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(54) Printer

(57) A printer for printing on cut-sheet paper comprises a first insertion opening (27) for inserting cut-sheet paper (200), a combined discharge/insertion opening (18) for inserting and discharging cut-sheet paper (200), a paper feed path connecting said insertion opening (27) and said discharge/insertion opening (18), a printing area (4a, 8) provided in said paper feed path for printing on said cut-sheet paper (200), a first set of rollers (23, 24) disposed at the insertion opening side, a first open/close mechanism (37) for setting said first set of rollers (23, 24) into either an open state or a closed state, a second set of rollers (19, 20) disposed at the discharge opening side, and a second open/close mechanism (105, 106) for setting the said second set of rollers (19, 20) into either an open state or a closed state. In addition, means (37a, 107, 105a) are provided for coupling said first and second open/close mechanisms such that when one set of rollers is in its open state the other is in its closed state, and single drive means (104) for operating said first and second open/close mechanisms.

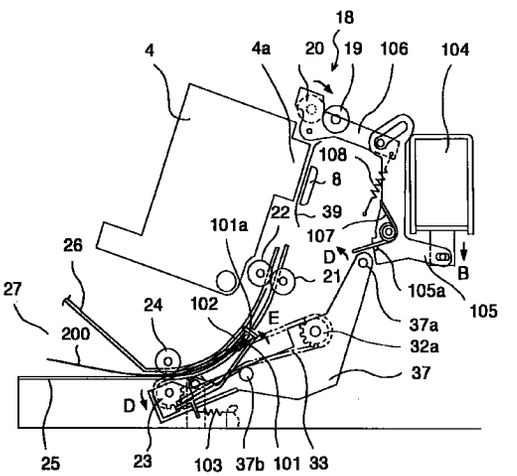


FIG. 5

EP 0 807 523 A2

Description

The present invention relates to a printer capable of printing on cut-sheet paper and, more particularly, to a point of sale (POS) printer for printing on cut-sheet paper, such as paper slips, bank checks etc..

Printers that can print on cut-sheet paper, i.e., single sheets of paper, such as a paper voucher, a slip, a bank check or the like, are known. In these printers, a sheet of paper is transferred to a printing area by a first pair of transfer rollers disposed adjacent a paper insertion opening (referred to as insertion rollers hereinafter). The sheet of paper is printed at a printing area and then discharged out of the printer by a second pair of transfer rollers disposed adjacent a paper discharge opening (referred to as discharge rollers hereinafter). For inserting a sheet of paper, the rollers are separated from each other to facilitate the insertion of the paper.

When printing on relatively large sheet of paper, such as a slip (herein after referred to as slip printing), the paper is inserted through the insertion opening, passed through a paper feed path past the printing area, and discharged through the discharge opening. On the other hand, when printing a few lines in a predetermined area on card-like cut-sheet paper such as a bank check for payment validation (herein after referred to as validation printing), the paper is inserted through the discharge opening and printing is performed while the paper is transferred back toward the discharge opening past the printing area. For the sake of convenience, the term "slip" will be used hereinafter as representative for any kind of cut-sheet paper suitable for slip printing and the term "check" will be used as representative for any kind of cut-sheet paper suitable for validation printing.

For example, Fig. 9 shows an explanatory view of a conventional printer that is capable of both slip printing and validation printing. Reference numeral 4 denotes a print head for printing on a slip 200 or a check 500 that is transferred to the printing area between print head 4 and a platen 38 by a pair of discharge rollers 19 and 20 and a pair of intermediate rollers 21 and 22, each pair being disposed in a manner that the rollers in each pair can be opened (separated from each other) and closed (brought together). Reference numeral 501 denotes a paper feed path for transferring a slip 200. A slip 200 inserted through an insertion opening on the front side of the printer into the paper feed path 501, it is guided by a paper guide 39 to the printing area, printed by the print head 4 and discharged through a discharge opening on the top. Note that a pair of insertion rollers (not shown) for slips is provided next to the insertion opening. For printing on the check 500, the discharge rollers 19 and 20 and the intermediate rollers 21 and 22 are both separated from each other as shown in the figure, and the check 500 is inserted through the discharge opening down into a groove section 501a. Then, the discharge rollers 19 and 20 and the intermediate rollers 21 and 22 are both brought into pressure contact to pinch the check 500, and printing by the print head 4 is performed as the check is advanced upwardly back to the discharge opening.

The above-described printer suffers the following problems.

(a) In order to insert a slip for slip printing, the insertion rollers are preferably separated from each other while the discharge rollers 19, 20 are preferably separated from each other for the insertion of a check. In the conventional printer opening and closing of the insertion rollers and opening and closing of the discharge rollers are independently performed by different drive sources (plungers or the like). As a result, the mechanism is complicated and independent control circuits are required for the respective drive sources. Furthermore, the printer shown in Fig. 9 requires an additional mechanism for opening and closing the intermediate rollers 21 and 22 in addition to that for the discharge rollers for inserting a check 500.

(b) In the POS printer of this type, a slip or check must be inserted into the appropriate opening. As a result, there is the danger that a slip or check is inserted into the wrong opening by mistake. There is another type of POS printer that prints on roll paper for printing receipts in addition to printing on cut-sheet paper. In this type of POS printer, a portion of the paper feed path is used in common for cut-sheet paper and roll paper, and each type of paper is transferred to same printing area. In this case, the paper feed path is formed in a manner that each type of paper is discharged through a different discharge opening. As a consequence, the number of openings for inserting and discharging paper is increased, and the danger of misoperation or misinsertion is even higher.

EP-B-0 428 163 discloses an impact dot matrix POS printer according to the precharacterizing part of claim 1, which differs from the one explained above with reference to Fig. 9 in that only the insertion rollers and the intermediate rollers but not the discharge rollers are provided. The platen and one of the intermediate rollers are supported on a first lever and one of the insertion rollers is supported on a second lever. The first lever is pivotally supported to close or open the intermediate rollers. When the intermediate rollers are open the printing area is also open, i.e., the platen is retracted from it working position opposite the print head. The second lever is also pivotally supported to close or open the insertion rollers. A first plunger is used to drive the first lever and a second plunger is used to drive the second lever. Both plungers are controlled in such a way that the insertion rollers and the intermediate rollers are either both open or both closed.

EP-A-0 676 295 discloses a similar printer having a pair of discharge rollers and a pair of intermediate roll-

ers. Regarding the intermediate rollers, the structure is the same as that disclosed in the document EP-B-0 428 163. One of the discharge rollers is mounted on a second lever which in turn is pivotally mounted on the first lever supporting one of the intermediate rollers. When the first lever is driven by a plunger to open the intermediate rollers, the second lever is turned at the same time to open the discharge rollers. Thus, both the discharge rollers and the intermediate rollers can be driven together to be both open or both closed.

The present invention is made to solve the above-described problems of the prior art. It is an object of the present invention to provide a printer capable of printing on a variety of types of cut-sheet paper in which a comparatively simple mechanism is used for opening/closing of transfer rollers and in which insertion of cut-sheet paper is facilitated and erroneous insertion prevented.

This object is achieved with a printer as claimed in claim 1. Preferred embodiments of the invention are subject-matter of the dependent claims.

In accordance with the claimed solution, when performing slip printing, only the rollers of the first set at the insertion side are separated from each other so that a slip for slip printing can be inserted. At this moment, the rollers of the second set disposed adjacent the discharge opening which is used for both discharging a slip for slip printing and inserting/discharging a check for validation printing, are maintained in a closed state. Thus, a check for validation printing cannot be inserted by mistake. On the other hand, when performing validation printing, the rollers of the first set are closed and those of the second set are separated from each other. Thus, a slip for slip printing cannot be inserted by mistake.

Preferred embodiments of the invention will be explained below in detail with reference to the drawings, in which

Fig. 1 schematically shows a cross-sectional view of the internal structure of a printer in accordance with one embodiment of the present invention,

Fig. 2 shows a front perspective view of the of the printer with a front cover removed,

Fig. 3 shows a perspective view of a paper transfer section of the printer,

Fig. 4 shows a perspective view of a roller drive mechanism of the printer,

Fig. 5 shows a side view of the transfer system in one state,

Fig. 6 shows a side view of a transfer system in another state,

Fig. 7 shows a perspective view of a stopper in a one state,

Fig. 8 shows a perspective view of the stopper in another state, and

Fig. 9 shows a side view of a conventional structure for positioning a sheet for validation printing.

Figs. 1 and 2 show the overall structure of a printer 1 in accordance with one embodiment of the present invention. As shown in Fig. 1, the printer 1 has a main case 2 made of, for example, resin or the like. A roll S of paper is disposed in a rear part inside the main case 2. A paper transfer section 3 for transferring paper to be printed is mounted in a front part of the case 2. An ink jet printing section 4 for printing on the paper is disposed in front of the paper transfer section 3. The printing section 4 is covered by a front cover 5 made of resin or the like. The paper roll S, the paper transfer section 3 and the printing section 4 are mounted on a main frame 6 made of metal or the like. As shown in Fig. 2, the printing section 4 is capable of moving between the lateral sides of the main frame 6 along a guide rail 7 fixed to the main frame 6.

As shown in Fig. 1, an ink jet head 4a of the printing section 4 is disposed opposite a platen section 8 that is provided in the paper transfer section 3. A printing area is defined between the ink jet head 4a and the platen section 8. The paper roll S is rotatably supported on a pair of support rollers 10 and 11 disposed in parallel with a roll core 9. The outer end of the paper roll S is drawn from the lower side of the printer toward the upper side. A paper path for the roll paper from paper roll S is formed in the paper transfer section 3. In other words, the roll paper is guided and transferred by a paper guide 12 and a roller 13 to the platen section 8. After printing on the roll paper by the printing section 4, the roll paper is further transferred by a roller 14 and discharged through a discharge opening 16 defined in an upper cover 15. When cut-sheet paper (described below) is not inserted, the roll paper can be printed.

As shown in Fig. 1, the upper cover 15 is rotatably mounted about a pivot axis 17. In order to facilitate insertion of the roll paper, the platen section 8 is designed to move closer to and farther from the ink jet head 4a in association with the opening or closing of the upper cover 15. In other words, the platen section 8 and transfer roller 14 are supported on a frame which is rotatable about a shaft of the roller 13. This frame is connected to a lever 46 and is forced by a spring mounted on the lever 46 in a direction in which the platen section 8 and the roller 14 are moved away from the ink jet head 4a. With this mechanism, when the upper cover 15 is closed, a pressure lever 47 fixed to the interior of the upper cover 15 pushes an upper section of the lever 46, and the platen section 8 is moved closer to the ink jet head 4a into a position where printing can be performed. On the other hand, when the upper cover 15 is opened for setting the roll paper, the pressure of

the pressure lever 47 is released from the lever 46. As a result, the platen section 8 is moved away from the ink jet head 4a by the resilient force of the spring mounted on the lever 46 and is placed in a receded position. Consequently, the roll paper is smoothly guided past the printing section to the discharge opening 16.

The upper cover 15 and the front cover 5 define a discharge opening 18 in the upper central area of the printer for discharging cut-sheet paper (a slip 200 on which slip printing is performed or a check 500 on which validation printing is performed). As described below, the discharge opening 18 also serves as an insertion opening for validation printing. A set of discharge rollers 19 and 20 is disposed adjacent the discharge opening 18. A set of intermediate rollers 21 and 22 is disposed between the set of insertion rollers and the printing section 4, and a set of insertion rollers 23 and 24 is disposed below the printing section 4. These rollers and a pair of guide members 25 and 26 define a paper feed path for transferring a slip 200. As shown in Fig. 2, when slip printing is performed, a slip 200 is inserted into a paper insertion opening 27.

Figs. 3 and 4 show the paper transfer section 3 in accordance with one embodiment of the present invention.

As shown in these figures each of the above mentioned sets of rollers in this embodiment comprises two pairs of rollers, each pair including a drive roller coupled to a drive source and an associated pinch roller. The two drive rollers of a respective set are fixed to the same shaft and the two pinch rollers have the same rotary axis. It is to be noted that the number of pairs of drive and pinch rollers in the respective sets of rollers is not critical to the invention.

As shown in Figs. 3 and 4, the rollers 13 and 14 for transferring roll paper are mounted on a metal support frame 28 substantially U-shaped in cross-section. The support frame 28 is mounted on a metal transfer frame 29 that forms a paper feed path for cut-sheet paper. The roller 13 for transferring roll paper is formed from a material that is not slippery, such as rubber or the like, and has a drive shaft 30 coupled to a drive motor (not shown). The roller 13 and the roller 14 are rotated in the same direction by a gear train (not shown). The support frame 28 is pivotally mounted about the drive shaft 30 of the roller 13.

As shown in Fig. 3, insertion rollers 23 for transferring a slip 200 are mounted on a shaft 31 that is rotatably mounted on an open/close lever 37. Also, intermediate rollers 21 are mounted on a shaft 100 that is rotatably mounted on the transfer frame 29.

As shown in Fig. 4, the insertion rollers 23 are driven by a drive pulley 32 that is driven by a motor (not shown), a belt 33 and a pulley 34. The intermediate rollers 21 are driven by a gear 35 that is driven by the above-described motor via a gear 36 that engages the gear 35. The open/close lever 37 is pivotally mounted on the transfer frame 29 about a shaft 32a having the drive pulley 32 mounted on one end thereof and the gear 35 on the other end.

Referring to Figs. 5 and 6, a cut-sheet transfer mechanism and its operation in the case of slip printing will be described. It is noted that the roll paper transfer mechanism shown in Fig. 1 is not shown in Figs. 5 and 6.

The paper insertion opening 27 is defined by the upper and lower guide members 25 and 26 and guides a slip 200. When the slip 200 is inserted, the rollers 23 are separated from the rollers 24 and do not obstruct insertion of the slip 200. At this moment, a tip section 101a of a stopper 101 protrudes from the lower guide member 25 into the paper feed path by the resilient force of a spring 103. When the slip 200 is inserted, its leading end is stopped at a position corresponding to that of the stopper 101. A paper detector 102 is provided generally at the same location as the tip section 101a of the stopper 101. The paper detector 102 detects insertion of the slip 200.

The detector 102 also detects the trailing end of the slip 200. Therefore, the detector 102 can be used, for example, to control the bottom margin on a slip (the position of the last printing line) that is pre-set prior to printing. As shown in Fig. 5, when the rollers 23 are separated from the rollers 24, the rollers 20 contact the rollers 19 under pressure. Therefore, a slip 200 cannot be inserted through the discharge opening 18 by mistake.

When the slip 200 stops at the stopper 101, and the paper detector detects that the slip is set in position, a controller section (not shown) activates a plunger 104 so that the armature of the plunger 104 moves in the direction of an arrow A as shown in Fig. 6. By this operation, the rollers 20 are separated from the rollers 19 via levers 105 and 106. At the same time, a spring 107 pushes a pin 37a of the open/close lever 37. As a result, the open/close lever 37 rotates about the shaft 32a in the direction of an arrow C, and the rollers 23 are brought into pressure contact with the rollers 24 with the slip 200 being pinched therebetween. In other words, the rollers 23 are pushed against the rollers 24 by the resilient force of the spring 107.

At this moment, the stopper 101 rotates against the spring force of the spring 103 in association with the motion of the open/close lever 37 in the direction of the arrow C, and thus the tip section 101a of stopper 101 is lowered below the lower guide member 25.

Then, the rollers 23, 24 are driven to transfer the slip 200 toward the ink jet head 4a. The rotation of the drive pulley 32 mounted on the shaft 32a is transferred through the belt 33 to the pulley 34 mounted on the same shaft as the rollers 23 so that the rollers 23 are rotated. The tension of the belt 33 is adjustable by finely adjusting the position of an adjusting pulley 37b that is mounted on the open/close lever 37. The tension of the belt 33 is factory-adjusted to an appropriate level.

As the slip 200 is advanced by the rotation of the rollers 23, 24, it is introduced between the intermediate rollers 21 and 22. The rollers 21 and 22 are always in pressure contact with each other. Rotational force of a

drive motor (not shown) is transferred through the drive shaft 32a and the gears 35 and 36 to the rollers 21. The slip 200, that is transferred by the rollers 21, 22, 23 and 24, is introduced between the guide member 39 and the ink jet head 4a and printed. In a preferred embodiment, while the unshown drive motor for driving the rollers is stopped, the ink jet head 4a is moved along the guide rail 7 to print one line of characters. Then, the rollers are driven to move the slip 200 by a predetermined amount (for printing the next line), and then printing is performed by the ink jet head 4a again. These operation steps are repeated.

After passing the printing area between the guide member 39 and the ink jet head 4a, the slip 200 enters an open space between the rollers 19 and 20. The distance from the position at which the slip 200 abuts the tip section 101a of the stopper 101 to the position at which the slip 200 reaches the open space between the rollers 19 and 20 is known and a corresponding feeding amount is pre-set in the controller section that controls the motor for driving these transfer rollers. Thus, when the slip 200 has been transferred by the pre-set feeding amount, the slip 200 reaches the space between the rollers 19 and 20.

At this moment, the plunger 104 is activated so that the armature moves in the direction of an arrow B, as shown in Fig. 5, to move the levers 105 and 106. As a result, the rollers 20 are brought into pressure contact with the rollers 19 and the leading end of the slip 200 is pinched by the rollers 19 and 20. Accordingly, the slip 200 can be transferred by the rollers 19 and 20. The pressure force acting between the rollers 19 and 20 is determined by the spring 108. When the armature of the plunger 104 moves in the direction of the arrow B, an abutting section 105a of the lever 105 pushes up the spring 107. As a result, the spring 107 is released from the pin 37a of the lever 37, and the resilient force of the spring 107 that acts to bring the rollers 23 in pressure contact with the rollers 24 is removed. The open/close lever 37 rotates about the shaft 32a in the direction of an arrow D due to the weight of the rollers 23.

As a result, the pressure contact between the rollers 23 and rollers 24 is released, and the rollers 23 are separated from the rollers 24. In this state, the slip is transferred by the rotation of the two sets of the rollers 19, 20, 21 and 22. Also, at this moment, the spring force of the spring 103 forces the tip section 101a of the stopper 101 to protrude above the lower guide member 25 into the paper feed path. However, since the spring force of the spring 103 is set to be very weak, the tip section 101a cannot push up the slip 200 and does not prevent it from being advanced.

As described above, when slip printing is performed on a slip 200, the slip is transferred by the rollers 23 and 24 immediately after it is inserted. When the leading end of the slip has passed the rollers 21 and 22, the slip is transferred by the two sets of the rollers 23, 24, 21 and 22. When the leading end of the slip has reached the rollers 19 and 20, the slip is transferred by the two sets of rollers 20, 19, 21 and 22. When the trailing end of the slip has passed the rollers 21 and 22, the slip is transferred only by the rollers 19 and 20. By the paper transfer system described above, even a very short sheet of paper is accurately transferred when it is longer than the distance between the rollers 23 and 24 and the rollers 21 and 22 and longer than the distance between the rollers 21 and 22 and the rollers 19 and 20. The entire surface even of a very short slip can be printed. Furthermore, unless a slip is very long, no more than two sets of the rollers pinch and transfer a slip at a time. As a result, problems, such as wrinkles that may be formed in a sheet of paper by pinching it by too many rollers are not likely to occur and, therefore, the slip is securely transferred.

Next, a transfer mechanism and an operation for transferring a check for validation printing will be described in detail. Validation printing by a printer in accordance with the present invention is performed in the following manner. While the rollers 19 and 20 are separated, a check 500 is inserted through the discharge opening 18 down to an area adjacent the rollers 21 and 22. After setting the check in position (described in more detail below), the plunger 104 is activated by a corresponding command or key operation to bring the rollers 19 and 20 in pressure contact with each other. After the rollers 19 and 20 pinch the check, the ink jet head 4a is operated to print on the check, and the rollers 19 are driven as required so that the check is transferred back toward the discharge opening while it is being printed.

In this manner, when a check can be inserted for validation printing, the rollers 23 and 24 are closed, and therefore prevent a check for validation printing from being inserted through the insertion opening 27 by mistake.

Figs. 7 and 8 show perspective views of an area adjacent the intermediate rollers 21, 22. Fig. 7 shows a state where a check 500 for validation printing is inserted, and Fig. 8 shows a state where a slip 200 for slip printing is inserted.

A plurality of stoppers 222 are pivotally mounted on the same shaft that mounts the intermediate rollers 22. Each of the stoppers 222 is biased by relatively weak spring force of a spring 223 (a torsion spring in this embodiment) into a stopping position in which a protrusion 222b extends through a window 251 that is defined in the paper guide, into the paper feed path (the contact between the lower window edge and the lower face of the protrusion defines the stopping position)..

When a check 500 for validation printing is inserted through the discharge opening 18 while the rollers 19 and 20 are opened, the leading end of the check 500 abuts against the upper surface 222a of the protrusions 222b of the stoppers 222 so that the check 500 is set in position, as shown in Fig. 7. At this moment, the leading end of the check 500 does not contact the rollers 21 and 22. Then, the plunger 104 is activated to bring the rollers 20 and 19 into pressure contact with each other , the

rollers 20 and 19 are driven as required and the check 500 is printed.

On the other hand, as shown in Fig. 8, when a slip 200 for slip printing is fed, its leading end passes the rollers 21 and 22 and pushes up the protrusion 222b of the stoppers 222. As a result, the stoppers 222 rotate in a direction in which the paper feed path is opened. By this operation, the slip 200 can be transferred further upward. In accordance with an embodiment of the present invention, the stoppers 222 are provided on the same shaft as the roller 21 or 22. This results in a short distance between the location where a slip 200 is pinched by the rollers 21 and 22 and the location at which the leading end of the slip abuts against the stoppers 222 and has to withstand the reaction force imparted by the stoppers to the slip edge as the stoppers are moved to free the paper feed path for passage of the slip. As a result, even a very weak slip (i.e. paper of relatively low stiffness) can be readily transferred, and slips for slip printing are transferred free of troubles.

As shown in the figures, the paper feed path for cut-sheet paper between the insertion opening 27 and the discharge opening 18 comprises a first curved section and a second straight or substantially straight section. The curved section extends from the insertion opening up to the intermediate rollers 21, 22 and the straight section extends from the intermediate rollers to the discharge opening 18. The straight section is used in common for slips 220 and checks 500 and includes the printing area. Therefore, thin and weak paper can be as easily inserted as a check as can thick and strong paper. Furthermore, in the preferred embodiment described above, the stoppers 220 which define the lowermost position of the lower (leading) end of a check inserted through the discharge opening 18, extend into the straight section of the paper feed path just above the intermediate rollers 21, 22. Because of this structure a check can be easily positioned and, different from the structure shown in Fig. 9, there is no danger that a check, even if its leading end is curved or bent, unintentionally enters a wrong paper feed path.

In a preferred embodiment, the plunger is a self-holding type plunger that performs pulling or pushing of its armature by an electrical current applied for only a short period of time. As a result, power consumption by the printer is lowered.

Preferably, when the roll paper from paper roll S is printed, the rollers 23 and 24 are kept open and the rollers 19 and 20 are kept closed. As a result, when printing on the roll paper, the rollers 19 and 20 are closed, and therefore a check for validation printing cannot be inserted to the printing area. Also, even though the rollers 23 and 24 are opened, the tip section 101a of the stopper 101 protrudes in the paper feed path. As a consequence, a slip for slip printing can also not be inserted into the printing area. In this manner, when printing on the roll paper, the insertion opening 27 and the discharge opening 18 of the paper feed path for cut-sheet paper and the printing area are closed. Therefore, cut-sheet paper cannot be inserted by mistake while printing on roll paper.

In the structure in accordance with an embodiment of the present invention, the plunger is operated by a respective command or key operation to separate the rollers 19 and 20 from each other or bring the rollers 19 and 20 into pressure contact with each other. As a result, the printing area and a part of the paper feed path for slip printing are also used for validation printing in which a check is inserted through the discharge opening that is used for discharging both slips and checks. Moreover, the structure can accommodate a variety of different modes of usage and different types of paper. Also, during a specified print mode, a sheet of paper for a different print mode cannot be inserted by mistake.

It should be noted that the present invention is not limited to the embodiment described above, and a variety of modifications may be implemented.

For example, in the above-described embodiment, the description is made with reference to a printer that incorporates an ink jet head. However, the present invention is not limited to this particular embodiment, and the present invention is also applicable to a printer having any one of various types of print head, such as a dot impact type print head and the like.

Furthermore, the present invention is not limited to a printer for printing bills or bank checks, but is also applicable to other types of printers. Also, as mentioned previously, the reference to slips and checks in the foregoing description was only for the purpose of convenience and by no means intended to be restrictive. Both slip and check are representative for any kind of cut-sheet paper to which slip printing or validation printing may be applied.

Claims

1. A printer for printing on cut-sheet paper comprising:

   a first insertion opening (27) for inserting cut-sheet paper (200),
   a combined discharge/insertion opening (18) for inserting and discharging cut-sheet paper (200, 500),
   a paper feed path connecting said insertion opening (27) and said discharge/insertion opening (18),
   a printing area (4a, 8) provided in said paper feed path for printing on cut-sheet paper (200, 500) inserted into said paper feed path through said insertion opening (27) or said discharge/insertion opening (18),
   a first set of rollers (23, 24) disposed in said paper feed path at the insertion opening side thereof, the first set of rollers comprising at least one first pair of a drive roller (23) and a pinch roller (24),
   a first open/close mechanism (37) for setting

said first set of rollers (23, 24) into either an open state in which the drive roller and the pinch roller of said at least one first pair are separated from each other to allow insertion of cut-sheet paper (200) in between, or a closed state in which the rollers engage the cut-sheet paper for transporting it along said paper feed path toward said printing area,

a second set of rollers (19, 20) disposed in said paper feed path at the discharge opening side thereof, the second set of rollers comprising at least one second pair of a drive roller and a pinch roller, and

a second open/close mechanism (105, 106) for setting the said second set of rollers (19, 20) into either an open state in which the drive roller and the pinch roller of said at least one second pair are separated from each other to allow insertion of cut-sheet paper (200, 500) in between, or a closed state in which the rollers engage the cut-sheet paper for transporting it past said printing area toward said discharge opening (18),

characterized by

means (37a, 107, 105a) for coupling said first and second open/close mechanisms such that when one set of rollers is in its open state the other is in its closed state, and

single drive means (104) for operating said first and second open/close mechanisms.

2. The printer according to claim 1, wherein said paper feed path is divided at a position between said insertion opening (27) and said discharge/insertion opening (18) into a first substantially straight section on the discharge/insertion opening side and a second curved section on the insertion opening side, the printing area (4a, 8) being in the first section.

3. The printer according to claim 1 or 2, further having and stopper means (222, 22a, 222b) for positioning the leading end of cut-sheet paper (500) inserted through said discharge/insertion opening (18), said stopper means being arranged to allow passage of cut-sheet paper (200) through the paper feed path in a first direction from the insertion opening (27) toward the discharge/insertion opening (18) but to prevent passage of cut-sheet paper (500) in a second direction opposite to the first direction.

4. The printer according to claims 2 and 3, wherein said stopper means (222, 22a, 222b) is positioned at or near said position at which the paper feed path is divided into said first and second sections.

5. The printer according to any one of the preceding claims, further comprising a third set of rollers (21, 22) for transporting cut-sheet paper (200), the third set being disposed intermediate the said first set and said printing area (4a, 8).

6. The printer according to claim 5 as dependent on claim 3, wherein said third set of rollers (21, 22) is always in a closed state and said stopper means (222, 222b) is positioning between said third set of rollers (21, 22) and said printing area (4a, 8).

7. The printer according to claim 6, wherein said stopper means (222) is provided immediately next to said third set of rollers (21, 22).

8. The printer according to claim 7, wherein said stopper means comprises one or more stopper members (222) supported on an axis coaxial with a rotary axis of either drive or pinch rollers of said third set of rollers (21, 22) so as to be turnable between a first and a second position, and biasing means (223) for biasing the one or more stopper members into said first position, each stopper member (222) having a protrusion (222b) extending into the paper feed path in said first position and having an abutment face (22a) for abutment by cut-sheet paper (500) inserted in said second direction, and retracted in said second position so as to allow passage of cut-sheet paper (200) in said first direction, said stopper members and biasing means being arranged such that the stopper members are turnable toward said second position by cut-sheet paper advanced by said third set of rollers (21, 22) in said first direction.

9. The printer according to any one of the preceding claims, further comprising

a stopper (101, 101a) for positioning the leading end of cut-sheet paper (200) inserted through said insertion opening (27), and

moving means (37, 103) moving the stopper between a first position in which it projects into said paper feed path and a second position in which it is retracted from the paper feed path, said moving means being coupled to said first open/close mechanism (37) so as to be operated by said single drive means (104) in association with said first open/close mechanism such that the stopper is in its first position when said first set of rollers (23, 24) is in its open state.

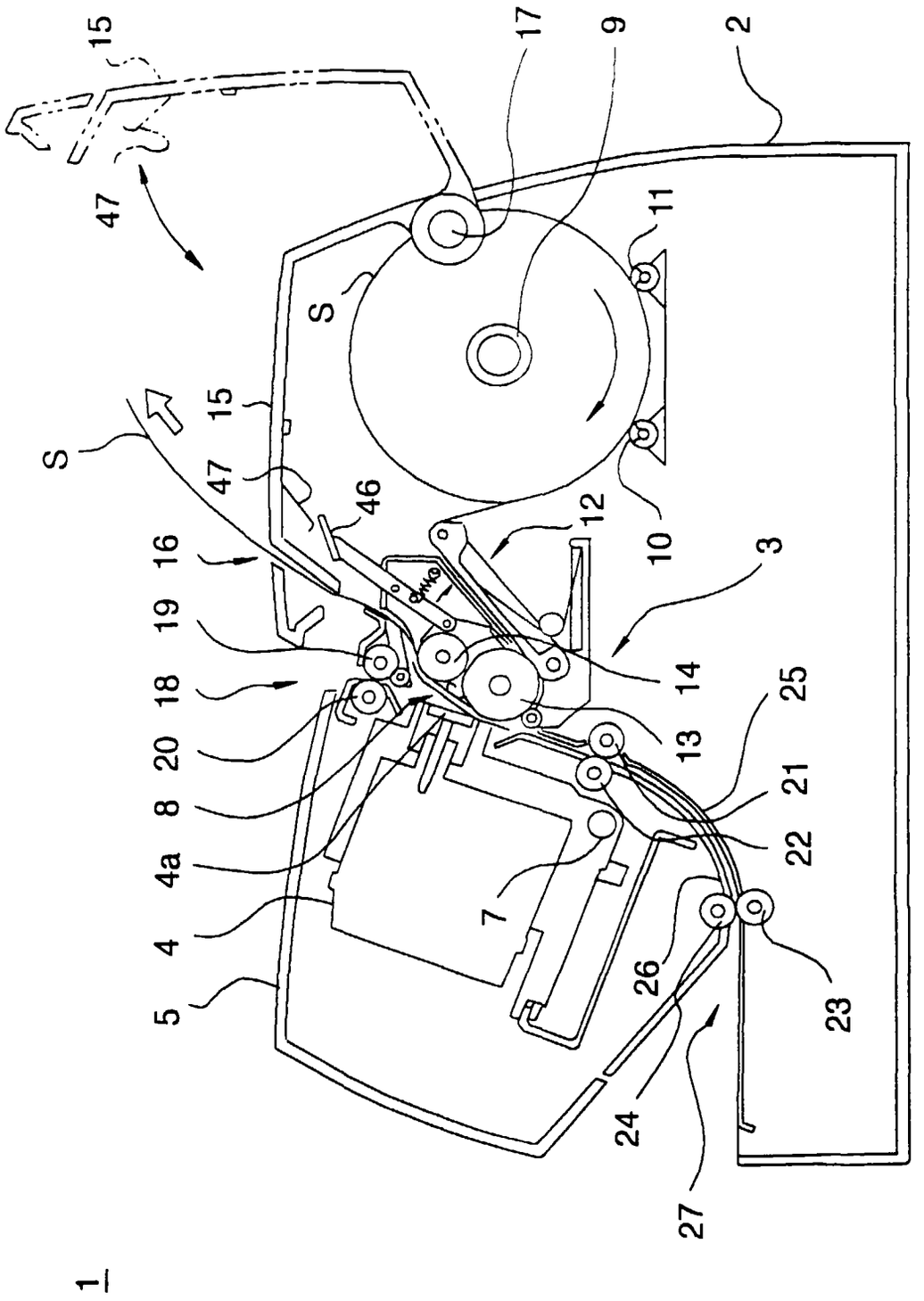
10. The printer according to any one of the preceding claims, further comprising a paper feed path for transferring a roll paper past said printing area (4a, 8).

11. The printer according to claim 10, further comprising means for keeping said first set of rollers (23, 24) in its open state and said second set of rollers

(19, 20) in its closed state for printing on roll paper.

12. The printer according to any one of the preceding claims, wherein of one of said first and second sets of rollers (23, 24, 19, 20) the or each pinch roller (24) is supported by a frame (29) and the or each drive roller (23) is fixed on a shaft (31) rotatably supported by a lever (37) which is in turn pivotally mounted about a pivot axis (32a) on said frame (29), said lever forming the respective open/close mechanism, and wherein a driving force for rotating said drive roller (23) is applied through a belt (33) stretched between a driven pulley (34) fixed on said shaft (31) and drive pulley (32) disposed coaxially with said pivot axis (32a).

13. The printer according to claim 12, further comprising an adjusting pulley (37b) provided on said lever (37) for adjusting the tension of the belt (33).


1
2
3
4
4a
5
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
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46
47
S

FIG. 1

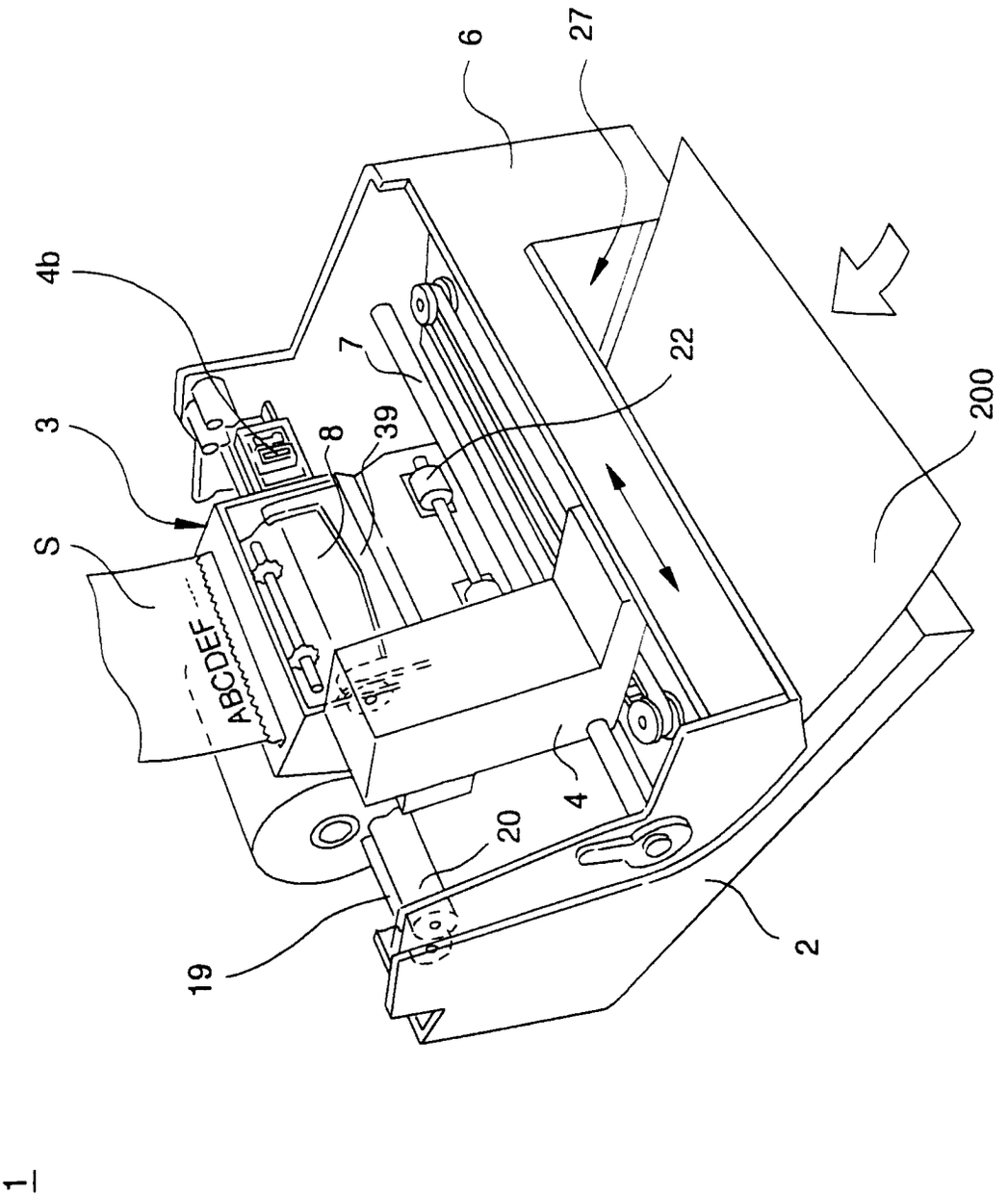

FIG. 2

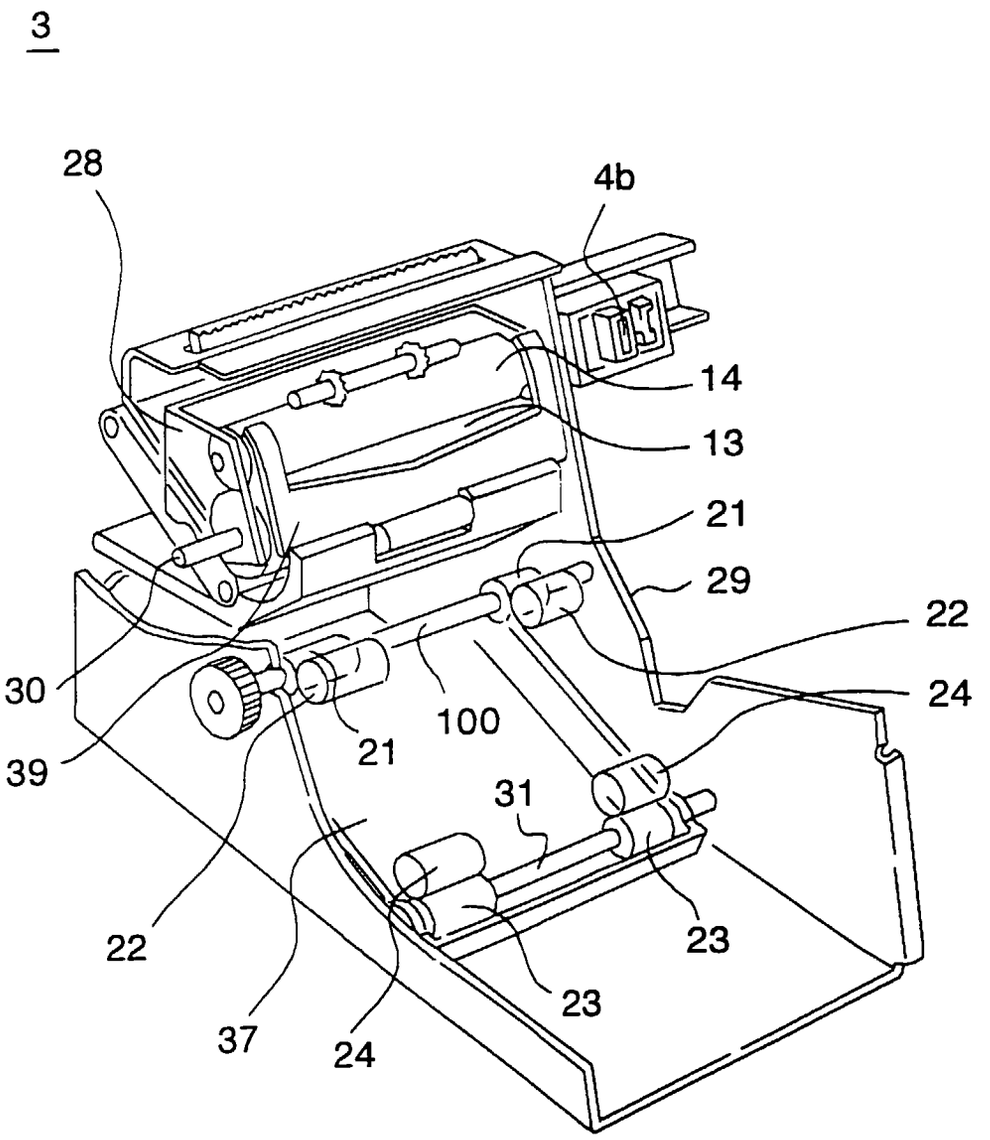

FIG. 3

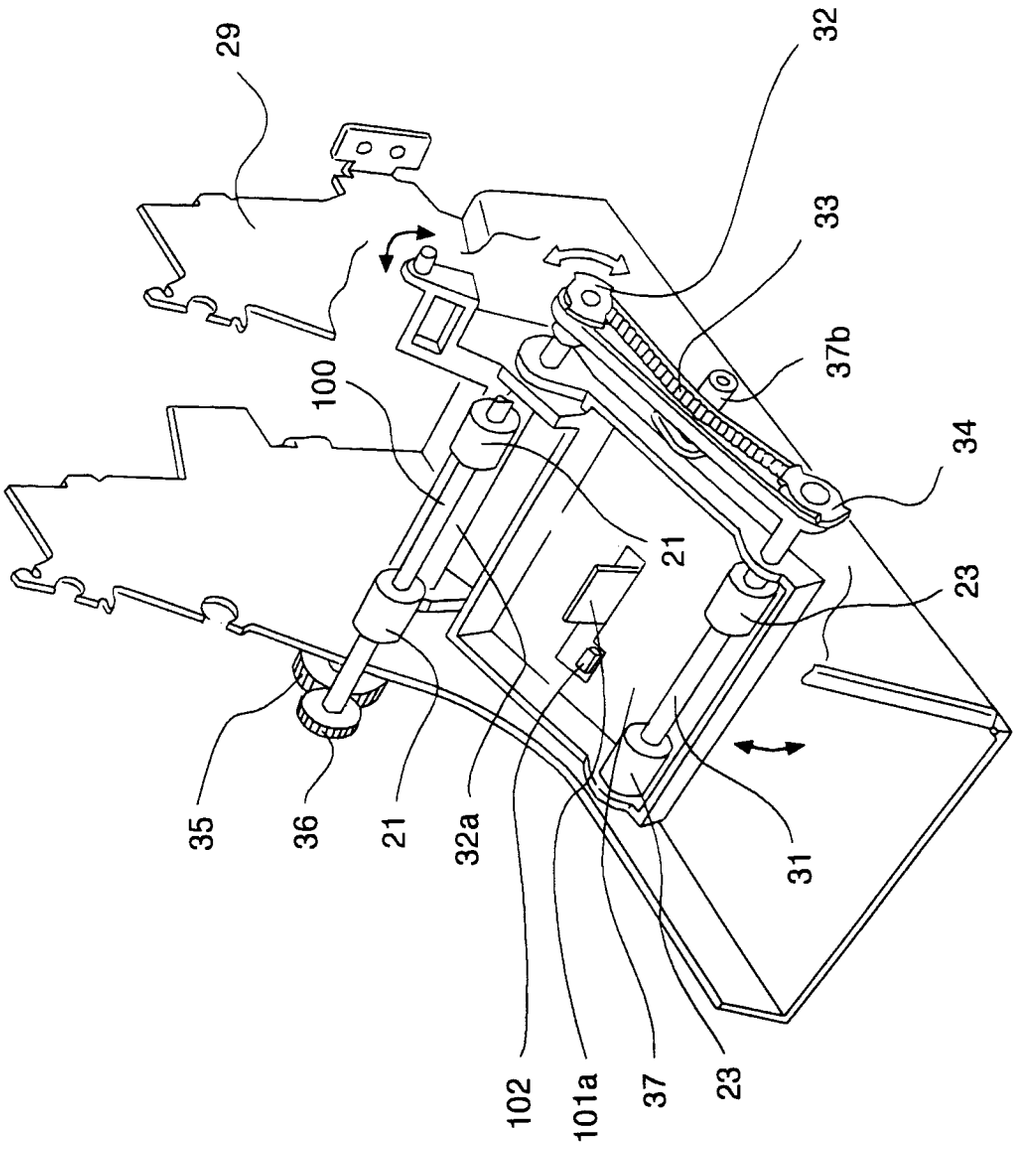

FIG. 4

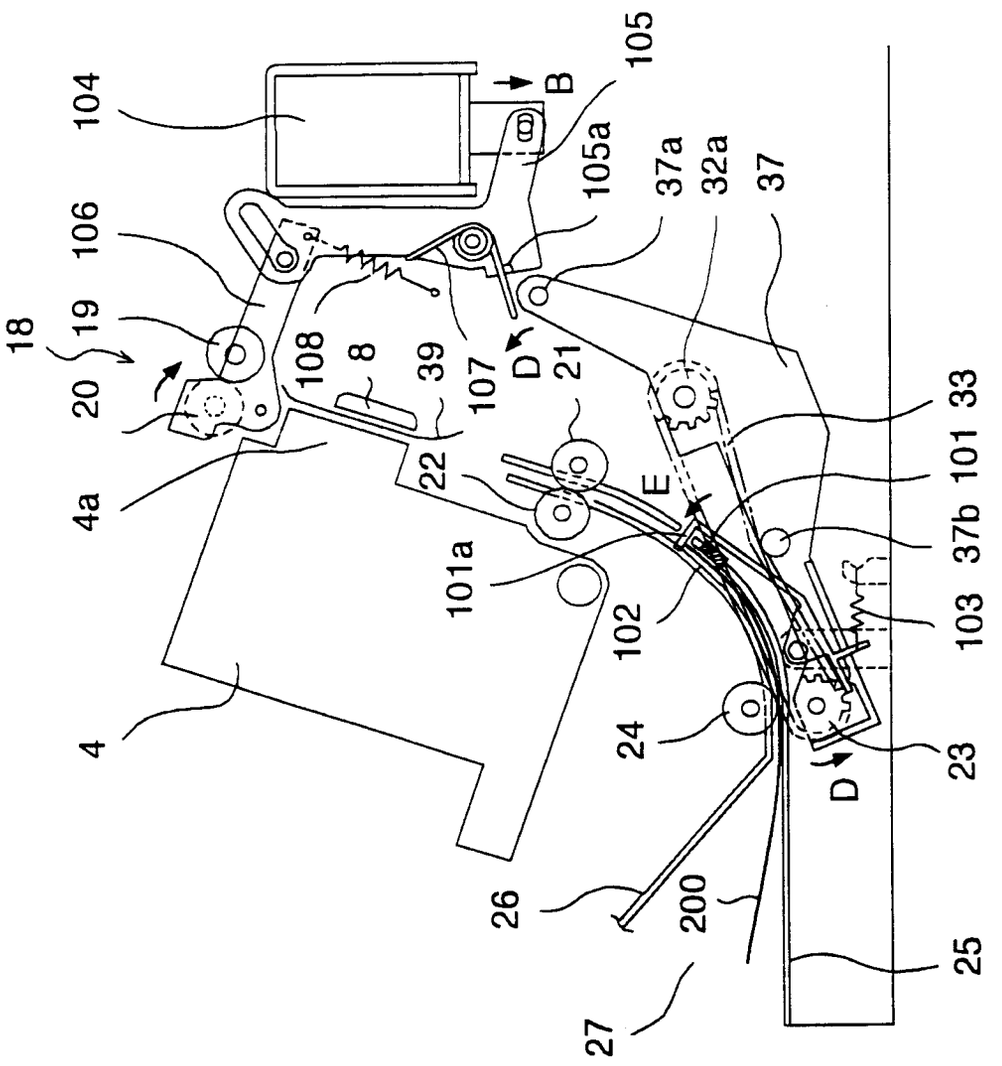
104
B
105
105a
37a
32a
37
106
19
18
20
108
8
39
107
D
21
33
4a
22
E
101
37b
101a
102
103
4
24
23
D
26
200
25
27

FIG. 5

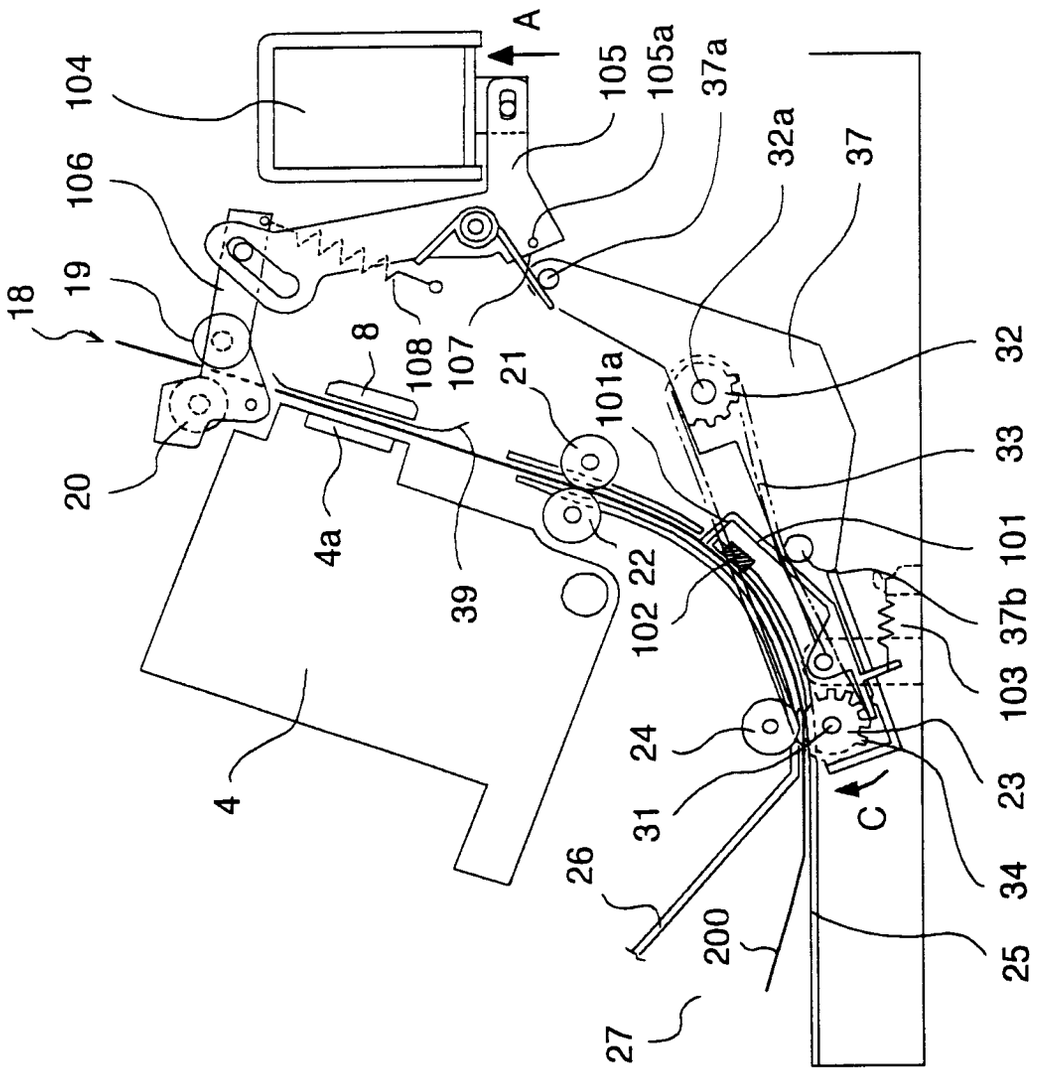
A
104
106
19
18
20
4
4a
8
108
107
39
21
101a
105
105a
37a
32a
37
32
33
101
37b
103
23
34
25
22
102
24
31
26
200
27
C

FIG. 6

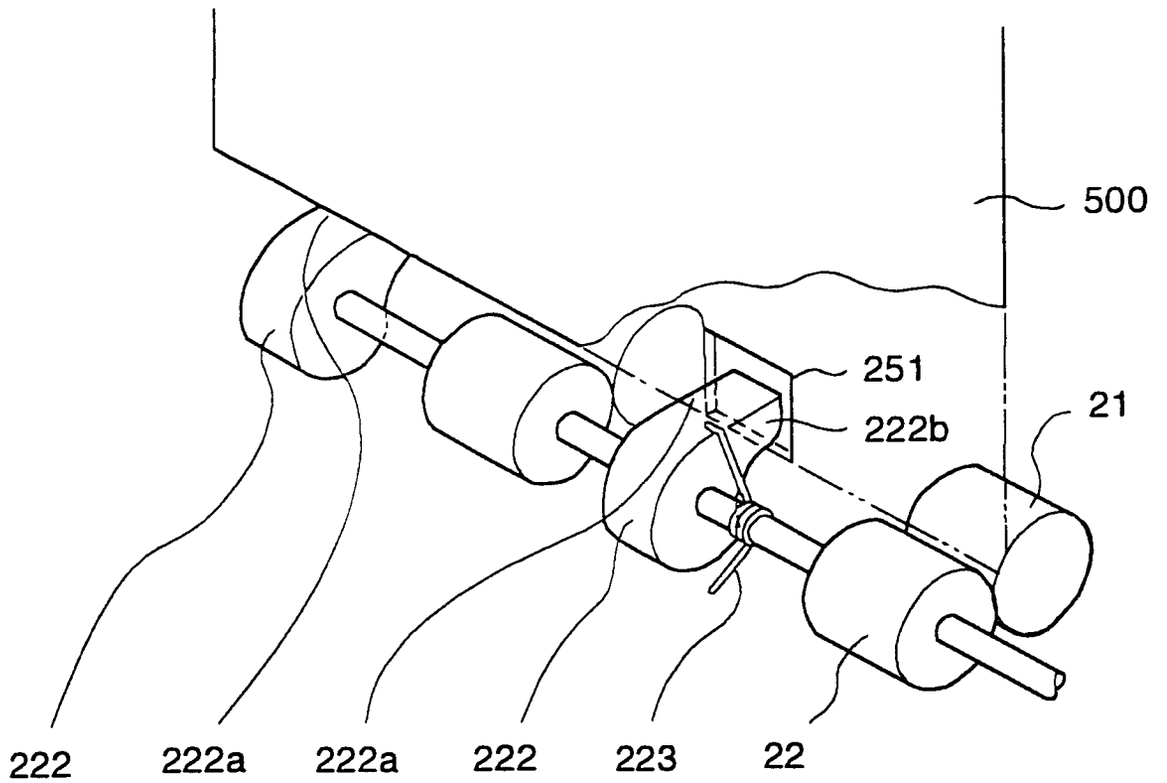

FIG. 7

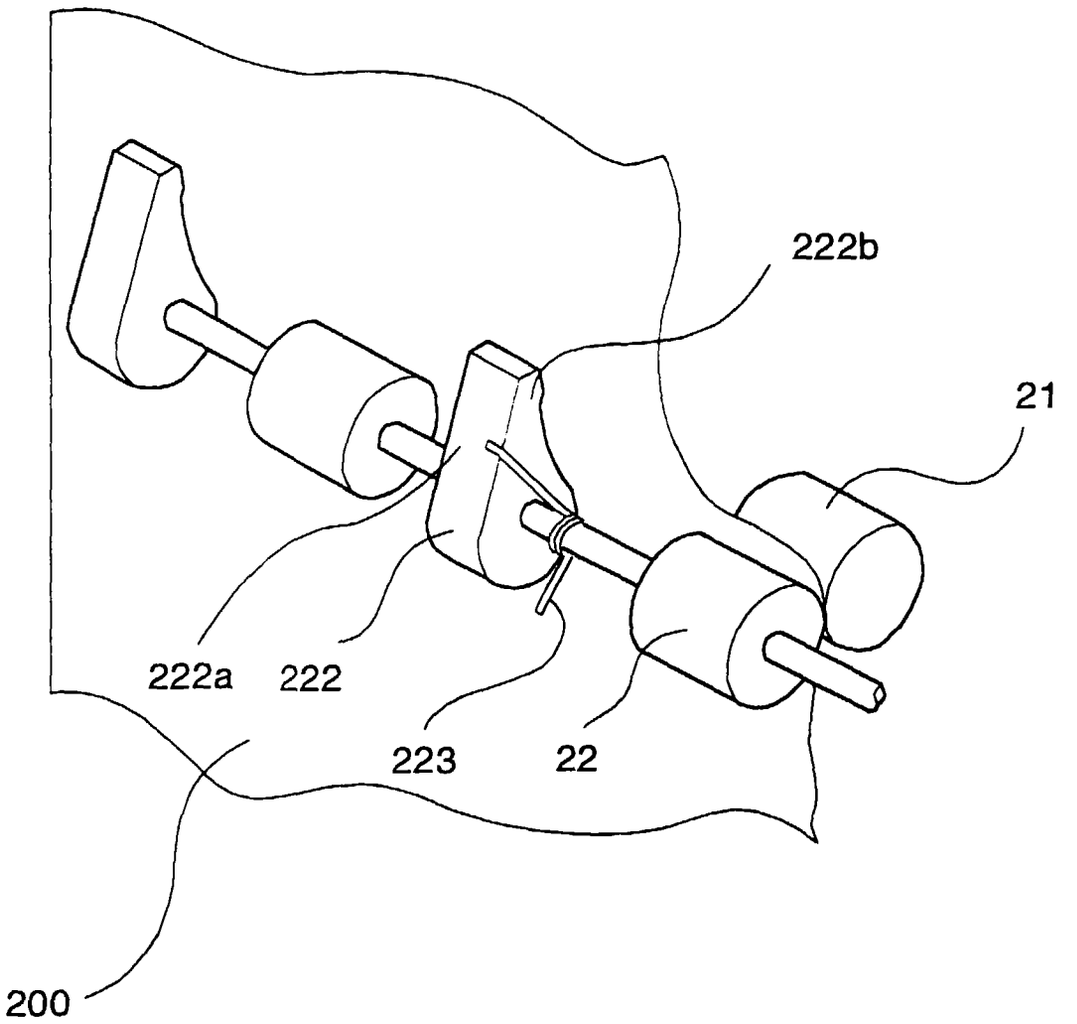

FIG. 8

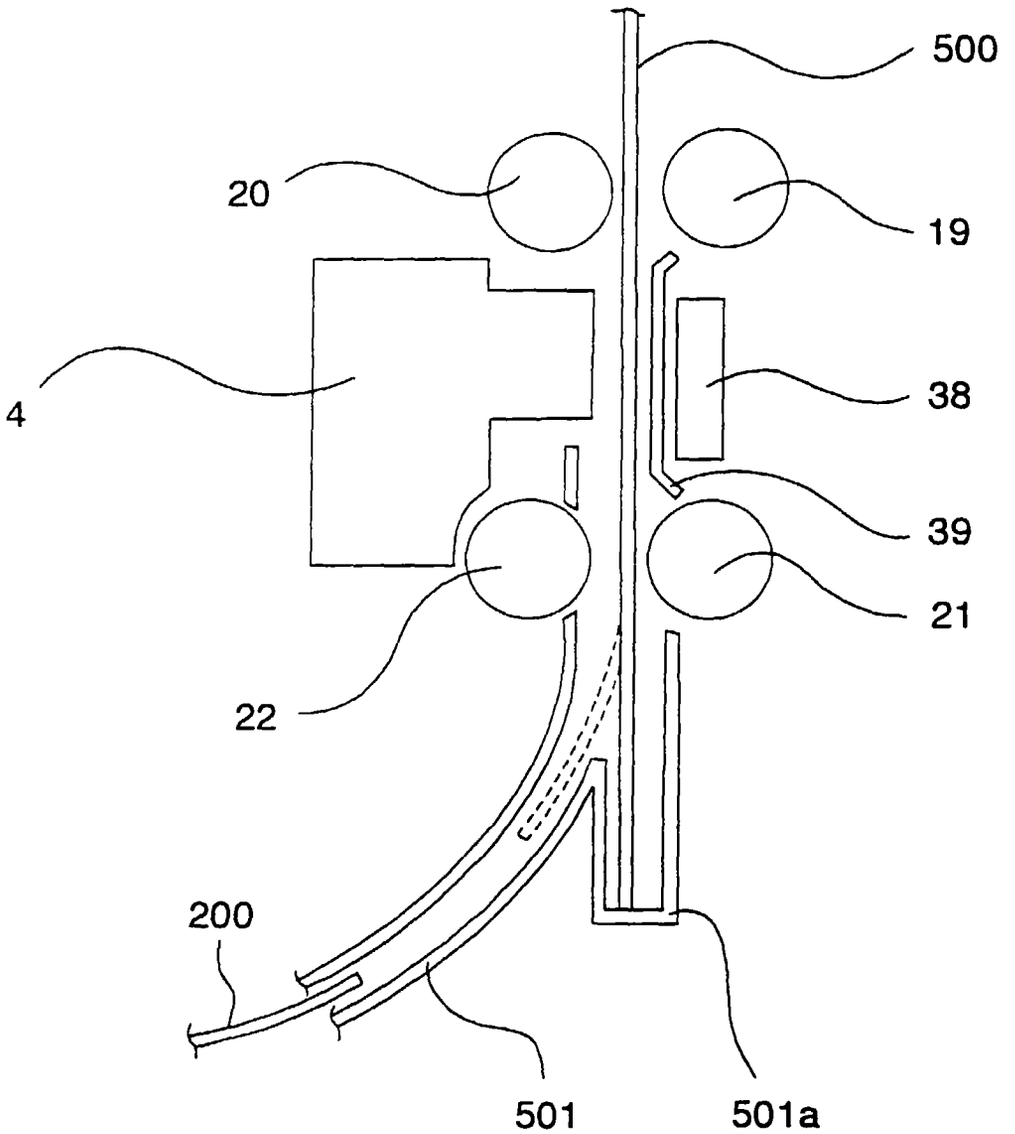

FIG. 9