moving back and forth by the belt conveyor unit 725. The front door plate 713 is closed and locked by the locking unit 714 all the time except for the time interval when a customer puts in or takes out a mail piece. The rear door unit is closed all the time except for the time interval when a finished mail piece is stored to the front mail storage 616 by the belt conveyor unit 725.

[0078] Referring to FIGS. 23-25, the mail container storage unit 800, which is also one of the distinctive characteristics of this invention, will now be described in detail. The mail container storage unit 800 is used to deliver a mail container filled with franked mail pieces.

[0079] The mail container storage unit 800 comprises a plurality of drawers 810 which can be locked and unlocked automatically. The drawers 810 are mounted in the lower part 3 by a pair of slide rails 813 and a block 816 is attached to one side of the drawer 810. The block 816 is used to lock the drawer 810 by a solenoid-actuated locker 814 and to detect the open/closed status of the drawer 810 by a mechanical sensor 818. Both the block 816 and the mechanical sensor 818 are attached to lower part 3 for each drawer 810.

[0080] The customer selects an available drawer 810 from the user interface 8 where all available drawers are shown graphically. The selected drawer 810 is unlocked immediately. Then the customer pulls the drawer 810 out to the front by a catch 811 to store a mail container 812 filled with franked mail pieces into the drawer 810. After

storing a mail container 812, the customer pushes the drawer 810 to the end where the drawer 810 is locked again by the locker 814. On finishing the process of mail container acceptance, a receipt is printed and discharged to the customer.

[0081] Referring to FIGS. 15-16 again, the control configuration of a preferred embodiment of this invention will now be briefly described. The central controller 22 directly controls the actions of all actuators, such as motors and solenoids described heretofore by a microprocessor-based control unit, and checks the sensor states. The central PC 21 treats user input and output through the user interface 8 according to the progress of mail acceptance and sends commands or receives status information from the central controller 22. The central PC 21 also directly communicates with off-the-shelf devices e.g. digital camera 233, barcode readers 706, card reader and small printers for receipt, stamp and indicia label. The central PC 21 further processes the image captured by the camera 234 for measuring the size of the mail piece, recognizing barcodes, detecting double feed errors and for determining whether the orientation of the mail piece is correct for printing indicia by indicia printing unit 400. The power box 23 provides DC power for all the motors, solenoids, sensors, and said off-the-shelf devices controlled by the central PC 21. The uninterrupted power supply unit 24 provides AC power to the central PC 21, the power box 23 and the user interface 8, and it also provides AC power for at least some minutes e.g. 5 minutes in case of a power failure.

[0082] Referring now to FIGS. 26-27, the mail acceptance procedure of a preferred embodiment of this invention will be described in detail. This procedure is completely implemented as a main operation program executed by the central PC 21.

[0083] On the step 900, a customer comes to the self-service mail-accepting machine 1 and starts a transaction by inserting his card into the card input slot 10. On starting the transaction, a screen for inputting id and password is shown to the customer on the user interface unit 8.

[0084] On the step 901, a card reader (not shown) extracts information from the card and the customer inputs his ID and password using the touch screen of user interface unit 8. The acquired information is transmitted to a remote server via the central PC 21. The remote server authenticates the information using the related database and sends back an answer. On successful authentication, the main menu screen is shown up and the postage can be paid online using the connected bank account of the card. The customer failed in authentication cannot use the machine 1 and the card is ejected to the customer.

[0085] On the step 902, the authenticated customer selects an acceptance menu. If the customer wants to send a lot of mail pieces with moderate size and weight automatically with a high speed, he should select batch acceptance 910. If his mail piece is too big or heavy, he should use individual acceptance. Furthermore, if all of

his mail pieces are already franked and stacked in a mail container, he should use container acceptance. On selecting the batch acceptance, the slide door 7 shown in FIG. 1 is unlocked.

5 **[0086]** On the step 910 - the first step in the batch acceptance - the customer should select an exact postal service he wants to use, e.g., 1 st class or 2nd class or registered mail, international or domestic, etc.

10 **[0087]** On the step 911, the customer opens the unlocked slide door 7 and arranges mail pieces in an orientation suitable to print indicia by the indicia-printing unit 500 and then stack the mail pieces on the loading base 111 of the feeding unit 100. The correct orientation of the mail piece is such that the address side of the mail piece faces to the rear wall 115 and the top edge of the mail piece touches top face of the loading base 111 of the feeding unit 100. As long as the size and weight of a mail piece does not exceed a limit e.g. 350mm length in long side, 250mm length in short side, 15mm in thickness and 1 Kgf in weight, the customer can load a mixed mail stack of various size and weight. The total thickness of the mail pieces, which can be loaded at a time as a batch can be expanded in the present invention by virtue of a mail pushing mechanism without a spring shown in FIGS. 5-6.

15 25 A mail piece of too big size or heavy weight cannot be unstacked in the feeding unit 100 and causes a jam at the unstacking part 110, therefore the customer should take out the mail piece by himself.

30 **[0088]** On the step 912, the feeding unit 100 separates a mail piece one by one from the mail stack and feeds the separated mail piece to downstream. The thickness of the mail piece is measured in this step by detecting the size of the gap between the pick-up roller 126 and idle roller 127 shown in FIG. 4. The measured thickness is sent to the central computer 21.

35 **[0089]** On the step 913, the scanning unit 200 captures an image of the address side of the moving mail piece. The captured image is transmitted to the central computer 21 and used by a computer program to determine the lengths of the long side and short side of the mail piece, and to determine whether the orientation of the mail piece is correct for printing postal indicia on it, and to detect a double feed error by the measured size of the mail piece, and further used to recognize the barcodes attached on the mail piece.

40 **[0090]** On the step 914, the weighing unit 300 measures the weight of the mail piece without stopping it. The measured weight is sent to the central computer 21.

45 **[0091]** On the step 915, the central computer 21 determines whether the steps 911-914 are successful or not. If any error occurs in measuring thickness, capturing image and in measuring lengths, recognizing barcode, determining orientation and detecting double feed, the mail piece is treated as a failed one. On the failed mail pieces, the indicia are not printed and the mail pieces are diverted to the compartment 13 in FIG. 15 later on the step 917.

[0092] On the step 916, the indicia printing unit 400

prints digital indicia instead of a stamp on the address side of the mail piece without stopping it. The digital indicia is printed on the predetermined area of the address side of the mail piece and includes the postage amount, 1-D or 2-D barcodes, mail acceptance date and place, the post office logo, the kind of postal service and etc. The central computer 21 calculates postage amount using the size, weight and the postal services elected by the customer. The postage amount of a mail piece is debited online from the bank account connected to the card once the indicia are printed on the mail piece.

[0093] On the step 917, the diverting unit 500 diverts the mail piece according to the decision on the step 915. Failed mail pieces are diverted to the compartment 13 and the customer reloads the mail pieces later on the load plate 111 of the feeding unit. Successful mail pieces are printed on the step 916 and fed to the storing unit 600.

[0094] On the step 918, the storing unit 600 stores a mail piece to one of the several mail storages - two storages in this embodiment - according to a categorizing criterion e.g. a registered mail or not, a express mail or not and etc.

[0095] On the step 919, the customer selects "finished" button in the user interface unit 8 if all the mail pieces loaded by him as a batch are processed completely. Otherwise, the steps 912-919 are repeated for the next piece automatically.

[0096] On the step 903, a receipt is printed and discharged to the customer through an outlet 9 in FIG. 1 if he finished a batch mail acceptance.

[0097] On the step 904, the card inserted into the slot 10 at the step 900 is ejected to the customer, and the current transaction is finished. The machine 1 waits for another customer.

[0098] The procedure for the acceptance of individual mail piece is comprised of the steps 920-934.

[0099] On the step 920, an authenticated customer selects the individual mail acceptance menu on the use interface 8 and then the front door plate 713 in FIG. 22 is opened up. The individual mail acceptance platform 700 is used to deliver a large-sized or heavy mail piece in a fashion that only one mail piece can be accepted at a time.

[0100] On the step 921 of the individual mail acceptance, shown in FIG. 27, the customer loads a mail piece on the conveyor unit 705, through the opening 16 in FIG. 1. The conveyor unit 705 moves the mail piece into the platform to close the front door plate 713.

[0101] On the step 922, the customer selects a postal service he wants to use to deliver the mail piece. Furthermore, the customer should input the size category of the mail piece. The electronic scale 725 in FIG. 22 weighs the mail piece.

[0102] On the step 923, the process path is divided according to the service selected by the customer. If the customer selects a service such as a registered mail, which needs a barcode to be attached on the mail piece, the next step is the step 924. For ordinary mails, the next

step is the step 926 bypassing the steps 924-925.

[0103] On the step 924, two barcode-readers 706 read the barcode during the mail piece passes the laser beams 722 by moving it by the conveyor unit 5 in FIG. 21 covering the whole width of the opening 16.

[0104] On the step 925, the process path is divided according to the result of barcode reading. If the barcode is recognized successfully, the path goes ahead to the step 926. Otherwise, the customer should take out the mail piece from the opening 16 and examine the mail piece whether a barcode label is attached on it. An error message is shown on the small LCD panel 17. If a barcode is attached on the mail piece, the customer retries the barcode reading step 925 by reloading the mail piece to the opening 16. If no barcode is found on the mail piece, the process path goes to the step 933.

[0105] On the step 933, the customer request a barcode label on the user interface 8. Then a barcode label is printed and discharged to the outlet 14 in FIG. 1.

[0106] On the step 934, the customer attaches the barcode label on the mail piece and retries the barcode reading step 925 by reloading the mail piece to the opening 16.

[0107] On the step 926, the postage amount is displayed on the user interface 8. The postage amount is calculated by the central PC 21 using the measured weight and the mail size, postal service information inputted by the customer.

[0108] On the step 927, as soon as the customer confirms the postage amount, the amount is paid through an online debiting from the bank account connected to the card or the customer can pay with coins using the coin slot 11 to buy the stamp if the postage amount is small.

[0109] On the step 928, a stamp of the paid amount is printed and discharged to the outlet 14.

[0110] On the step 929, the customer takes out the mail piece from the opening 16 and attaches the stamp and reloads the mail piece into the opening 16.

[0111] On the step 930, the rear door 720 is opened up and the mail piece is moved by the conveyor unit 5 to drop into the mail storage 616 in FIG. 19.

[0112] On the step 931, a receipt is printed and discharged to the outlet 9 and the front door plate 713 is closed.

[0113] On the step 932, the card inserted into the slot 10 at the step 900 is ejected to the customer, and the current transaction is finished. The machine 1 waits for another customer.

[0114] The procedure for acceptance of mail container is comprised of the steps 940-948.

[0115] On the step 940, an authenticated customer selects the mail container acceptance menu on the use interface 8. Then the current status - used or vacant - of all drawers 810 is displayed on the user interface 8.

[0116] On the step 941, the customer selects a vacant drawer 810.

[0117] On the step 942, the solenoid-actuated locker 814 unlocks the selected drawer r 810 .

[0118] On the step 943, the customer pulls out the

drawer 810 to the front.

[0119] On the step 944, the customer stores a mail container filled with franked mail pieces into the drawer 810.

[0120] On the step 945, the customer pushes back the drawer to the end.

[0121] On the step 946, the solenoid-actuated locker 814 locks the selected drawer 810.

[0122] On the step 947, a receipt is printed and discharged to the outlet 9.

[0123] On the step 948, the card inserted into the slot 10 at the step 900 is ejected to the customer, and the current transaction is finished. The machine 1 waits for another customer.

[0124] As described above, using a self-service mail accepting machine according to the present invention, customers can deliver a mixed batch input of letters and flats with a high speed and high degree-of automation by a sequence of automatic operations for feeding, scanning, weighing, indicia printing, diverting and storing the mail piece. Customers can also deliver a large or heavy individual mail piece, which cannot be accepted and stored automatically, by using an individual mail acceptance platform. Further, mail containers filled with franked mail pieces can be accepted and stored in a plurality of automatic drawers.

[0125] While the present invention has been described in connection with a preferred embodiment, it is to be understood that the subject matter encompassed by the present invention is not limited to the specific embodiment, and equivalents as can be included within the spirit and scope of the following claims.

Claims

1. A self-service mail accepting machine comprising a case for encapsulating all apparatus and for providing a plurality of doors for maintenance and emptying of mail storages and for providing a plurality of inlets and outlets for the customer during the mail acceptance process; a user interface unit for visual and vocal interaction with users; a payment unit for customers to pay the postage; a feeding unit for separating and feeding a mail piece from the mixed input stack of letters and flats and for measuring the thickness of the mail piece; a scanning unit for capturing a digital image of a moving mail piece fed from said feeding unit, and the captured image is used to determine the orientation of the mail piece, measure the lengths of the mail piece, recognize barcodes on the mail piece and detect the double feed; a weighing unit for measuring the weight of a moving mail piece fed from said scanning unit; an indicia printing unit for printing a digital indicia on a predetermined region of a moving mail piece fed

from said weighing unit;

a diverting unit for changing the path of the mail piece according to the result of said feeding unit, said scanning unit, said weighing unit in such a way that the successful mail piece is not printed by said indicia printing unit and fed to the storing unit, and the failed mail piece is ejected to an external outlet for re-trying; a storing unit for storing a mail piece fed from the diverting unit to the appropriate storage among the two storages according to a pre-determined criterion such as registered mail or ordinary mail; a receipt dispensing unit for printing and discharging a receipt to a customer and discharging a transaction report to a machine administrator; and a control unit for controlling hardware, supplying power and executing all the process steps of mail acceptance by a software program; **characterized in that,**

said feeding unit comprising a pushing part for generating constant thrust force between the foremost mail piece in the mail stack and unstacking rollers regardless of the remaining number of mail pieces in the initial mixed input stack of letters and flats; said scanning unit comprising a camera part including a digital line scan camera for capturing the image of a moving mail piece, an illumination part for adjusting the lighting condition on the mail piece, a feeding part including a motor driven roller and an idle roller for moving the mail piece with a constant speed and a rotary encoder connected to said idle roller by a timing belt for providing an appropriate timing signal to capture a image;

said weighing unit comprising a conveyor unit attached on the load plate of an electronic scale for measuring the weight of a moving mail piece;

said indicia printing unit comprising a printing part including a movable print head mechanism for printing on a moving mail piece, a feeding part including a conveyor unit for feeding a mail piece with a constant speed and secure pose during printing to obtain high quality output;

said diverting unit comprising a solenoid driven ejector for ejecting said failed mail piece, a compartment for stacking the ejected mail piece, a conveyor for feeding the successful mail pieces to said storing unit;

said storing unit comprising two or more mail storages, a motor driven distributor for changing the drop routes of the mail piece to said mail storages; and said control unit comprising a hardware controller for directly controlling actuators and treating sensor signals, a power box to supply a plurality of AC and DC powers and a central computer for executing mail acceptance process, image processing and communication with external server for postage payment and data exchange.

2. The machine as set forth in claim 1, wherein

said pushing part comprises a push bar connected to a weight by an inextensible wire and a guiding mechanism for pushing the mail stack from the rear side to generate a friction force between the unstacking rollers and the foremost mail piece in the mail stack.

3. The machine as set forth in claim 1, wherein:

said user interface unit comprises a monitor with touch screen for visual interaction and speakers for vocal interaction with customer.

4. The machine as set forth in claim 1, wherein said payment unit comprises a card reader and communication means included in said central computer to pay the postage by an online card transaction including card verification and debiting from the connected bank account.

5. The machine as set forth in claim 1, further comprising an individual mail acceptance platform used by customers to deliver a large-sized or heavy mail piece, which cannot be treated automatically by the batch mail process apparatus, in a fashion that only one mail piece can be accepted at a time.

6. The machine as set forth in claim 3, wherein said individual mail acceptance platform comprises an automatic door to put in a mail piece, an electronic scale for weighing a mail piece, a conveyor unit mounted on the load plate of said electronic scale to move the mail piece to said mail storage, a barcode-reading unit to read the barcode attached on the mail piece in case of a special mail service.

7. The machine as set forth in claim 1, further comprising a mail container storage unit for accepting and storing a mail container filled with franked mail pieces.

8. The machine as set forth in claim 5, wherein said mail container storage unit comprises a plurality of auto-locking drawers for storing the mail container in secure.

9. The machine as set forth in claim 1, further comprising a label dispensing unit for printing and discharging a label to the customer needed for special mail service.

10. The machine as set forth in claim 1, further comprising a stamp dispensing unit for printing and discharging a stamp to the customer.

Amended claims in accordance with Rule 86(2) EPC.

1. A self-service mail accepting machine comprising, a feeding unit for separating and feeding a mail piece from the mixed input stack of letters and flats and for measuring the thickness of the mail piece; a scanning unit for capturing a digital image of each mail fed from the feeding unit and wherein the captured image is used to determine the orientation of each mail, measure the length of each mail, recognize barcodes on each mail and detect the double feed; a diverting unit for changing the path of each mail according to the scanning result of the scanning unit; and a control unit for controlling the components of the machine, **characterized in that**, the feeding unit comprises a reverse rotation part to prevent double feeding from the mixed mail stack and a pushing part to exert a constant force to the forward feeding rollers regardless of the magnitude of the remaining mails; the scanning unit comprises a digital line scan camera for capturing an image of the address side of each mail and a photo sensor and a rotary encoder unit for timing the capture of the camera; and the diverting unit comprising a conveyor belt for transferring successful each mail downstream to a storing unit and a ejector for ejecting out each failed mail to a compartment.

2. The machine according to claim 1, wherein the reverse rotation part comprises a plate spring to give normal force to the mixed mails and a reverse rotating roller to rotate in reverse direction of a forward feeding belt.

3. The machine according to claim 1, wherein the pushing part comprises a plurality of weights moving vertically according to the magnitude of the mixed mails, a push bar moving towards the rear wall according to the movement of the weights and a sliding block to guide the movement of the push bar.

4. The machine according to claim 1, wherein the scanning unit further comprises a rotary encoder to give synchronizing signal to the camera.

5. The machine according to claim 1, wherein the diverting unit further comprises a sensor to detect a failed mail and a solenoid to move the ejector forward up to the end of the a belt conveyor unit.

6. The machine according to claim 1, wherein the storing unit comprises a distributor having an opening for receiving each mail piece from the upstream diverting unit and a plate to change the falling direction of each mail.

7. The machine according to claim 1, wherein the machine further comprises an individual mail acceptance platform for treating mail piece which can be accepted in one piece at a time.

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8. The machine according to claim 7, wherein the platform comprises a pair of barcode readers; a pair of slide guides to guide the up-down movement; a safety sensor unit with a transmitting unit and a receiving unit; and an optical sensor to detect a incoming mail piece.

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9. The machine according to claim 1, wherein the machine further comprises a mail container storage unit having drawers mounted by a pair of slide rails, a block to lock each drawer by a solenoid-actuated lock and to detect the state of each drawer by a mechanical sensor.

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10. The machine according to claim 1, wherein the control unit comprises a hardware controller for directly controlling actuators and treating sensor signals; a power box for supplying a plurality of AC and DC power; and a central computer for executing mail acceptance process, image processing and communication with external serve for postage and data exchange.

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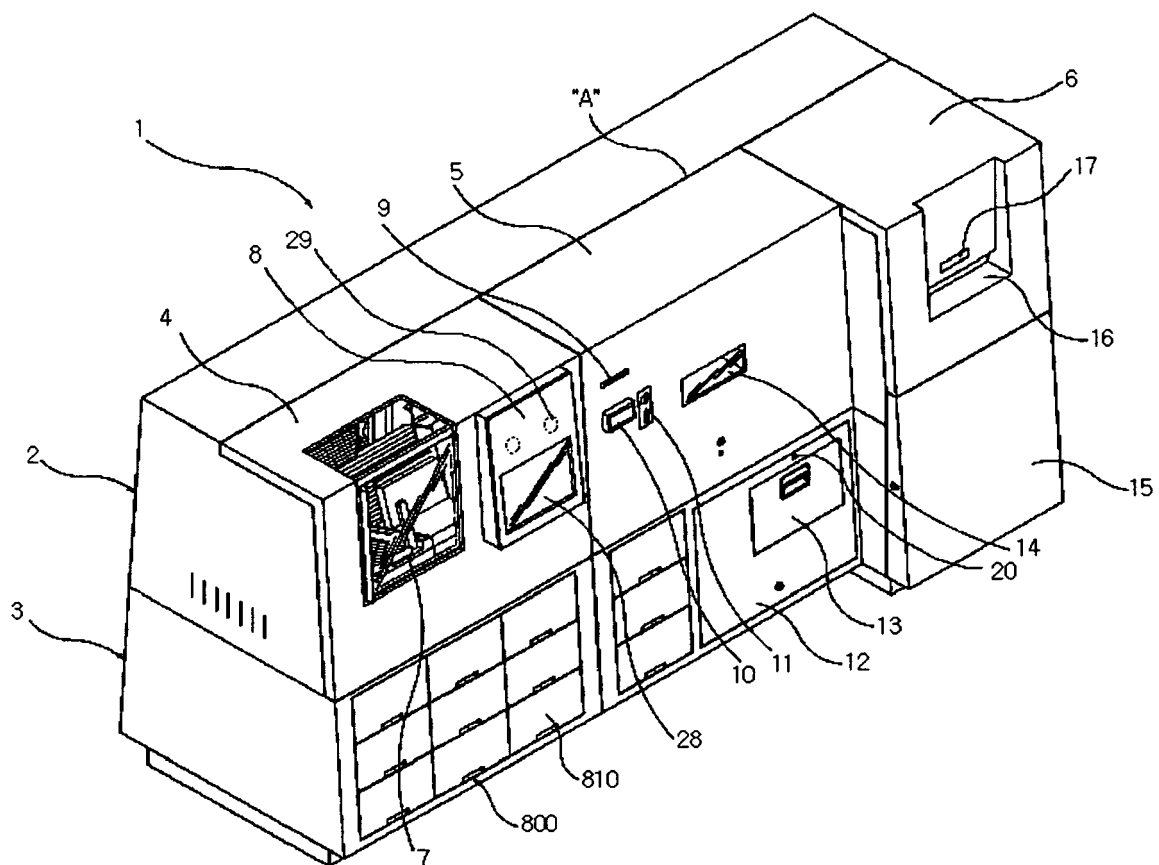


Fig 1

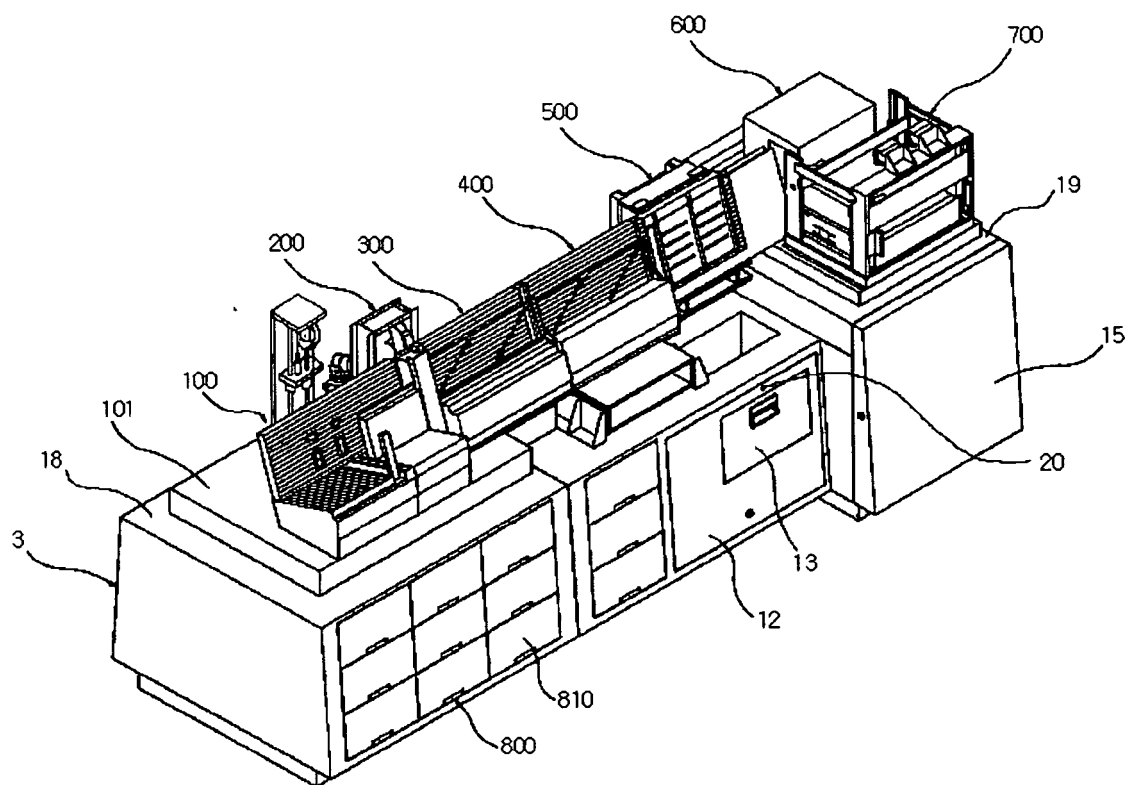


Fig 2

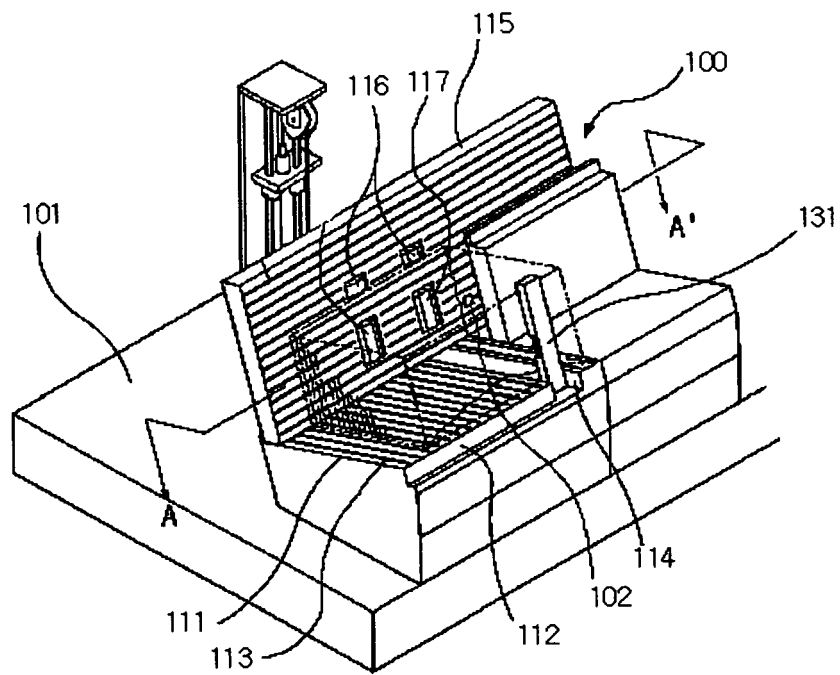


Fig 3

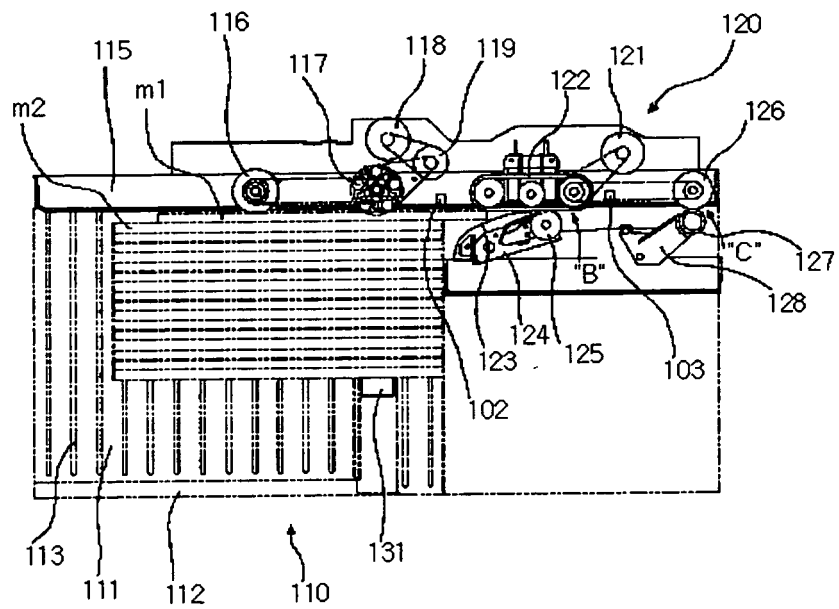


Fig 4

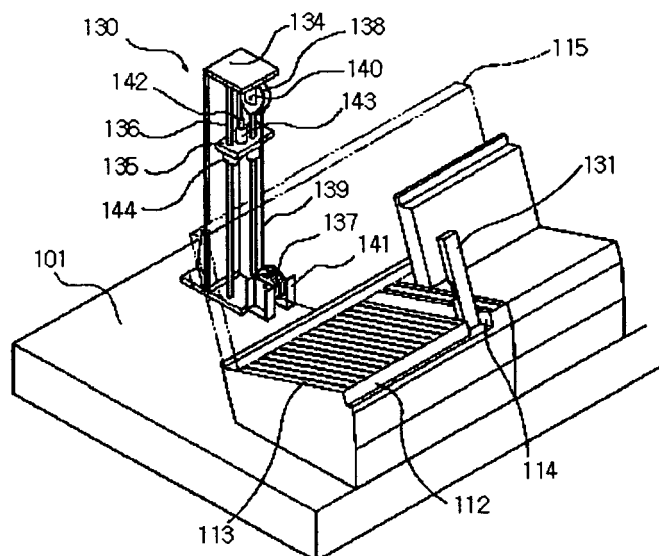


Fig 5

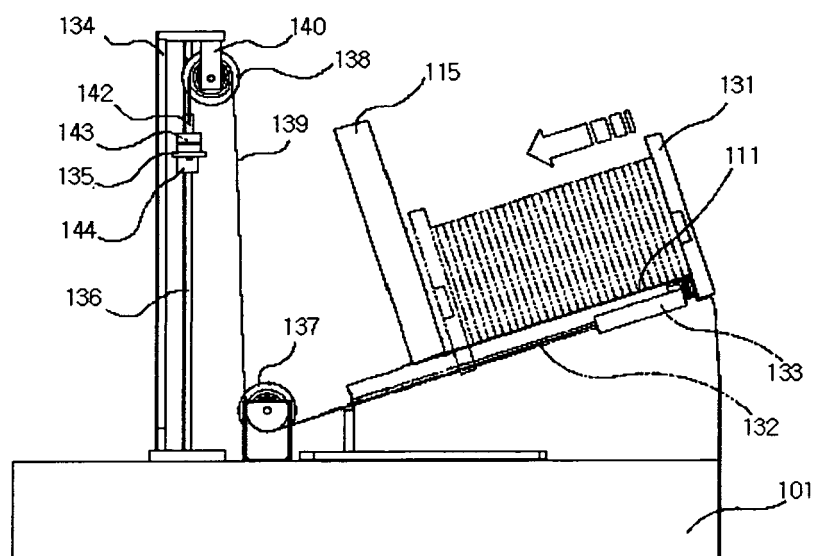


Fig 6

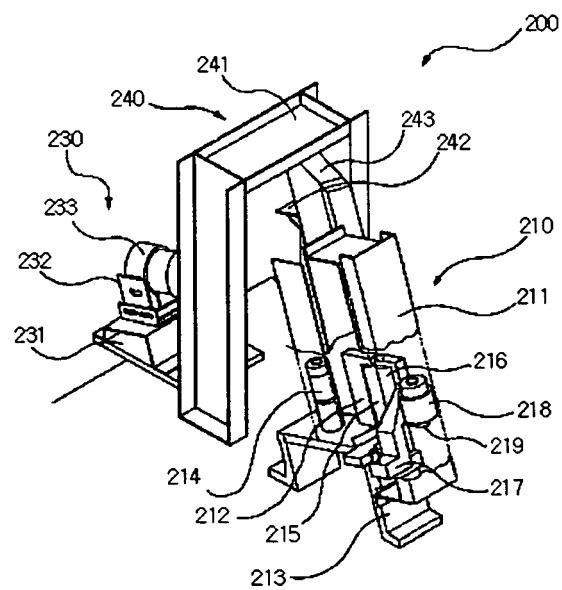


Fig 7

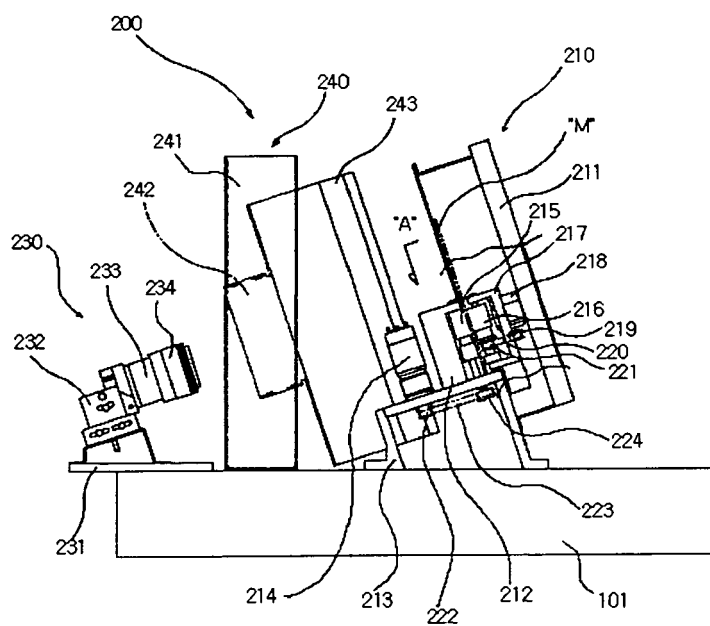


Fig 8

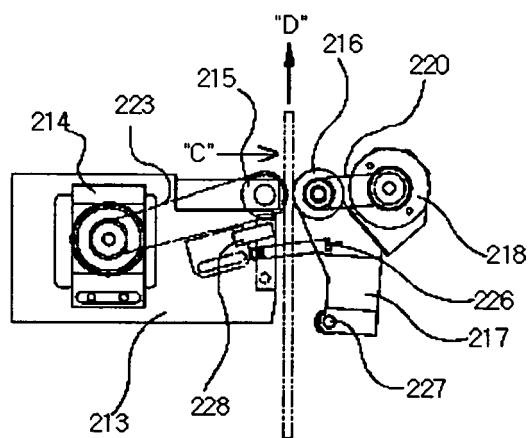


Fig 9

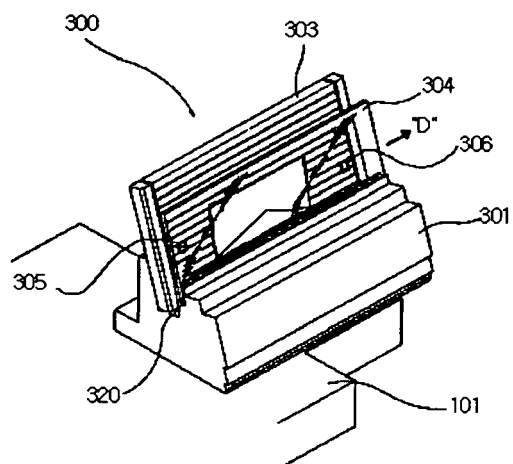


Fig 10

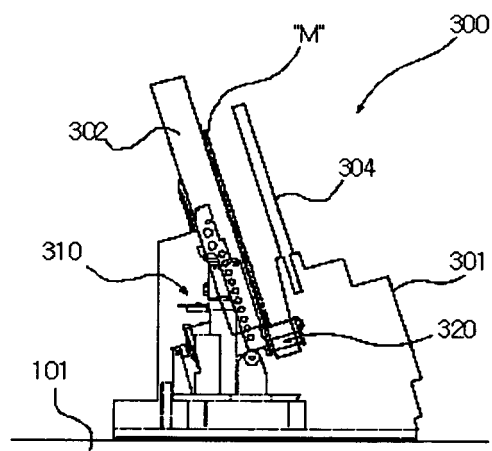


Fig 11

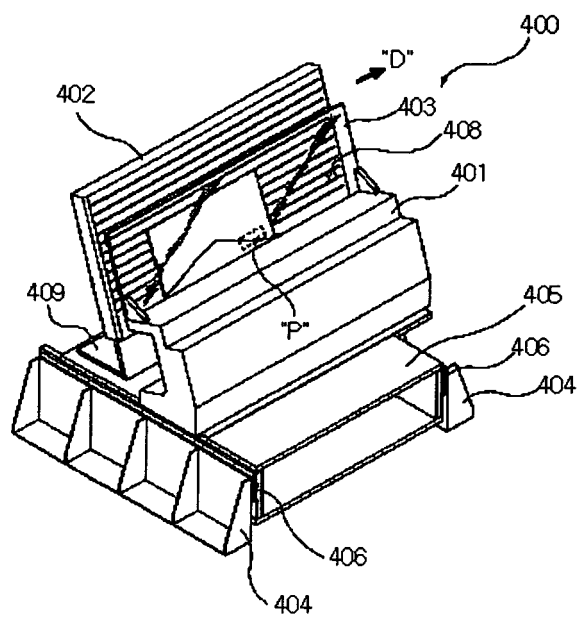


Fig 12

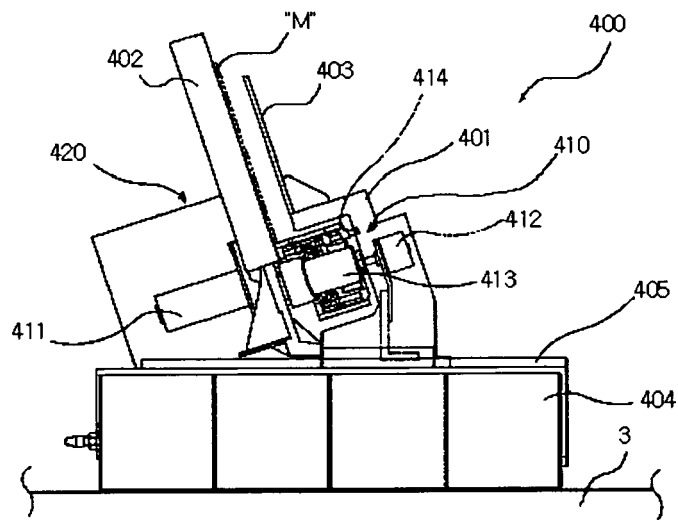


Fig 13

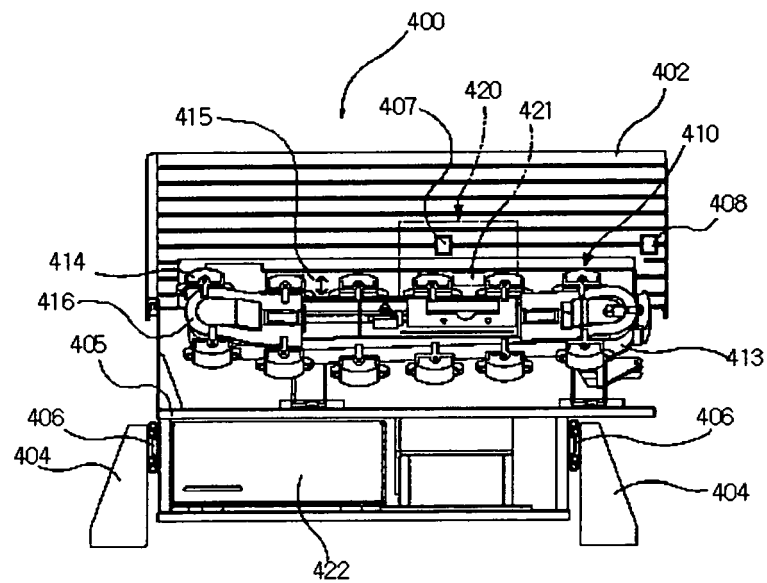


Fig 14

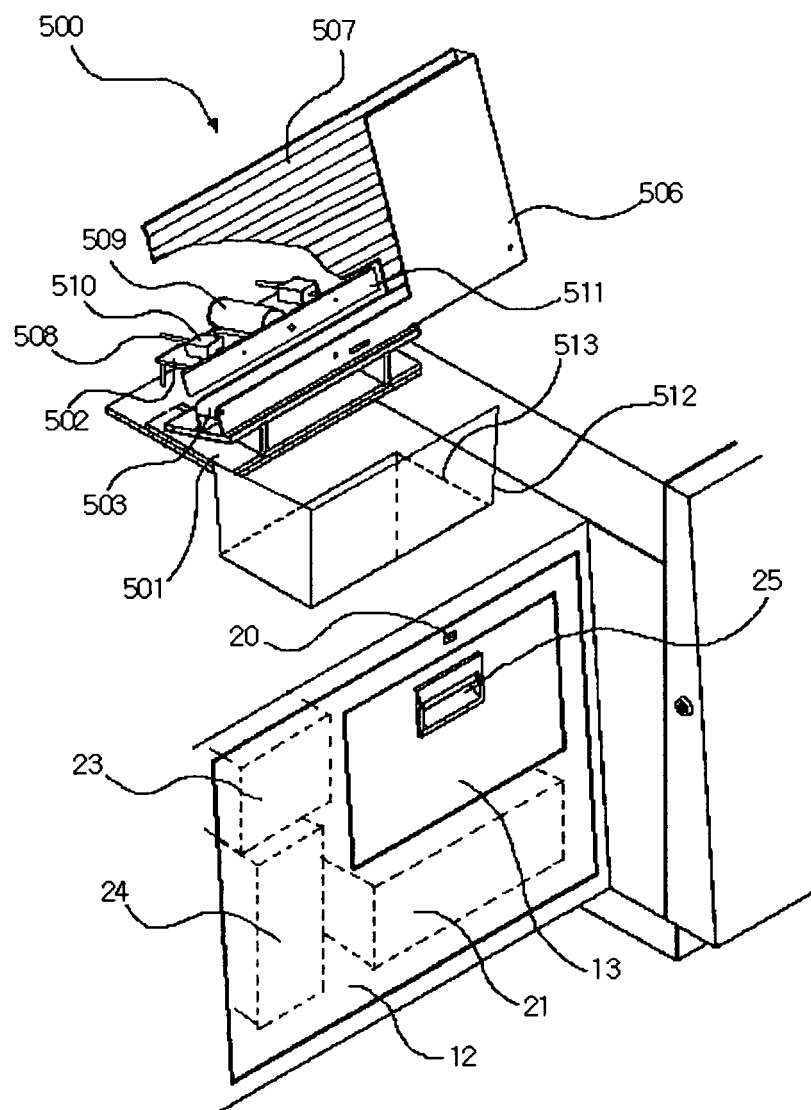


Fig 15

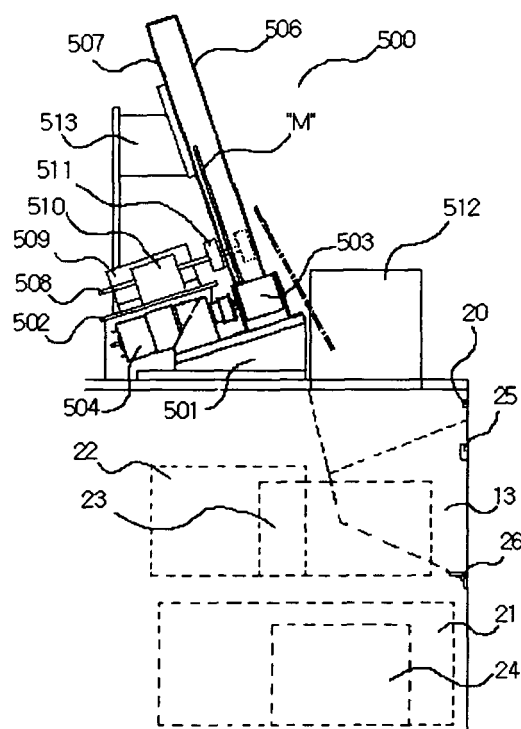


Fig 16

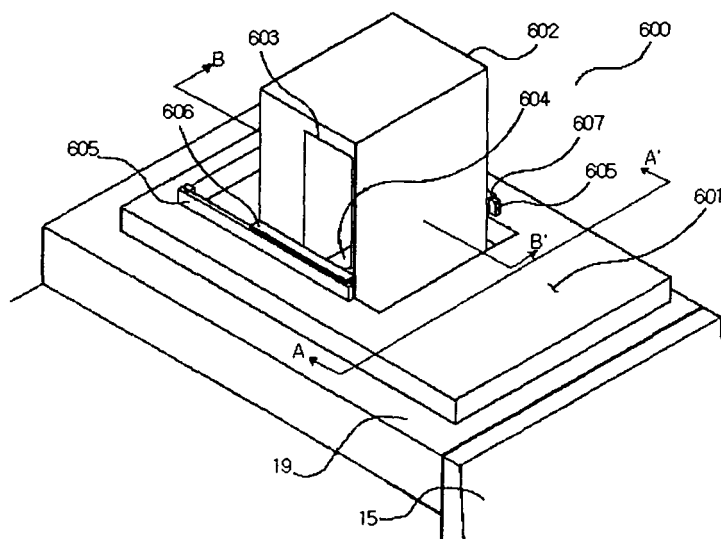


Fig 17

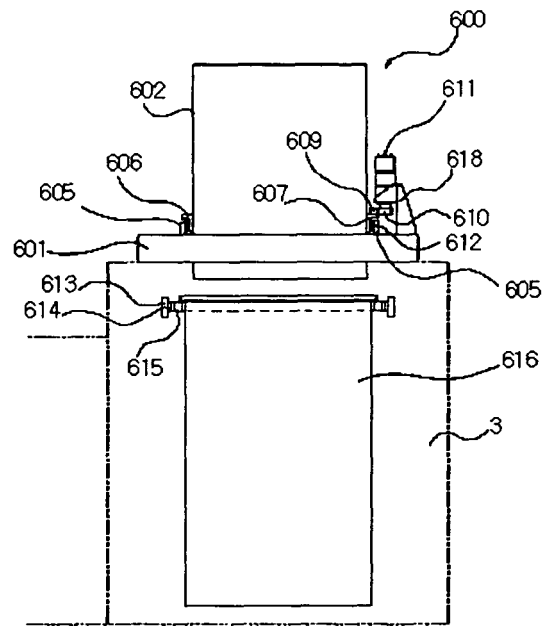


Fig 18

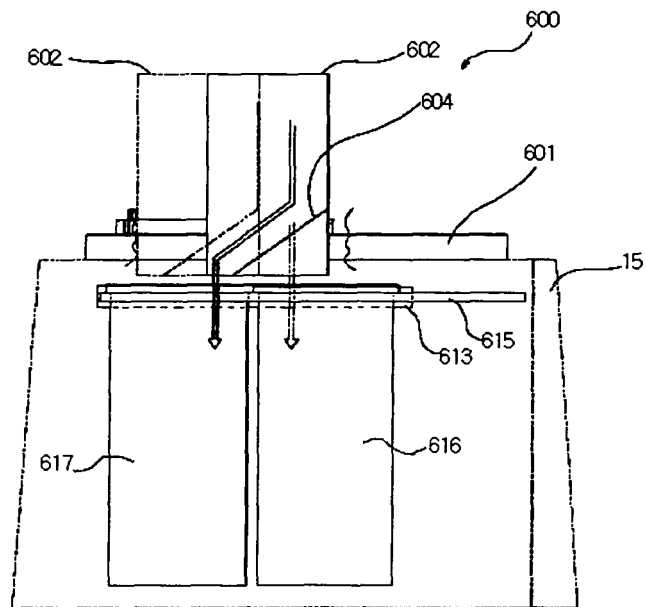


Fig 19

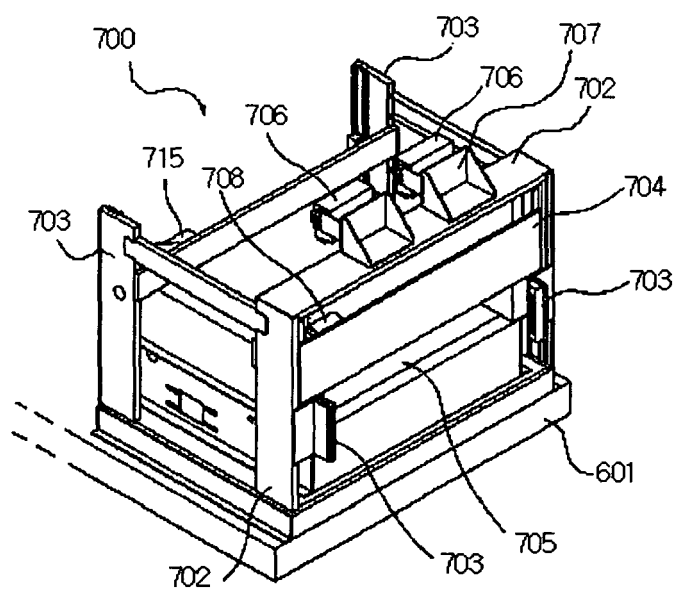


Fig 20

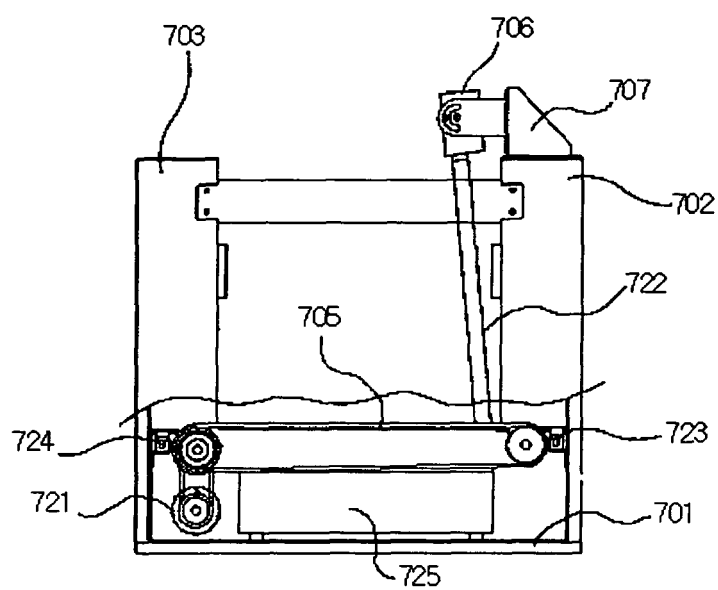


Fig 21

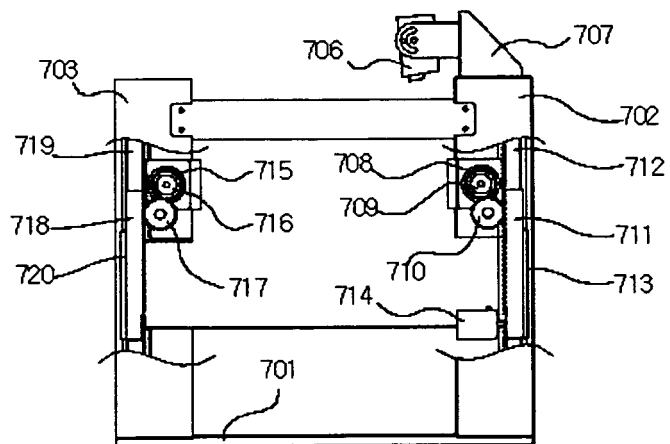


Fig 22

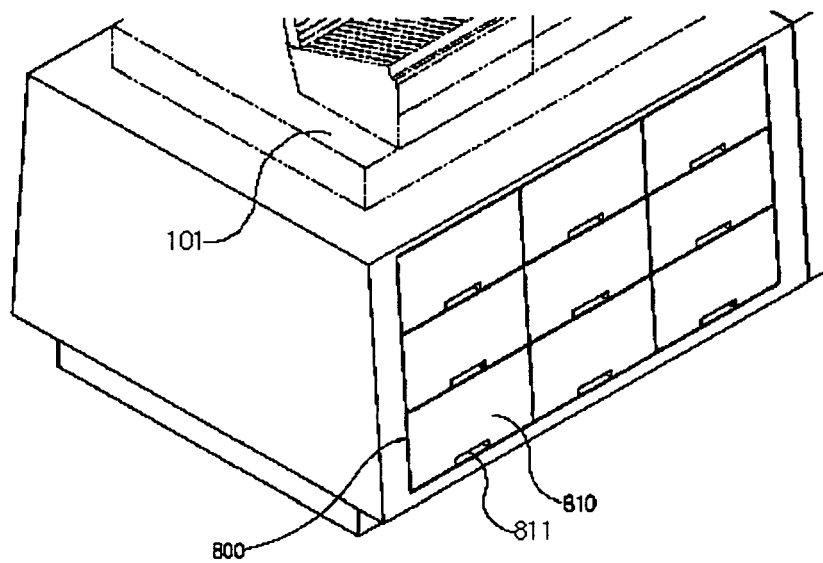


Fig 23

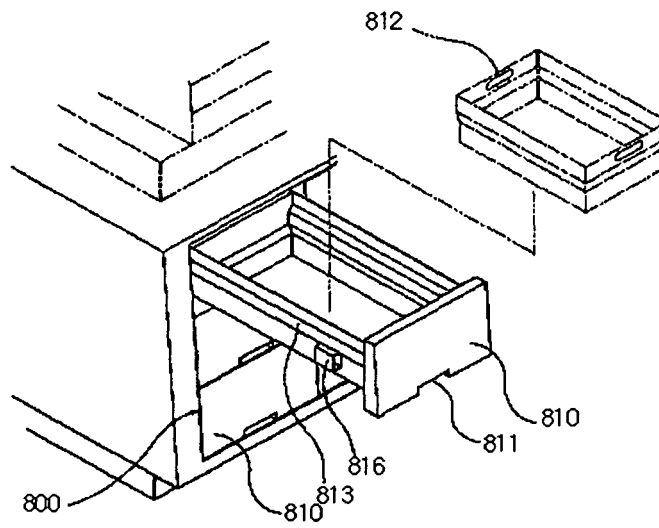


Fig 24

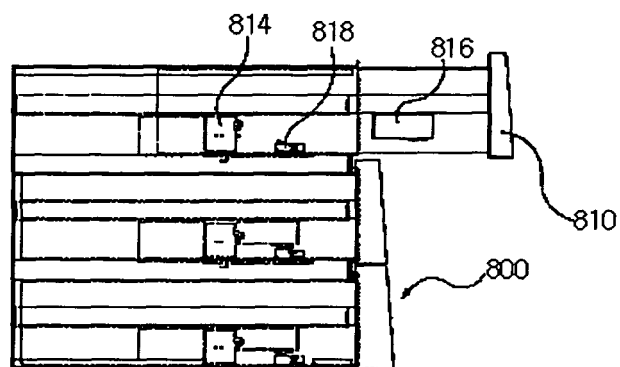


Fig 25

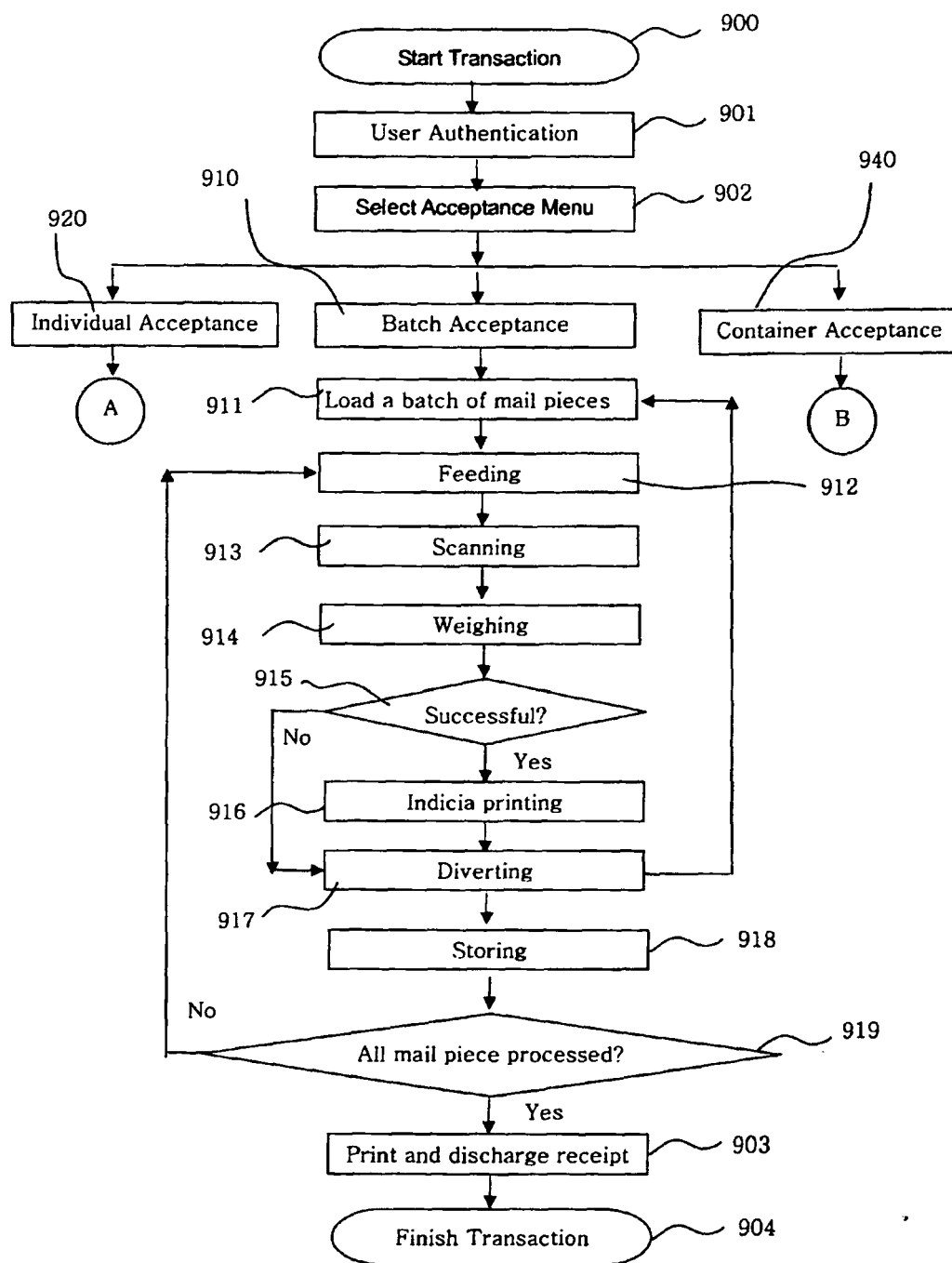


Fig 26

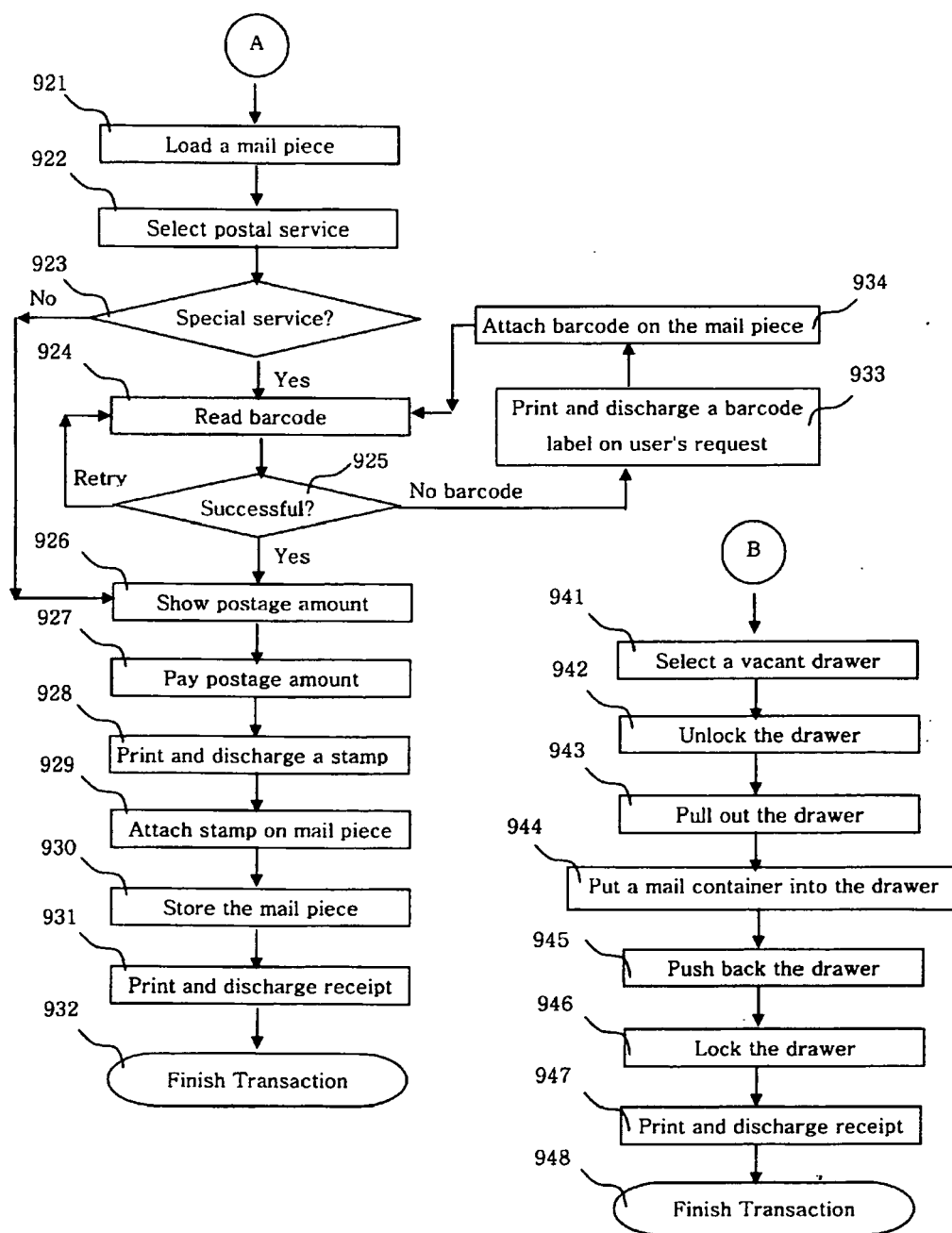


Fig 27



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 00 8134

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 6 477 514 B1 (GIL ASHER ET AL) 5 November 2002 (2002-11-05) * figure 1a * * column 2, line 38 - column 4, line 32 * * column 5, line 66 - column 13, line 4 * -----	1-10	G07B17/00
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The Hague		29 September 2005	Papastefanou, E
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