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(54) ENVELOPE FEEDER HAVING DUAL ALIGNED CONVEYORS

ZUFÜHREINRICHTUNG FÜR BRIEFUMSCHLÄGE MIT ZWEI AUSGERICHTETEN FÖRDERERN
DISPOSITIF D'ALIMENTATION EN ENVELOPPES COMPORTANT DEUX TRANSPORTEURS
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Description

Technical Field

[0001] The present invention relates to conveyor based envelope feeders for printers.

Background Art

[0002] Envelope feeders are typically used by organizations such as banks or insurance companies, print shops, and mailing houses that service such organizations, to produce a large volume of mail pieces. For example, banks send out monthly balance ledgers, insurance companies send out claim summaries, and for corporations shareholders might receive quarterly income/dividend statements. Each envelope must be labeled in order to properly utilize the U.S. Postal System, and each must meet certain USPS printing positional requirements. While in the past "windowed" envelopes were utilized in order that preprinted envelopes might be combined with individually printed sheets of paper oriented to show through the envelope window, most modern mail printing systems include the ability to individually print envelopes using onsite, relatively inexpensive laser or inkjet printers. This allows for the combining of customized envelopes with customized printed sheets at the point of disembarkation.

[0003] However, the feeding of envelopes into relatively inexpensive commercial laser or inkjet printers can be problematic. The typical configuration is to have an "envelope stacker" or "envelope shoe" holding dozens or even hundreds of envelopes in a stacked column from which individual envelopes are pulled from the bottom of the stack and conveyed along a conveyor deck that is positioned to feed envelopes into the manual feed tray of a printer. A pair of friction rollers commonly referred to as "footballs" presses down upon a leading edge of an envelope held in the stacker and in conjunction with a pair of conveyor rolling belts engages the envelope to shear it away from the bottom of the envelope stack. The footballs include removable donut weights on a spindle that extends upward from the feed deck so that the pressure of the footballs may be adjusted in response to envelope size and thickness, and other conditions. Alternatively, the footballs are biased downwards with a spring which may be adjusted with a tensioning knob or screw. The sheered envelope then moves forward under the weight of additional passive rollers on the conveying rollers to keep consistent friction between each envelope and the conveyor so that the envelopes maintain edge alignment relative to a receiving input or ingestion area on a printer, such as a manual input tray.

[0004] However, these "stacker" based envelope feeders are operator intensive because a myriad of elements require continuing adjustment and attention by an operator. First, the footballs must be made with a consistent friction coefficient and, hence, the material diopther must

be closely monitored during manufacturing. Second, the weight of envelopes changes with the envelope stack height and consistent sheering of envelopes can typically be maintained only for a certain range of envelope stack height which may vary with each new batch of envelopes. In addition, adjustments to the side walls and backstop retaining wall in the envelope stacker must be adjusted for a particular weight and size of envelope. Finally, as conveyor belt friction varies with time, and due to variations in humidity, dust, and other environmental factors, football weight, position of the footballs relative to the leading edge of an envelope, and the backstop wall angle must be adjusted frequently in order to provide a consistent feeding of envelopes into the input tray or slot of a printer. Hence, an operator must become accustomed to each feeder and skilled at making minute adjustments to the feeder elements to keep a consistent flow of envelopes into a printer.

[0005] The issue affects more than just print job speed completion. Modern laser printers are designed for high printing speeds and the processing of large batches of stock media. Often such systems apply toner images to a transfer belt and roller in anticipation of receiving a fast moving group of media sheets. Printers have sensors at their source input channels and if a few envelopes are processed and then the next expected envelope does not appear in an expected time interval a "stall" condition occurs within the printer and the transfer belt and roller may need to be cleaned and reprocessed in order to prepare for the arrival of a new batch of envelopes. Hence, great amounts of toner may be wasted and the life expectancy of a printer's transfer roller may also be decreased. The problem is exacerbated in color laser printers.

[0006] WO 2011/031966 discloses a friction feeder assembly that is designed to be positioned near a digital printer's manual feed tray, and feed envelopes, one at a time, to the manual feed tray feed roller, thus increasing the production capability of the printer. The printer has a top-feed roller accessible from outside the printer and the feeder assembly comprises a bottom-feed sheet feeder physically and electrically separate from the printer, and a delivery table positioned to receive sheets from the sheet feeder and deliver the sheets one at a time to the top-feed roller, the delivery table being pivotably mounted relative to the printer, to allow a free end of the delivery table to move vertically with respect to the top-feed roller.

[0007] Hence, what is needed is an envelope feeder that will work with relatively inexpensive inkjet or laser printers and keep those printers continuously fed or "primed" with envelopes without stalls, and without the constant and continuous operator attention required by conventional envelope feeders.

Disclosure of the Invention

[0008] The invention is an envelope feeder for a printer

having two aligned conveyors moving at different speeds, as defined in the independent claims. An upstream conveyor moves a backwards slanted procession of envelopes having equal height upper edges onto a downstream conveyor that accelerates the envelopes along a curved upper edge so that by the time any single envelope arrives at the printer ingestion or feed slot, the envelope is almost completely flat yet supported upwards slightly so that the pickup roller of the printer can easily and reliably ingest the envelope for processing. The conveyors create a stack of envelopes at a pickup assembly in the input slot of the printer and a sensor is positioned at the pickup assembly so that when the stack of envelopes is sufficiently depleted, a signal is sent to a control assembly in the feeder to advance the conveyors for a set duration, thereby replenishing the envelope stack at the printer. The entire feeder is a movable, self-contained unit that may be mated to varying types of high-speed printers.

Brief Description of the Drawings

[0009] A envelope feeder incorporating the features of the invention is depicted in the attached drawings which form a portion of the disclosure and wherein:

- Figure 1 a top perspective view of the envelope feeder;
- Figure 2 is a bottom perspective view of the envelope feeder;
- Figure 3A is a left side elevational view of the envelope feeder;
- Figure 3B is a right side elevational view of the envelope feeder;
- Figure 4A is a top plan view of the envelope feeder;
- Figure 4B is a magnified top plan view of the envelope feeder with the acceleration conveyor assembly removed from the horizontal feed assembly and positioned to the left;
- Figure 5 is a bottom plan view of the envelope feeder;
- Figure 6 is a diagrammatic view of the envelope feeder connected to a printer;
- Figure 7 is a diagrammatic view of the envelope feeder showing the relative positions of envelopes with respect to the conveyors during operation;
- Figure 8 is a movement flow diagram of the envelope feeder;
- Figure 9 is an electrical control schematic for the envelope feeder; and,
- Figure 10 is magnified view of the envelope feeder connected to a printer and showing one embodiment of an envelope pickup sensor assembly.

Best Mode for Carrying Out the Invention

[0010] Referring to the drawings for a better understanding of the function and structure of the invention, Figures 1-5 show the envelope feeder 10 from different

views showing all of the major components of the invention. A printer 11 is shown in phantom having the invention positioned so that the output of the feeder 10 inserts envelopes into the input tray or input slot 12 of printer 11.

5 The feeder 10 includes a horizontal feeder assembly 14 that supports an acceleration conveyor assembly 16 and a feed conveyor assembly 17. Both the acceleration conveyor assembly 16 and feed assembly 17 are laterally supported by guide plates 19a,b and side plates 20a,b, and the entire assembly 14 is slidably supported below
10 by a base 21.

[0011] As shown, the acceleration conveyor 16 is positioned toward the downstream end 23 of the feeder 10, and the feed conveyor 17 is positioned toward the upstream end 24 of the feeder 10. The acceleration conveyor assembly 16 is positioned over a cover 26 that is also laterally supported by the guide plates 19a,b. The feed conveyor assembly 17 includes a deck 27 over which four (4) belts 28 traverse for movement of envelopes as will be discussed. A triangular backstop 29 is positioned along the length of the conveyor feed assembly 17 to provide a support to a stack of envelopes loaded onto the deck 27. The position of the backstop is determined by the amount of envelopes loaded onto the conveyor feed assembly deck 27. As seen, the left guide plate 19b is somewhat shorter than the right guide plate 19a to facilitate operative access to the upstream portion of the deck 27 and for the loading and unloading of envelopes against the backstop 29.

30 **[0012]** Fig. 2 shows the underside of the feeder 10 and provides a better view of how the horizontal feed assembly 14 slides relative to the printer. The base 21 includes two slide panels 31a,b, each having a vertical portion 37a,b and an angled horizontal portion 38a,b. Each horizontal portion 38 includes mounting holes 32 for mounting the base 21 on a work table or other suitable platform (see Fig. 6) for the feeder 10. The work table typically might be mounted on lockable wheels so that the entire feeder 10 might be moved into a general relative position next to printer 11 to which the feeder 10 would be mated. The slide panels 31a,b are connected together by three struts 32 that stabilize the base 21 so that as the horizontal assembly 14 is moved toward or away from the printer 12 the slide panels 31 will not buckle. A pair of slide rails 36 is affixed to the top edge of each slide panel 31 and the horizontal feed assembly 14 includes two pairs of rollers 41 bolted onto its lower side edges sized so that they lock into rails 36. The arrangement allows for the horizontal feed assembly 14 to be finely positioned toward the printer after the work table on which the feeder 10 rests has been positioned within the general vicinity of the printer 11, thus facilitating mating.

[0013] A series of guide mount assemblies 43 laterally support the right guide plate 19a so that it may be moved inward and outward relative to the acceleration conveyor assembly 16 and the conveyor feed assembly 17 to accommodate different lengths of envelopes. A linear guide mount plate 44 is bolted to the right support plate 20a

and a hollow sleeve 46 is mounted on the inside surface of the guide mount plate 44. A guide mounting plate 51 is bolted to the outside surface of the guide plate 19a and a shaft 47 affixed to the plate 19a such that the shaft extends laterally away from the guide plate 19a. The shaft 47 extends through the hollow sleeve 46 so that the guide plate 19a is supported by the shaft as it translates through the sleeve 46. A guide locking plate 48 is affixed to the top of the guide mounting plate 51 which has a channel formed in the center of the plate. A locking handle 49 is screwed into the top of mount plate 44 and extends through the locking plate channel such that when the handle 49 is tightened movement of the locking plate 51 is arrested, thereby locking the guide plate 19a in place at a selected position along the locking channel. The three guide mount assemblies 43 are identical and provide lateral, adjustable support for moving the right guide plate 19a in and out from the envelope flow area.

[0014] On the left side of the feeder 10, generally the side from where an operator controls the feeder 10, the left guide 19b is laterally adjusted with a "C" shaped guide handle 57 that is part of a left guide mount assembly. The handle 57 is mounted to the guide plate 19b with a plate 58 bolted to the guide plate. The arms of the handle 57 extend through two guide blocks 59 that are affixed to the top of another mounting plate 61 that is bolted to the left support plate 20b at its lower end. The arms of the handle 57 include slots or channels 62 on each arm and a pair of locking bolts 63 extend through each channel screw into the blocks 59. The blocks 59 are formed such that the handle 57 may be moved inward and outward to effect lateral movement of the left guide 19b and then locked into place by tightening the bolts 63.

[0015] Referring now to Fig. 4A and Fig. 4B, the feeder includes an acceleration conveying assembly 16. For illustration purposes in Fig. 4B, the acceleration conveyor assembly 16 has been exploded from its normal position within in the horizontal feeder assembly 14 shown in Fig. 4A. The acceleration conveyor assembly 16 includes a pair of bearing mount members 66a,b that rotatably support five (5) shafts spanning the distance between the mounts 66a,b. Two rubber conveying belts 68 surround the shafts 67 from the right-most shaft to the left-most shaft. A belt separator bracket 69 spans the two bearing mount members 66a,b and provides additional support between the pair of bearing mount members 66a,b. The belt separator bracket 69 also includes a plurality of guide screws 71 that extend upwards from the bracket 69 to guide the lower belt portion during travel around the shafts 67.

[0016] The right-most shaft 67a includes a drive motor 73 and gearing assembly 74 that turns shaft 67a via a short drive belt (not shown) at the left most extent of the shafted 67a to power belts 68. Due to the elastic tension that the belts 68 exert on the shafts 67, when shaft 67a rotates, the other shafts passively rotate in response thereof.

[0017] Referring also to Fig. 5, it may be seen that en-

velope feed conveyor assembly 17 includes a motor drive assembly 34 connected to a drive shaft 81 positioned between an upstream preparation deck 55 and loading deck 27. The drive assembly 34 includes a gearing assembly next to a standard electric drive motor that drives a gear positioned on the metal shaft of the shaft 81. A similar passive idler shaft 82 is positioned on the other end of deck 27 toward the downstream end 23. Each shaft 81,82 includes four recessed belt engagement portions 83 having raised surface features to increase friction. Each recessed portion 83 on roller 81 has an aligned companion recessed portion, and four belts 28 span the two rollers at each recessed portion 83 as shown. The belts are made of plastic fabric, and while resilient their surface features are such that the underside surface glides easily over the top of loading deck 27 while being supported by same.

[0018] Underneath loading deck 27, a series of roller belt guides 84 that are rotatably supported at their ends by brackets (not shown) affixed to the underside of deck 27 and interior surfaces of the support plates 20a,b. The brackets are formed such that they are adjustably spaced from the underside of the deck 27 to impart a selected amount of tension to each belt 28 toward the underside surface of deck 27. Also, each belt guide 84 includes a plurality of spacers affixed to the primary shaft of the belt guide to separate each belt 28 from one another and maintain a preselected spatial relationship between them. Typically, three guides 84 are utilized underneath deck 27 spaced at equal distances from each other and from the end rollers 81 and 82.

[0019] At the downstream end, deck 27 includes at least one guide finger 86 extending toward the downstream direction and over roller 82 so that envelopes moving in the downstream direction do not fall in between rollers 82 and 67a during movement toward printer 11. Envelope feed conveyor 17 also includes an underside cover 86 covering most of the underside of deck 27 and the belts 28, and a second cover 87 covering the feeder drive shaft 81 and, generally, the belts 28 in upstream end of the envelope feeder 17.

[0020] For holding envelope boxes and related envelope container paraphernalia, the feeder 10 includes a preparation deck assembly 53 that is supported by two rail plates 54a,b having their ends bolted to the upstream extent of the right support plate 20a. The plates 54a,b are of sufficient thickness so that relatively heavy envelope boxes may be placed on the deck 55 such that the operator may have an ample supply of envelopes for each job. In order to avoid tipping of the feeder due to boxes of envelopes laid on the preparation deck 55, the base 21 includes mounting apertures 32 in the lower portions of the slide panels 31a,b which preferably are used to firmly mount the base on a work table (see Fig. 6).

[0021] As may be seen in Fig. 6, the feeder 10 is preferably bolted securely onto a table 40 and moved into a position adjacent to the printer 11 with collator 110 abutting the manual input ingestion 12 area on the printer so

that the downstream end 23 of the feeder 10 abuts the pickup roller assembly 13 on the printer 11. The horizontal feeder assembly 14 may also be finely adjusted using the horizontal feed assembly rollers 41 so that roller 67e discharges envelopes directly into the pickup roller assembly 13 across a gap between roller 67e and pickup roller 18 (see Fig. 7). As may be understood, the gap between the feeder 10 and the printer 11 may be adjusted to suit the type of printer to which the feeder 10 is being mated and the type of envelope media being printed.

[0022] Referring now to Fig. 7, it may be seen that the envelope feeder 10 is designed to provide a two stage feed flow 100 that suits the ingestion of envelopes for printing at a rate adapted to suit most high-speed printers. Conveyors 16 and 17 are oriented longitudinally and in the same horizontal plane to create a continuous smooth liner movement of envelopes 101 along the feeder 10 from an upstream end 24 toward a downstream end 23. Preferably, envelopes 101 are stacked against backstop 29 at approximately a sixty (60) degree backward slanting angle 105 and laid in a grouped parallel fashion 103 on the feed conveyor belts 28 such that the backward angle is maintained, thereby creating a horizontal plane 113 along the upper edges of the envelopes 101 parallel to the loading deck 27. Other backward facing angles will work also, however, the inventors have found about sixty (60) degrees to be optimal. When actuated, the conveyors 16 and 17 operate at different speeds with the acceleration feed conveyor 17 moving at approximately eight (8) times that of feed conveyor 16. Movement is coordinated with a microprocessor (see Fig. 9) so that conveyors 16 and 17 move simultaneously. However, since the acceleration conveyor 16 is moving faster than the feed conveyor the lower edge of each envelope 101 advances more rapidly as soon as an envelope reaches the separation point 104 (a slight gap) between each conveyor. As the lower edges of the envelopes advance toward the downstream end 23, the lower edges of each envelope spread out relative to any adjacent envelope moving along the acceleration feed conveyor 16, thereby creating a shingled feed grouping of envelopes 102 that form a curve 114 along their upper edges as shown. In three dimensions, the curve 114 is actually a curved plane formed along the upper edges of the envelopes. The severity of the curve angle 114 will vary depending upon the height of the particular envelope being fed along the conveyors, the speed of the acceleration feed conveyor, and the length of the acceleration feed conveyor 16. But, generally the curve 114 will have a downward slope that is most severe from the gap 104 to about the mid-way point of the acceleration feed conveyor toward the downstream end, with a more moderate curve slope within the second half of the acceleration feed conveyor.

[0023] The shingled envelope group 102 terminates at the downstream end of the acceleration feed conveyor with an envelope pickup stack 117 in an engagement/pickup zone 116 of pickup assembly 13. As the envelopes move toward the printer pickup roller assembly

13 a stack of envelopes forms below a pickup roller 18, being partially supported and moved into place by roller 67e, at which point the overlap of each envelope over one another increases considerably. The stack height is typically at least 6 envelopes deep which raises the upper most envelope to easy engagement with the pickup roller 18 and facilitates the ingestion of envelopes into the printer 11 at a speed suitable for high-speed printer processing. Since the acceleration feed conveyor is continuously moving envelopes into place at the bottom of the envelope stack 117, the stack 117 is continuously replenished at a rate that will sustain the availability of an envelope to the pickup roller 18 at all times until all envelopes on the acceleration feed conveyor are consumed. A sensor 118 is positioned below the envelope stack 117 in the pickup zone 116 and is configured to deflect backward and downward at the presence of any envelopes within the pickup zone 116. When the pickup zone 116 is absent of envelopes, the sensor 118 moves upward and provides a signal to indicate a "paper-out" condition to the printer 11, or to the feeder 10 if desired and as will be further discussed.

[0024] Referring to Fig. 8 in view of Fig. 7, it may be seen that the process 120 of feeding envelopes utilizing feeder 10 involves a combination of operator and automatic controls 128. An operator loads a stacked collection of envelopes against the backstop 122 and initiates a continuous advancement of the acceleration and feed conveyors (16 and 17) 123 utilizing a switch 124 until a satisfactory envelope pickup stack 117 has been established 126. Although a stack of about six (6) envelopes is preferred, as long as one envelope is present in the pickup zone the automatic feeding process will proceed successfully under automatic control. Once envelopes are available for the printer 11 to process in the pickup zone 116, the conveyors are switched off 127 and the printer 11 initiated 129. As part of the pickup assembly 13, an optical proximity sensor (153 in Figs. 9 and 10) detects the travel distance of the pickup roller 18 as it moves down to pick up an envelope by detecting a reflective surface (163 in Fig. 10) on the roller 18. As the envelope pickup stack 117 depth diminishes due to printer ingestion, the travel distance of the pickup roller must increase to pickup remaining envelopes. The sensor 153 is calibrated to detect a certain length of movement of the pickup roller 18 downward corresponding with a depletion of the envelope stack to a known quantity of envelopes, typically less than or equal to 6 envelopes. When the sensor 153 is triggered, it sends a signal 131 to a control system 140 (see Fig. 9). The control system 140 responds by advancing both conveyors for about one half ($\frac{1}{2}$) a second 132 causing several envelopes (typically 4-6) within the shingled envelope group 102 to advance into the envelope stack 117 at the bottom-most position of the stack. As can be understood by steps 131, 132, and 134, the acceleration feed conveyor 16 will continue to feed envelopes into the envelope stack for consumption by the pickup roller 18 as long as envelopes

are present within the stack 117 responsive to continuing pickup roller sensor signals. While the inventors have found that one half ($\frac{1}{2}$) a second of conveyor advancement is satisfactory for standard, low-cost electric drive motors, the period of time for advancing the conveyors in coordinated unison will depend upon the envelope ingestion speed (i.e. the print speed of the printer) and the movement speed of the conveyors 16, 17. However, once the conveyor activation time duration has been satisfactorily established, the conveyors will be continually advance envelopes at coordinated intervals to replenish the envelope stack 117 irrespective of the speed at which the envelopes arrive at the pickup zone 116, and irrespective of how long or the type of envelope media that has been loaded onto the conveyors. Moreover, such replenishment is done without operator intervention.

[0025] When no further envelopes are present in the stack 117, the paper out sensor 118 will rotate upwards and send a signal 136 to indicate on a display 137 that a paper-out condition has occurred. The signal can be processed internally by the printer pursuant to known processing within the printer electronics when paper is unavailable, and/or the signal can simultaneously be processed by the control system 140 to stop the conveyors 16 and 17 from further movement. Alternatively, an operator can simply actuate a switch on the feeder 10 to disengage further movement of the conveyors.

[0026] As shown in Fig. 9, the control system 140 includes a micro-controller 141 connected to a group A of sensors 147, including the optical proximity sensor 153 for sensing the movement downward of the pickup roller 18, indicating a depletion event in the height of the envelope stack 117, and at least one sensor 151 to indicate a paper out condition in the envelope stack. The micro-controller 141 may be any known 4 or 8 bit micro-controller that can be programmed as is understood in the industry. Additional sensors 152, such as an envelope alignment condition within the pickup zone 116, may also be included to form a second sensor sub-group B 149. Micro-controller 141 also controls motor drivers 145 that turn-on and initiate rotation of two motors 142. Motor 143 drives acceleration feed conveyor 16 and motor 144 drives feed conveyor 17. Two variable resistor elements 156 and 157 control the voltage supplied to the motors 142, and thereby vary the speed of each motor by providing a varying voltage value to the micro-controller 141. Manual switch 154 actuates immediate and continuous movement of the motors 142 pursuant to the loading step 122/123 in Fig. 8, and power supply 159 provides power to the control system 140, including all sensors and motors from an AC source 161.

[0027] It will be noted that for the herein described embodiment, feeder 10 does not need the presence of sub-group B 149 sensors to operate. For example, mechanical sensor 151 arranged within the pickup assembly 13 (e.g. element 118 in Fig. 7) may be left unconnected to control system 140 and provide an internal signal to the printer 11 only. Further, sensor group A 147 may be varied

as may be understood to enhance the timing and speed of ingestion of envelopes into printer 11. For example, optical proximity sensor 153 might be replaced with a pressure switch adjacent to the stack to determine its height, or by a lever switch in contact with the pickup roller to determine its movement downward. Nevertheless, the inventors prefer the use of an optical proximity sensor to determine a depletion event in the pickup stack 117 at the pickup zone 116 because of its ease of calibration for different types of printers.

[0028] Preferably, the micro-controller 141 is programmed to actuate the motors 142 upon the receipt from sensor 153, indicating a stack depletion event, for a time period of approximately one half ($\frac{1}{2}$) of one second, although a movement actuation range of .3 to .7 seconds will typically satisfy the pickup speed for most printers using a pickup roller to ingest an envelope for processing. The duration of the movement actuation should be evaluated prior to feeder 10 operation so that movement duration may be pre-programmed into the micro-controller 141, or a simple variable resistor knob for each roller (e.g. elements 156 and 157) may be adjusted to set the speed of each conveyor drive motor and, thereby, the speed of each conveyor.

[0029] The inventors have found that an optimal configuration for the feeder 10 is a speed of 46 inches/minute for the acceleration feed conveyor 16 combined with a speed of 5.7 inches/minute for the feed conveyor 17, thereby yielding an 8:1 speed ratio, with a dual conveyor activation period of .5 seconds. However, higher and lower ratios are possible. A low ratio of 5:1 is possible with the acceleration feed conveyor 16 moving at 46 inches/minute and the feed conveyor 17 moving at 9.2 inches/minute, and the conveyors would need to be activated for .3 seconds. A high ratio is also possible with the acceleration feed conveyor 16 moving at 46 inches/minute and the feed conveyor 17 moving at 3.8 inches/minute, but the conveyors would need to be activated for at least .7 seconds to keep the pickup stack satisfactorily filled. As the ratio decreases, an increase in overlap between envelopes results on acceleration feed conveyor 16 so that a smaller activation period is necessary to replenish the pickup stack for a given conveyor speed. As the ratio increases, the degree of overlap in envelopes on the acceleration feed conveyor 16 decreases such that a longer conveyor activation period is necessary to replenish the pickup stack. However, irrespective of the ratio selected, it is critical that the acceleration feed conveyor 16 must move with sufficient speed to deliver replenishment envelopes to the envelope stack 117 faster than the printer can ingest the envelope pickup stack 117. Further, it is critical that the acceleration feed conveyor 16 be substantially faster than the envelope feed conveyor 17 so that a shingled column is created having a curve similar to the curve 114 shown in Fig. 7. Such a speed differential results in the lying flat or "lying down" of envelopes such that a satisfactory envelope stack 117 is formed within the manual input tray area of printer 11

to allow rapid pickup and ingestion by the pickup roller assembly 13 without stalls.

[0030] Fig. 10 provides a detailed view of the pickup roller assembly 13 with an envelope stack 117 already formed beneath the assembly 13 trailed by a shingled set of waiting envelopes 102. As shown, at the point of pickup of an envelope, roller 18 moves down to capture the top-most envelope and moves it forward into the printer for processing. Other envelopes are stacked in shingled fashion below the lead envelope supporting one another within the pickup zone 116. Paper out sensor 118 is depressed while any envelope is present within the pickup zone 116, thereby stopping the sending of any signal by the sensor 118. Pickup roller 18 includes just below sensor 153 an optically reflective surface 163 capable of reflecting light frequencies detected by sensor 153. When pickup roller 18 moves downward a preselected distance, sensor 153 detects a calibrated loss of reflected light by the sensor due to the distance the reflective surface has moved downward and away from sensor 153. When the pickup roller travels the calibrated distance, sensor 153 sends a signal to the micro-controller 141 as previously discussed and conveyors 16 and 17 activate to replace the envelopes ingested by the printer 11 for a specified time period. Since, optimally, the acceleration conveyor 16 moves at eight (8) times the rate of conveyor 17, a flat shingled procession of envelopes is continually presented to the pickup roller 18 in an orientation that facilitates envelope pickup and at a feed rate that maintains envelopes in the correct orientation in the pickup zone 116 until all envelopes on the acceleration feed conveyor 16 have been exhausted. Guides 19a and 19b assist to keep the envelope procession structured such that each envelope arrives at the pickup zone 116 with an orthogonally oriented leading edge.

[0031] While I have shown my invention in one form, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various changes and modifications without departing from the scope of the claims.

Claims

1. An envelope feeder (10) for a printer (11) having an input slot (12) and a pickup assembly (13) in said input slot, the envelope feeder (10) comprising:
 - a. a first motorized conveyor (16) having an upstream end (24) and a downstream end (23), wherein said downstream end is positioned adjacent to an input slot (12) on said printer (11);
 - b. a second motorized conveyor (17) having an upstream end and a downstream end, wherein said second conveyor is positioned such that envelopes moved in a downstream direction on said second conveyor empty onto the upstream end of said first conveyor (16) to form a grouping

of envelopes thereon;

c. wherein said first conveyor (16) moves at a speed substantially greater than said second conveyor (17);

d. wherein said feeder (10) is configured to transition a grouping of envelopes (101) on said second conveyor (17) from a substantially vertical orientation in which each envelope on said second conveyor has a horizontally aligned upper edge (113) to a shingled stack of envelopes on said first conveyor (16), and wherein said shingled stack of envelopes is substantially horizontal upon arrival at said printer (11);

e. means for providing a backstop (29) to support envelopes (101) loaded on said second conveyor in a substantially vertical position; and,

f. control means (140) dependent upon a sensor (147) at said pickup assembly (13) for cooperatively advancing said first and second conveyors responsive to a condition at said input slot (12).

2. An envelope feeder as recited in claim 1, wherein said feeder (10) is further configured such that the upper edges of said grouping of envelopes on said first conveyor forms a downward sloping curve (114) extending from the downstream end (23) of said second conveyor (17) to the downstream end (23) of said first conveyor (16).
3. An envelope feeder as recited in claim 2, wherein said speed differential between said first and second conveyors is about seven times greater.
4. An envelope feeder as recited in claim 3, wherein said first and second conveyors define a gap (104) between them comprising a transition zone, and wherein said envelopes transition from a fixed orientation on said second conveyor (17) to a continually rotating orientation on said first conveyor (16) at said transition zone;
5. An envelope feeder as recited in claim 4, wherein said feeder (10) is adapted to form a pickup stack (117) of envelopes within said pickup assembly (13) upon movement of said first conveyor; and optionally, the envelope feeder further comprising a sensor (153) positioned at said pickup assembly (13) and in electrical communication with said control means (140), and wherein said sensor is configured to register the depletion of said pickup stack (117) to a predefined level and communicate said depletion event to said control means, and wherein said control means responsive to said depletion event communication is configured to advance said conveyors for a preselected time duration to periodically replenish said pickup stack (117).

6. An envelope feeder as recited in claim 1, wherein said control means (140) comprises:

a. a micro-controller (141);
 b. a plurality of motor drivers (145) connected to said micro-controller for driving motors (142) on said conveyors;
 c. at least one input means (156) connected to said micro-controller for setting the speed of said conveyors;
 d. means for supplying power (159) to said control means; and,
 e. a switch (154) for initiating continuous movement of said conveyors;
 and optionally wherein said first conveyor comprises:

a. five parallel shafts (67);
 b. a pair of parallel bearing members (66) rotatably supporting said shafts at their ends;
 c. two endless conveyor belts (68) spanning said shafts and parallel to one another;
 d. drive means (73, 74) connected to one said shaft for driving said same; and,
 e. at least one guide means (71) for keeping said conveyor belts at fixed locations on said first conveyor;

and further optionally, wherein said second conveyor comprises:

a. two parallel shafts (81, 82) positioned at the ends of said second conveyor(17) ;
 b. two parallel support plates (20) rotatably supporting said two shafts at their ends;
 c. four endless conveyor belts (28) spanning said two shafts;
 d. drive means (34) connected to said one shaft at an upstream end of said second conveyor for driving said same;
 e. a deck (27) supported by and extending between said two support plates (20), wherein said conveyor belts (28) are slidably supported by said deck (27) on an upper surface of said second conveyor; and,
 f. a plurality of rotating guide means affixed to the underside of said deck for tensioning and keeping said conveyor belts at fixed locations on said second conveyor.

7. An envelope feeder as recited in claim 6, wherein said feeder further comprises a base (21) having means for slidably supporting said first and second conveyors, and wherein said first and second conveyors are arranged into a single chassis form; and optionally, the envelope feeder further comprising two adjustable guide rails extending in an up-

stream and downstream direction of said feeder for guiding said envelopes along said conveyors during movement thereon.

8. An envelope feeder as recited in claim 1, wherein said feeder (10) is adapted to form a pickup stack of envelopes (117) within said pickup assembly (13) upon movement of said first conveyor (16), and wherein said feeder further includes a sensor (140) positioned at said pickup assembly and in electrical communication with said control means (140), and wherein said sensor is configured to register the depletion of said pickup stack (117) to a predefined level and communicate said depletion event to said control means, and wherein said control means responsive to said depletion event communication is configured to advance said conveyors for a preselected time duration to periodically replenish said pickup stack;
 and optionally wherein said feeder comprises a self-contained movable unit.

9. An envelope feeder (10) for a printer having a manual input slot (12) for media, a pickup assembly (13) for picking up media placed into said slot, and a paper out sensor (118) positioned in said slot (12), the envelope feeder (10) for feeding envelopes (101) for printing into said input slot, the envelope feeder comprising:

a. a horizontal feeder assembly (14) having an acceleration conveyor (16) positioned adjacent to said manual input slot, a feed conveyor (17) adjacent and in-line with to said acceleration conveyor at the upstream end (24) of said acceleration conveyor, and a pair of parallel guide plates (19) extending along the length of said horizontal feeder assembly on the outside portions of said two conveyors;
 b. means (21) for supporting said horizontal feeder assembly in proximal relation to said printer;
 c. drive means (34) affixed to each said conveyor for driving said same; and,
 d. control means (140) responsive to at least one sensor (118) in said manual input slot for advancing said conveyors with said drive means, wherein said control means advances said acceleration conveyor at a rate substantially greater than said feeder conveyor such that envelopes moving on said acceleration conveyor form a downwardly sloping shingled group (102) of envelopes, each envelope having a substantially flat orientation upon reaching said manual input slot (12);

and optionally wherein said acceleration conveyor (16) moves at about seven times the rate of said feed

conveyor (17).

10. An envelope feeder as recited in claim 9, further comprising a backstop (29) supported by said feed conveyor for supporting said envelopes thereon in a substantially vertical orientation; and optionally wherein said feeder comprises a self-contained movable unit. 5
11. An envelope feeder as recited in claim 9, wherein said sensor (118) is positioned at said pickup assembly and is in electrical communication with said control means; and optionally wherein said conveyors define a gap (104) between them comprising a transition zone, and wherein said envelopes transition from a fixed orientation on said feed conveyor to a continually rotating orientation on said acceleration conveyor at said transition zone. 10 15 20
12. A two stage envelope feeder (10) for feeding envelopes (101) into an input slot (12) on a printer (11), comprising:
 - a. a first stage conveyor assembly (17); 25
 - b. a second stage conveyor assembly (16), wherein said second stage conveyor is positioned to receive envelopes from said first stage conveyor;
 - c. wherein said first stage conveyor (17) moves envelopes at an identical backward vertical angle of at least a 50 degrees and includes means (29) for supporting said envelopes at said angle;
 - d. means (140) in communication with said first and second stage conveyors for automatic controlled advancement of envelopes on said conveyors; 30 35
 - e. wherein said control means (140) is adapted to move said second stage (16) conveyor at a speed substantially faster than said first stage (17) conveyor such that envelopes received from said first stage conveyor form a shingled stack (102) having a sloped downward curve and wherein each said envelope arrives at said input slot (12) in a substantially horizontal orientation, and wherein each envelope is vertically stacked upon a previously received envelope within said input slot to create a stacked column (117) of envelopes therein; and, 40 45
 - f. an optical sensor (153) positioned proximal to said input slot and in electrical communication with said control means (140) for monitoring the residual height of said vertical envelope stack and sending a signal to said control means upon said vertical envelope stack decreasing to a predetermined residual level. 50 55

13. An envelope feeder as recited in claim 12, wherein

said first stage conveyor assembly (17) comprises:

- a. two parallel shafts (81, 82) positioned at the ends of said first stage conveyor assembly (17);
- b. two parallel support plates (20) rotatably supporting said two shafts at their ends;
- c. four endless conveyor belts (28) spanning said two shafts;
- d. drive means (34) connected to said one shaft at an upstream end of said first stage conveyor assembly for driving said same;
- e. a deck (27) supported by and extending between said two support plates (20), wherein said conveyor belts (28) are slidably supported by said deck on an upper surface of said first stage conveyor assembly; and,
- f. a plurality of rotating guide means (84) affixed to the underside of said deck (27) for tensioning and keeping said conveyor belts (28) at fixed locations on said first stage conveyor assembly (17).

14. A method for feeding envelopes into an input slot (12) of a printer (11), comprising the steps of:

- a. loading envelopes (101) on first conveyor (17) such that the envelopes are vertically oriented in a stack with a back angle of a predetermined amount;
- b. advancing said first conveyor (17) in a downstream direction (23) such that said envelopes empty onto a second conveyor (16);
- c. in cooperative movement between said first and second conveyors, advancing said emptied envelopes on said second conveyor at a speed faster than said first conveyor such that said envelopes form a shingled stack (102) moving in a downstream direction (23) and having their upper edges forming a sloped downward curve (114), wherein such envelopment movement causes each envelope to arrive at said printer slot (12) in a horizontal orientation;
- d. loading a group of said horizontal oriented envelopes into said printer slot to form a pickup stack (117) therein; and,
- e. automatically advancing said first and second conveyors to replenish said pickup stack as said envelopes are consumed by said printer (11).

15. The method as recited in claim 14, wherein said step of automatically advancing said first and second conveyors comprises advancing said second conveyor at a rate of between 5 and 12 times the rate of said first conveyor.

16. The method as recited in claim 15, wherein said step of loading a group of said horizontal oriented envelopes into said printer slot comprises loading at least

one envelope into said printer slot prior to advancing said first and second conveyors.

17. The method as recited in claim 16, wherein said step of automatically advancing said first and second conveyors to replenish said pickup stack (117) as said envelopes are depleted comprises periodically advancing said conveyors for a predefined time segment of between .3 and .7 seconds. 5
18. The method as recited in claim 17, further comprising the step of monitoring said envelope pickup stack (117) with an optical sensor (153) measuring the travel distance of a pickup roller (13) engaging the topmost envelope in said pickup stack (117) and sending a signal to a control means (140) to initiate said automatically advancing replenishment step when said pickup roller travel distance exceeds a specified amount; 10
and optionally wherein said steps of advancing said first conveyor (17) in a downstream direction (23) with stacked envelopes and advancing emptied envelopes onto said second conveyor (16) to form an envelope stack (117) in said printer slot (12) are controlled by a human operator operating a switch (154) on an electrical control system. 20 25
19. The method as recited in claim 14, wherein said step of automatically advancing said first and second conveyors to replenish said pickup stack (117) as said envelopes are depleted comprises periodically advancing said conveyors in predefined time segments; 30
and optionally, wherein said step of automatically advancing said first and second conveyors to replenish said envelope pickup stack further comprises the step of monitoring said envelope pickup stack (117) with an optical sensor (153) measuring the travel distance of a pickup roller (13) engaging the topmost envelope in said pickup stack (117) and sending a signal to a control means (140) to initiate said automatically advancing step. 35 40

Patentansprüche

1. Umschlagzuführung (10) für einen Drucker (11) mit einem Eingangsschlitz (12) und einer Aufnahmeanordnung (13) in dem Eingangsschlitz, wobei die Umschlagzuführung (10) Folgendes umfasst: 50
 - a. einen ersten motorisierten Förderer (16) mit einem stromaufwärts gelegenen Ende (24) und einem stromabwärts gelegenen Ende (23), wobei das stromabwärts gelegene Ende nahe bei dem Eingangsschlitz (12) an dem Drucker (11) positioniert ist; 55
 - b. einen zweiten motorisierten Förderer (17) mit

einem stromaufwärts gelegenen Ende und einem stromabwärts gelegenen Ende, wobei der zweite Förderer so positioniert ist, dass Umschläge in stromabwärts weisender Richtung auf dem zweiten Förderer leer auf das stromabwärts gelegene Ende des ersten Förderers (16) zubewegt werden, um darauf eine Gruppe von Umschlägen zu bilden;

c. wobei sich der erste Förderer (16) mit einer Geschwindigkeit bewegt, die wesentlich größer ist als die des zweiten Förderers (17);

d. wobei die Zuführung (10) so konfiguriert ist, dass sie eine auf dem zweiten Förderer (17) angeordnete Gruppe von Umschlägen (101) von einer im Wesentlichen vertikalen Ausrichtung, in der jeder Umschlag auf dem zweiten Förderer eine horizontal ausgerichtete obere Kante (113) aufweist, zu einem flachen fächerartigen Stapel von Umschlägen auf dem ersten Förderer zu überführen, und wobei der flache Stapel von Umschlägen bei Ankunft an dem Drucker (11) im Wesentlichen horizontal ist;

e. Mittel zum Bereitstellen einer Rücklaufsperr (92), damit die Umschläge (101), die auf dem zweiten Förderer geladen sind, in einer im Wesentlichen vertikalen Position abgestützt werden; und

f. ein Steuermittel (140), die von einem an der Aufnahmeanordnung (13) angeordneten Sensor abhängig sind, um den ersten und den zweiten Förderer als Reaktion auf einen Zustand an dem Eingangsschlitz (12) kooperativ anzutreiben.

2. Umschlagzuführung nach Anspruch 1, wobei die Zuführung (10) ferner so konfiguriert ist, dass die oberen Kanten der Gruppe von Umschlägen auf dem ersten Förderer eine abwärts geneigte Kurve (114) bilden, die sich von dem stromabwärts gelegenen Ende (23) des zweiten Förderers (17) zu dem stromabwärts gelegenen Ende (23) des ersten Förderers (16) erstreckt. 35 40
3. Umschlagzuführung nach Anspruch 2, wobei der Unterschied der Geschwindigkeiten zwischen dem ersten und dem zweiten Förderer etwa siebenmal größer ist. 45
4. Umschlagzuführung nach Anspruch 3, wobei der erste und der zweite Förderer einen Spalt (104) zwischen beiden bilden, der eine Übergangszone umfasst, und wobei die Umschläge von einer festen Ausrichtung auf dem zweiten Förderer (17) zu einer kontinuierlich drehenden Orientierung auf dem ersten Förderer (16) an der Übergangszone übergehen. 50 55
5. Umschlagzuführung nach Anspruch 4, wobei der Einzug (10) so angepasst ist, dass er bei Bewegung

des ersten Förderers einen Aufnahmestapel (117) von Umschlägen innerhalb der Aufnahmeanordnung (13) bildet;

und optional: die Umschlagzuführung umfasst ferner einen Sensor (153), der an der Aufnahmeanordnung (13) positioniert ist und in elektrischer Kommunikation mit dem Steuermittel (140) steht, und wobei der Sensor so konfiguriert ist, dass er die Abnahme des Aufnahmestapels (117) auf ein vorbestimmtes Niveau registriert und das Ereignis der Abnahme an die Steuereinrichtung kommuniziert, und wobei die Steuereinrichtung, die auf das Ereignis der Abnahme reagiert, so konfiguriert ist, dass sie die Förderer für eine vorgewählte Zeitdauer antreibt, um den Aufnahmestapel (117) periodisch aufzufüllen.

6. Umschlagzuführung nach Anspruch 1, wobei das Steuermittel (140) Folgendes umfasst:

- a. einen Mikro-Controller (141);
- b. eine Mehrzahl von motorischen Antrieben (145), die mit dem Mikro-Controller verbunden sind, um die Motoren an den Förderbändern anzutreiben;
- c. mindestens eine Eingabeeinrichtung (156), die mit dem Mikro-Controller verbunden ist, um die Geschwindigkeit der Förderer einzustellen;
- d. Mittel zum Zuführen von Energie zu der Steuereinrichtung; und
- e. einen Schalter (154) zum Auslösen einer kontinuierlichen Bewegung der genannten Förderer;

und optional: wobei der erste Förderer Folgendes umfasst:

- a. fünf parallele Wellen (67);
- b. ein Paar von parallele Lagerelementen (66), die die Wellen an ihren Enden drehbar tragen;
- c. zwei endlose Förderbänder (68), die die Wellen überspannen und parallel zueinander angeordnet sind;
- d. Antriebsmittel (73, 74), die mit einer der Wellen verbunden sind, um diese anzutreiben; und
- e. mindestens eine Führungseinrichtung (71) zum Halten der Förderbänder an festen Stellen an dem ersten Förderer;

und ferner optional: wobei der zweite Förderer Folgendes umfasst:

- a. zwei Wellen (81, 82), die an den Enden des zweiten Förderers (17) positioniert sind;
- b. zwei parallele Stützplatten (20), die die beiden Wellen an ihren Enden drehbar tragen;
- c. vier endlose Förderbänder (28), die die beiden Wellen überspannen;
- d. Antriebsmittel (34), die an einem stromauf-

wärts gelegenen Ende des zweiten Förderers mit der einen Welle verbunden sind, um diese anzutreiben;

e. ein Deck (27), das von den beiden Stützplatten (20) getragen wird und sich zwischen diesen erstreckt, wobei die Förderbänder (28) von dem Deck (27) auf einer oberen Oberfläche des zweiten Förderers verschieblich getragen werden; und

f. eine Mehrzahl von rotierenden Führungsmitteln, die an der Unterseite des Decks angebracht sind, um die Förderbänder an festen Stellen an dem zweiten Förderer zu spannen und zu halten.

7. Umschlagzuführung nach Anspruch 6, wobei die Zuführung ferner eine Basis (21) umfasst, die mit Mitteln zum verschiebbaren Tragen des ersten und des zweiten Förderers versehen ist, und wobei der erste und der zweite Förderer in einer einzigen Chassisform angeordnet sind;

und optional: die Umschlagzuführung umfasst ferner zwei einstellbare Führungsschienen, die sich in eine stromaufwärts und stromabwärts weisende Richtung der Zuführung erstrecken, um die Umschläge während der Bewegung darauf entlang der Förderer zu führen.

8. Umschlagzuführung nach Anspruch 1, wobei die Zuführung so angepasst ist, dass sie einen Aufnahmestapel von Umschlägen (117) innerhalb der Aufnahmeanordnung (13) bei Bewegung des ersten Förderers (16) bildet, und wobei die Zuführung ferner einen Sensor (140) umfasst, der an der Aufnahmeanordnung positioniert ist und in elektrischer Kommunikation mit den Steuermitteln (140) steht, und wobei der Sensor derart konfiguriert ist, dass er die Abnahme des Aufnahmestapels (117) auf ein vordefiniertes Niveau registriert und das Ereignis der Abnahme zu der Steuereinrichtung kommuniziert, und wobei die Steuereinrichtung, die auf die Kommunikation des Ereignisses der Abnahme anspricht, so konfiguriert ist, dass die Förderer für eine vorgewählte Zeitdauer angetrieben werden, um den Aufnahmestapel periodisch aufzufüllen;

und optional: wobei die Zuführung eine in sich geschlossene bewegliche Einheit umfasst.

9. Umschlagzuführung (10) für einen Drucker mit einem manuellen Eingangsschlitz (12) für Medien, einer Aufnahmeanordnung (13) zum Aufnehmen von in den Schlitz eingelegten Medien und einem in dem Schlitz (12) positionierten Sensor (118) für die Papierausgabe, wobei die Umschlagzuführung (10) zur Zuführung von Umschlägen (101) dient, die zum Bedrucken in den Eingangsschlitz eingeführt werden, und wobei die Briefumschlagzuführung Folgendes umfasst:

- a. eine horizontale Zuführanordnung (14) mit einem Beschleunigungsförderer (16), der nahe an dem manuellen Eingangsschlitz positioniert ist, einem Zuführförderer (17), der nahe an dem Beschleunigungsförderer an dem stromaufwärts gelegenen Ende (24) des Beschleunigungsförderers liegt und der zu diesem ausgerichtet ist, und ein Paar paralleler Führungsplatten (19), die sich entlang der Länge der horizontalen Zuführanordnung und der Außenteile der beiden Förderer erstrecken;
- b. Mittel (21) zum Abstützen der horizontalen Zuführanordnung in proximaler Beziehung zu dem Drucker;
- c. Antriebsmittel (34), die an jedem Förderer angebracht sind, um denselben anzutreiben; und
- d. ein Steuermittel (140), die auf mindestens einen Sensor (118) anspricht, der in dem manuellen Eingangsschlitz angeordnet ist, um die Förderer mit dem Antriebsmittel anzutreiben, wobei die Steuereinrichtung den Beschleunigungsförderer mit einer Geschwindigkeit antreibt, die wesentlich größer als die des Zuführförderers ist, und zwar dergestalt, dass Umschläge, die sich auf dem Beschleunigungsförderer bewegen, eine nach unten geneigte gefächerte Gruppe (102) von Umschlägen bilden, wobei jeder Umschlag beim Erreichen des manuellen Eingangsschlitzes (12) eine im Wesentlichen flache Ausrichtung aufweist;
- und optional: wobei sich der Beschleunigungsförderer (16) mit etwa der siebenfachen Geschwindigkeit des Zuführrohrförderers (17) bewegt.
- 10.** Umschlagzuführung nach Anspruch 9, ferner umfassend eine Rücklaufsperr (29), die von dem Zuführförderer getragen wird, um die Umschläge darauf in einer im Wesentlichen vertikalen Ausrichtung abzustützen;
- und optional: wobei die Zuführung eine in sich geschlossene bewegliche Einheit umfasst.
- 11.** Umschlagzuführung nach Anspruch 9, wobei der Sensor (118) an der Aufnahmeanordnung positioniert ist und mit der Steuereinrichtung in elektrischer Verbindung steht;
- und optional: wobei die Förderer einen Spalt (104) zwischen sich bilden, der eine Übergangszone umfasst, wobei die Umschläge von einer festen Ausrichtung auf dem Zuführrohrförderer zu einer kontinuierlich drehenden Ausrichtung in der Übergangszone auf den Beschleunigungsförderer übergehen.
- 12.** Zweistufige Umschlagzuführung (10) zur Zuführung von Umschlägen (101) in einen Eingangsschlitz (12) an einem Drucker (11), umfassend:
- a. eine Fördereinrichtung einer ersten Stufe (17);
- b. eine Fördereinrichtung einer zweiten Stufe (16), wobei der Förderer der zweiten Stufe so positioniert ist, dass er Umschläge von dem Förderer der ersten Stufe aufnimmt;
- c. wobei der Förderer der ersten Stufe (17) Umschläge in einem identischen, rückwärtsgerichteten vertikalen Winkel von mindestens 50 Grad bewegt und Mittel (29) zum Abstützen der Umschläge in dieser Winkelstellung enthält;
- d. Mittel (140) in Kommunikation mit den Förderern der ersten und der zweiten Stufe zum automatisch gesteuerten Vorschieben von Umschlägen auf den Förderern;
- e. wobei das Steuermittel (140) so angepasst sind, um den Förderer der zweiten Stufe (16) mit einer Geschwindigkeit zu bewegen, die wesentlich schneller ist als die des Förderers der ersten Stufe (17), sodass die von dem Förderer der ersten Stufe empfangenen Umschläge einen gefächerten Stapel (102) mit einer abwärts geneigten Kurve bilden, und wobei jeder Umschlag in einer im Wesentlichen horizontalen Ausrichtung an dem Eingangsschlitz (12) ankommt, und wobei jeder Umschlag auf einem zuvor empfangenen Umschlag innerhalb des Eingangsschlitzes vertikal gestapelt ist, um einen Aufnahmestapel (117) von Umschlägen darin zu erzeugen; und
- f. einen optischen Sensor (153), der proximal zu dem Eingangsschlitz und in elektrischer Verbindung mit den Steuermitteln (140) positioniert ist, um die restliche Höhe des vertikalen Briefumschlagstapels zu überwachen und ein Signal an die Steuermittel zu senden, wenn der vertikale Umschlagstapel auf ein vorbestimmtes Restniveau abgenommen hat.
- 13.** Umschlagzuführung nach Anspruch 12, wobei die Förderanordnung (17) der ersten Stufe Folgendes umfasst:
- a. zwei parallele Wellen (81, 82), die an den Enden der Förderanordnung (17) der ersten Stufe angeordnet sind;
- b. zwei parallele Stützplatten (20), die die beiden Wellen an ihren Enden drehbar tragen;
- c. vierendlose Förderbänder (28), die die beiden Wellen überspannen;
- d. Antriebsmittel (34), die mit der einen Welle an einem stromaufwärts gelegenen Ende der Förderanordnung der ersten Stufe verbunden sind, um diese anzutreiben;
- e. ein Deck (27), das von den beiden Stützplatten (20) getragen wird und sich zwischen diesen erstreckt, wobei die Förderbänder (28) von dem Deck auf einer oberen Oberfläche der Fördera-

- nordnung der ersten Stufe verschiebbar getragen werden; und
f. eine Mehrzahl von rotierenden Führungsmitteln (84), die an der Unterseite des Decks (27) angebracht sind, um die Förderbänder (28) zu spannen und an festen Stellen auf der Förderanordnung (17) der ersten Stufe zu halten.
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14. Verfahren zum Zuführen von Umschlägen in einen Eingabeschlitz (12) eines Druckers (11), wobei das Verfahren die folgenden Schritte umfasst:
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- a. Laden von Umschlägen (101) auf den ersten Förderer (17), und zwar dergestalt, dass die Umschläge vertikal in einem Stapel mit einem Rückenwinkel von einem vorbestimmten Betrag ausgerichtet werden;
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- b. Antreiben des ersten Förderers (17) in einer stromabwärts verlaufenden Richtung (23), so dass die Umschläge leer auf einen zweiten Förderer (16) gelangen;
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- c. bei einer kooperativen Bewegung zwischen dem ersten und dem zweiten Förderer: Verschieben der leeren Umschläge auf dem zweiten Förderer mit einer Geschwindigkeit, die schneller ist als die auf dem ersten Förderer, sodass die Umschläge einen gefächerten Stapel (102) bilden, der sich in einer stromabwärts erstreckenden Richtung (23) bewegt, und ihre Oberkanten eine geneigte Abwärtskurve (114) bilden, wobei eine solche Bewegung der Umschläge bewirkt, dass jeder Umschlag in eine horizontale Ausrichtung zu dem Druckerschlitz (12) gelangt;
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- d. Laden einer Gruppe der horizontal ausgerichteten Umschläge in den Druckerschlitz, um einen Aufnahmestapel (117) darin zu bilden; und
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- e. automatisches Antreiben des ersten und des zweiten Förderers, um den Aufnahmestapel wieder aufzufüllen, wenn die Umschläge von dem Drucker (11) verbraucht sind.
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15. Verfahren nach Anspruch 14, wobei der Schritt des automatischen Antreibens des ersten und des zweiten Förderers das Antreiben des zweiten Förderers mit einer Geschwindigkeit zwischen dem 5-fachen und dem 12-fachen der Geschwindigkeit des ersten Förderers umfasst.
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16. Verfahren nach Anspruch 15, wobei der Schritt des Ladens einer Gruppe der horizontal ausgerichteten Umschläge in den Druckerschlitz das Laden von mindestens einem Umschlag in den Druckerschlitz vor dem Antreiben des ersten und des zweiten Förderers umfasst.
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17. Verfahren nach Anspruch 16, wobei der Schritt des automatischen Antreibens des ersten und des zweiten Förderers zum Auffüllen des Aufnahmestapels (117), wenn die Umschläge aufgebraucht sind, das periodische Antreiben der Förderer für ein vorbestimmtes Zeitsegment zwischen 0,3 und 0,7 Sekunden umfasst.
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18. Verfahren nach Anspruch 17, ferner umfassend den folgenden Schritt des Überwachens des Aufnahmestapels (117) der Umschläge mit einem optischen Sensor (153), der die Transportstrecke einer Aufnahmerolle (13) misst, die den obersten Umschlag in dem Aufnahmestapel (117) erfasst, und Senden eines Signals an ein Steuermittel (140), um den automatisch vorrückenden Schritt des Nachschubs einzuleiten, wenn die Transportstrecke der Aufnahmerolle einen bestimmten Betrag überschreitet; und optional: wobei die Schritte des Antreibens des ersten Förderers (17) in einer stromabwärts verlaufenden Richtung (23) mit gestapelten Umschlägen und des Verschiebens leerer Umschläge auf den zweiten Förderer (16) zur Bildung eines Umschlagstapels (117) in dem Druckerschlitz (12) von einer menschlichen Bedienungsperson gesteuert werden, die einen Schalter (154) an einem elektrischen Steuersystem betätigt.
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19. Verfahren nach Anspruch 14, wobei der Schritt des automatischen Antreibens des ersten und des zweiten Förderers zum Auffüllen des Aufnahmestapels (117), wenn die Umschläge aufgebraucht sind, das periodische Vorrücken der Förderer in vordefinierten Zeitsegmenten umfasst; und optional: wobei der Schritt des automatischen Anschreibens des ersten und des zweiten Förderers zum Auffüllen des Aufnahmestapels der Umschläge ferner den Schritt des Überwachens des Aufnahmestapels (117) der Umschläge mit einem optischen Sensor (153) umfasst, der die Transportstrecke einer Aufnahmerolle (13) misst, den obersten Umschlag in dem Aufnahmestapel (117) erfasst und ein Signal an ein Steuermittel (140) sendet, um den automatisch vorrückenden Schritt einzuleiten.
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- Revendications**
1. Dispositif d'alimentation en enveloppes (10) d'une imprimante (11) ayant une fente d'entrée (12) et un dispositif de prise (13) dans la fente d'entrée, le dispositif d'alimentation en enveloppes (10) comprenant :
- a. un premier convoyeur motorisé (16) ayant une extrémité amont (24) et une extrémité aval (23), cette extrémité aval étant située au voisinage de la fente d'entrée (12) de l'imprimante (11),
- b. un second convoyeur motorisé (17) ayant une extrémité amont et une extrémité aval, ce se-

- cond convoyeur étant placé de façon que les enveloppes se déplaçant dans le sens de l'aval sur le second convoyeur arrivent à l'extrémité amont du premier convoyeur (16) pour y former un groupage d'enveloppes, 5
dispositif dans lequel,
c. le premier convoyeur (16) se déplace à une vitesse nettement supérieure à celle du second convoyeur (17),
d. le dispositif d'alimentation (10) est configuré 10 pour faire passer un groupage d'enveloppes (101) sur le second convoyeur (17) ayant une orientation pratiquement verticale dans laquelle chaque enveloppe sur le second convoyeur a un bord supérieur aligné horizontalement (113) vers un empilage d'enveloppes en écailles sur le premier convoyeur (16) et qui est pratiquement horizontale à son arrivée à l'imprimante (11),
e. un moyen formant une butée arrière (29) pour 20 soutenir les enveloppes (101) chargées sur le second convoyeur dans une position pratiquement verticale, et
f. un moyen de commande (140) relié à un capteur (147) dans l'assemblage de prise (13) pour faire avancer par coopération le premier et second convoyeurs en fonction de la situation dans la fente d'entrée (12).
2. Dispositif d'alimentation en enveloppes selon la revendication 1, dans lequel, 30
le dispositif d'alimentation (10) est en outre configuré de façon que le bord supérieur du groupage d'enveloppes sur le premier convoyeur forme une courbe descendante (114) partant de l'extrémité aval (23) du second convoyeur (17) vers l'extrémité amont (23) du premier convoyeur (16). 35
3. Dispositif d'alimentation en enveloppes selon la revendication 2, dans lequel, 40
la vitesse différentielle entre le premier et le second convoyeurs est supérieure à environ sept fois.
4. Dispositif d'alimentation en enveloppes selon la revendication 3, dans lequel, 45
le premier et le second convoyeurs forment un intervalle (104) entre eux avec une zone de transition et les enveloppes passent d'une orientation fixe sur le second convoyeur (17) en une orientation basculant en continu sur le premier convoyeur (16) dans la zone de transition. 50
5. Dispositif d'alimentation en enveloppes selon la revendication 4, dans lequel, 55
le dispositif d'alimentation (10) adapté pour former un empilage de prise d'enveloppes (117) dans l'assemblage de prise (13) par le mouvement du premier convoyeur, et
- en option, le dispositif d'alimentation en enveloppes comporte en outre un capteur (153) positionné sur l'assemblage de prise (13) et communiquant électriquement avec le moyen de commande (140), le capteur étant configuré pour enregistrer la diminution de l'empilage de prise (117) jusqu'à un niveau prédéfini et communiquer cet état réduit au moyen de commande, qui répondant à cette communication d'état réduit, est configuré pour faire avancer les convoyeurs pendant une durée de temps présélectionnée pour compléter périodiquement l'empilage de prises (117).
6. Dispositif d'alimentation en enveloppes selon la revendication 1, dans lequel, 60
le moyen de contrôle (140) comprend :
- a. un microcontrôleur (141),
 - b. un ensemble de pilotes de moteur (145) relié au microcontrôleur pour commander les moteurs (142) des convoyeurs,
 - c. au moins un moyen d'entrée (156) relié au microcontrôleur pour régler la vitesse des convoyeurs,
 - d. des moyens pour l'alimentation (159) du moyen de commande, et
 - e. un commutateur (154) pour lancer le mouvement continu des convoyeurs,
- et en option, le premier convoyeur comprend :
- a. cinq axes parallèles (67),
 - b. une paire d'éléments de palier parallèles (66) portant à rotation les extrémités des axes,
 - c. deux courroies de convoyeur sans fin (68) passant sur les arbres et en parallèle l'une à l'autre,
 - d. un moyen d'entraînement (73, 74) relié à l'un des arbres pour entraîner celui-ci, et
 - e. au moins un moyen de guidage (71) pour tenir les courroies de convoyeur dans des positions fixes sur le premier convoyeur,
- et en outre, en option, le second convoyeur comprend :
- a. deux axes parallèles (81, 82) aux extrémités du second convoyeur (17),
 - b. deux plaques de support, parallèles (20) portant à rotation les deux axes par leurs extrémités,
 - c. quatre courroies de convoyeur sans fin (28) entre deux arbres,
 - d. des moyens d'entraînement (34) reliés à un arbre à l'extrémité amont du second convoyeur pour entraîner celui-ci,
 - e. un plateau (27) porté par deux plaques de support (20) et s'étendant entre celles-ci, les

- courroies de convoyeur (28) glissant sur le plateau (27) sur la surface supérieure du second convoyeur, et
 f. un ensemble de moyens de guidage en rotation fixés en-dessous du plateau pour tendre et tenir les courroies de convoyeur dans des positions fixes sur le second convoyeur.
7. Dispositif d'alimentation en enveloppes selon la revendication 6, dans lequel, le dispositif d'alimentation comprend en outre une base (21) ayant des moyens pour porter en glissement le premier et le second convoyeurs et ces premier et second convoyeurs sont disposés sur un seul châssis, et en option, le dispositif d'alimentation en enveloppes comprend en outre deux rails de guidage réglables s'étendant dans la direction amont et dans la direction aval du dispositif d'alimentation pour guider les enveloppes le long des convoyeurs pendant leur mouvement.
8. Dispositif d'alimentation en enveloppes selon la revendication 1, dans lequel, le dispositif d'alimentation (10) est adapté pour former un empilage de prise d'enveloppes (117) dans l'assemblage de prise (13) par le mouvement du premier convoyeur (16), et le dispositif d'alimentation comprend en outre un capteur (140) placé dans l'assemblage de prise, et en liaison électrique avec le moyen de commande (140), et le capteur est configuré pour enregistrer la réduction de l'empilage de prise (117) jusqu'à un niveau prédéfini et communiquer cet état réduit au moyen de commande, et le moyen de commande répond à cette communication d'état réduit pour faire avancer les convoyeurs pour une durée prédéterminée pour compléter périodiquement l'empilage de prise, et en option, le dispositif d'alimentation comprend une unité mobile autonome.
9. Dispositif d'alimentation en enveloppes (10) d'une imprimante ayant une fente d'entrée manuelle (12) pour des média, un assemblage de prise (13) pour prendre le médium placé dans la fente et un capteur de sortie de papier (118) dans la fente (12), le dispositif d'alimentation en enveloppes (10) pour alimenter en enveloppes (101) pour l'impression, la fente d'entrée comprenant :
- a. un dispositif d'alimentation horizontal (14) ayant un convoyeur d'accélération (16) adjacent à la fente d'entrée manuelle, un convoyeur d'alimentation (17) adjacent et en ligne avec le convoyeur d'accélération, à l'extrémité amont (24) du convoyeur d'accélération, et une paire de plaques de guidage parallèles (19) le long de l'as-
- semblage d'alimentation horizontal sur les parties extérieures des deux convoyeurs,
 b. des moyens (21) pour porter l'assemblage d'alimentation horizontal au voisinage de l'imprimante,
 c. des moyens d'entraînement (34) fixés à chaque convoyeur pour entraîner celui-ci, et
 d. un moyen de commande (140) relié à au moins un capteur (118) dans cette fente d'entrée manuelle, pour faire avancer les convoyeurs avec les moyens d'entraînement, le moyen de commande faisant avancer le convoyeur d'accélération à une vitesse notablement supérieure à celle du convoyeur d'alimentation de façon que les enveloppes se déplaçant sur le convoyeur d'accélération forment un groupement en écailles, s'inclinant vers le bas (102), chaque enveloppe étant pratiquement à plat lorsqu'elle arrive dans la fente d'entrée manuelle (12), et en option, le convoyeur d'accélération (16) défile à une vitesse environ sept fois supérieure à celle du convoyeur d'alimentation (17).
10. Dispositif d'alimentation en enveloppes selon la revendication 9, comprenant en outre une butée arrière (29) portée par le convoyeur d'alimentation pour soutenir les enveloppes sur celui-ci dans une orientation pratiquement verticale, et en option, le dispositif d'alimentation a une unité mobile autonome.
11. Dispositif d'alimentation en enveloppes selon la revendication 9, dans lequel, le capteur (118) est placé au niveau de l'assemblage de prise et il est en liaison électrique avec le moyen de commande, et en option les convoyeurs forment entre eux un intervalle (104) avec une zone de transition, et les enveloppes transitent entre une orientation fixe sur le convoyeur d'alimentation et une orientation basculant en continu sur le convoyeur d'accélération dans la zone de transition.
12. Dispositif d'alimentation en enveloppes (10) à deux étages pour alimenter en enveloppes (101) une fente d'entrée (12) d'une imprimante (11) comprenant :
- a. un premier étage d'assemblage à convoyeur (17),
 - b. un second étage d'assemblage à convoyeur (16), ce second étage à convoyeur étant positionné pour recevoir les enveloppes du premier étage à convoyeur,
 - c. le premier étage de convoyeur (17) déplaçant les enveloppes orientées selon un angle vertical arrière, identique, d'au moins 50 degrés et comprenant des moyens (29) pour soutenir les en-

- veloppes selon cet angle,
- d. des moyens (140) communiquant avec le premier et le second étages à convoyeur pour commander automatiquement l'avancement des enveloppes sur les convoyeurs, 5
- e. le moyen de commande (140) étant adapté pour actionner le second étage (16) à convoyeur à une vitesse nettement plus rapide que le premier étage à convoyeur (17) de façon que les enveloppes arrivant sur le premier convoyeur forment un empilage incliné (102) selon une courbe inclinée dans le sens descendant et chacune des enveloppes arrive à la fente d'entrée (12) avec une orientation pratiquement horizontale, et 10
- chaque enveloppe est empilée verticalement sur une enveloppe reçue précédemment dans la fente d'entrée pour créer un empilage (117) d'enveloppes dans celle-ci, et 15
- f. un capteur optique (153) à proximité de la fente d'entrée et en liaison électrique avec le moyen de commande (140) pour contrôler la hauteur résiduelle d'un empilage d'enveloppes, vertical et envoyer un signal au moyen de commande lorsque l'empilage d'enveloppes, vertical diminue de hauteur jusqu'à un niveau résiduel prédéterminé. 20 25
- 13.** Dispositif d'alimentation en enveloppes selon la revendication 12, dans lequel, selon lequel, le premier étage d'assemblage à convoyeur (17) comprend :
- a. deux axes parallèles (81, 82) aux extrémités du premier étage d'assemblage à convoyeur (17), 30 35
- b. deux plaques de support parallèles (20) portant en rotation les extrémités des deux axes,
- c. quatre courroies sans fin de convoyeur (28) reliant les deux axes, 40
- d. un moyen d'entraînement (34) relié à un axe à l'extrémité amont du premier étage d'assemblage de convoyeur pour entraîner celui-ci,
- e. un plateau (27) porté par les deux plaques de support (20), entre celles-ci les courroies de convoyeur (28) coulissant sur le plateau, sur la surface supérieure du premier étage d'assemblage à convoyeur, et 45
- f. un ensemble de moyens de guidage en rotation (84) fixés en dessous du plateau (27) pour mettre en tension et tenir les courroies de convoyeur (28) dans des positions fixes sur le premier étage d'assemblage à convoyeur (17). 50
- 14.** Procédé d'alimentation en enveloppes d'une fente d'entrée (12) d'une imprimante (11) comprenant des étapes consistant à :
- a. charger les enveloppes (101) sur un premier convoyeur (17) de façon que les enveloppes soient orientées verticalement dans l'empilage avec un angle arrière prédéfini,
- b. faire avancer le premier convoyeur (17) dans le sens aval (23) de façon que les enveloppes arrivent sur un second convoyeur (16),
- c. par la coopération des mouvements entre le premier et le second convoyeurs, faire avancer les enveloppes pour arriver sur le second convoyeur à une vitesse supérieure à celle du premier convoyeur de façon que les enveloppes forment un seul empilage (102) se déplaçant dans la direction aval (23) et ayant leur bord supérieur formant une courbe inclinée descendante (114) pendant le mouvement des enveloppes de sorte que chaque enveloppe arrive avec une orientation horizontale dans la fente d'imprimante (12),
- d. charger un groupe d'enveloppes orientées horizontalement dans la fente d'imprimante pour former un empilage de prise (117) dans celle-ci, et
- e. faire avancer automatiquement le premier et le second convoyeur pour remplir l'empilage de prise pendant que l'imprimante (11) prend les enveloppes.
- 15.** Procédé selon la revendication 14, selon lequel, l'étape d'avancée automatique du premier et du second convoyeur consiste à faire avancer le second convoyeur à une vitesse comprise entre cinq et douze fois la vitesse du premier convoyeur.
- 16.** Dispositif d'alimentation en enveloppes selon la revendication 15, selon lequel, l'étape de chargement d'un groupe d'enveloppes orientées horizontalement dans la fente de l'imprimante consiste à charger au moins une enveloppe dans la fente de l'imprimante avant de faire avancer le premier et le second convoyeur.
- 17.** Dispositif d'alimentation en enveloppes selon la revendication 16, selon lequel, l'étape de faire avancer automatiquement le premier et le second convoyeur pour compléter l'empilage de prise (117) à mesure que les enveloppes sont enlevées, consiste à faire avancer périodiquement les convoyeurs pendant un segment de temps prédéfini compris entre 0,3 et 0,7 secondes.
- 18.** Dispositif d'alimentation en enveloppes selon la revendication 17, comprenant en outre l'étape de contrôle de l'empilage de prise d'enveloppes (117) avec un capteur optique (153) mesurant la distance parcourue par un rouleau de pick-up (13) en prise avec l'enveloppe du dessus de l'empilage (117) et en-

voyer un signal à un moyen de commande (140) pour commencer l'étape de remplissage par l'avance automatique lorsque le rouleau de pickup parcourt une distance dépassant une distance spécifiée, et

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en option les étapes consistant à faire avancer le premier convoyeur (17) dans la direction aval (23) avec les enveloppes empilées et faire avancer les enveloppes pour les passer sur le second convoyeur (16) pour former un empilage d'enveloppes (117) dans la fente d'imprimante (12) sont commandées par un opérateur humain actionnant un commutateur (154) du système de commande électrique.

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- 19.** Dispositif d'alimentation en enveloppes selon la revendication 14, selon lequel, l'étape consistant à faire avancer automatiquement le premier et le second convoyeur pour remplir l'empilage de prise (117) à mesure que les enveloppes sont enlevées, consiste à faire avancer périodiquement les convoyeurs pendant des segments de temps prédéfinis, et
- en option, cette étape consistant à faire avancer automatiquement le premier et le second convoyeur pour compléter l'empilage de prise d'enveloppes comprend en outre l'étape de contrôle de l'empilage de prise d'enveloppes (117) avec un capteur optique (153) mesurant la distance parcourue par le rouleau de prise (13) coopérant avec l'enveloppe du dessus de l'empilage (117) et envoyant un signal vers le moyen de commande (140) pour lancer l'étape d'avancée automatique.

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FIG. 1

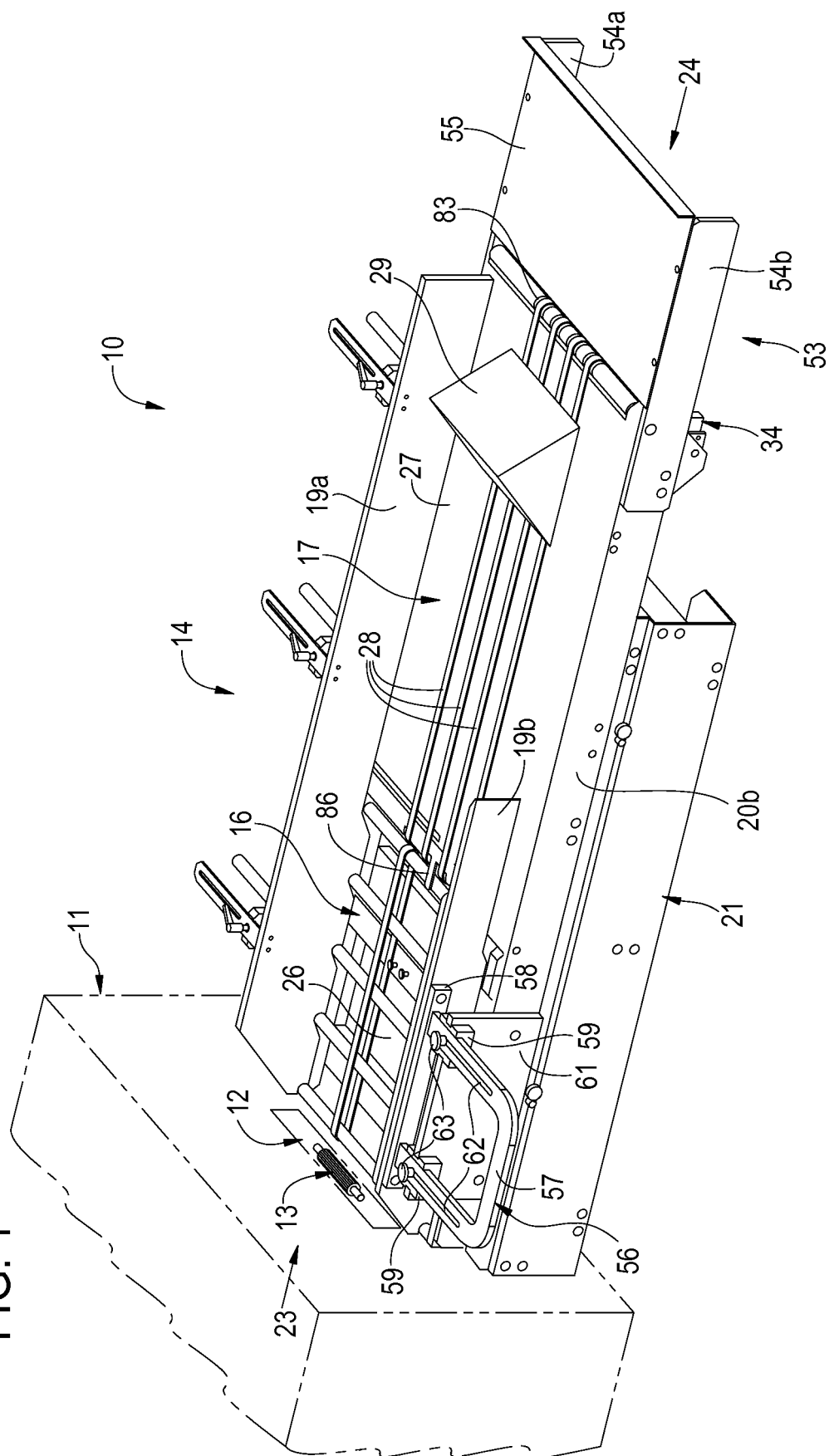


FIG. 2

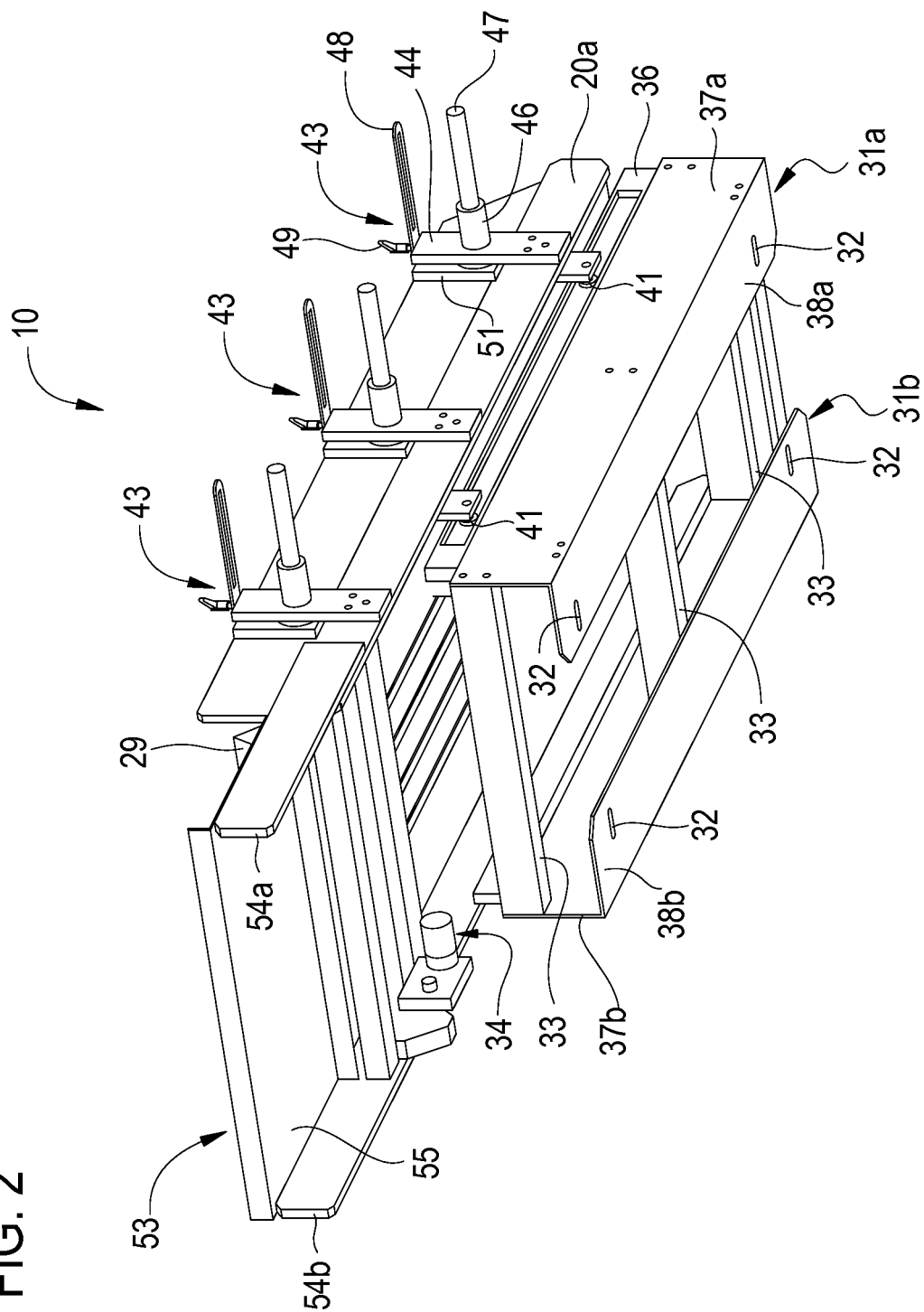


FIG. 3A

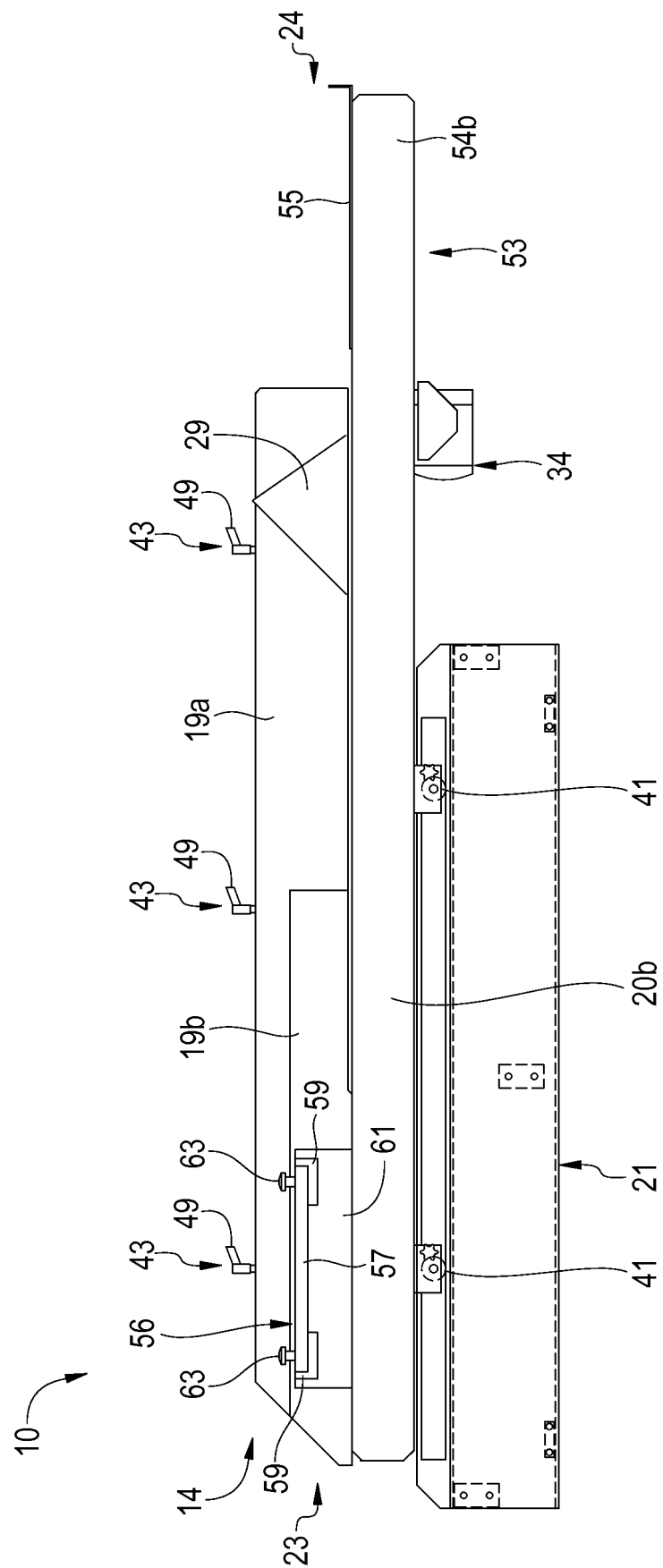


FIG. 3B

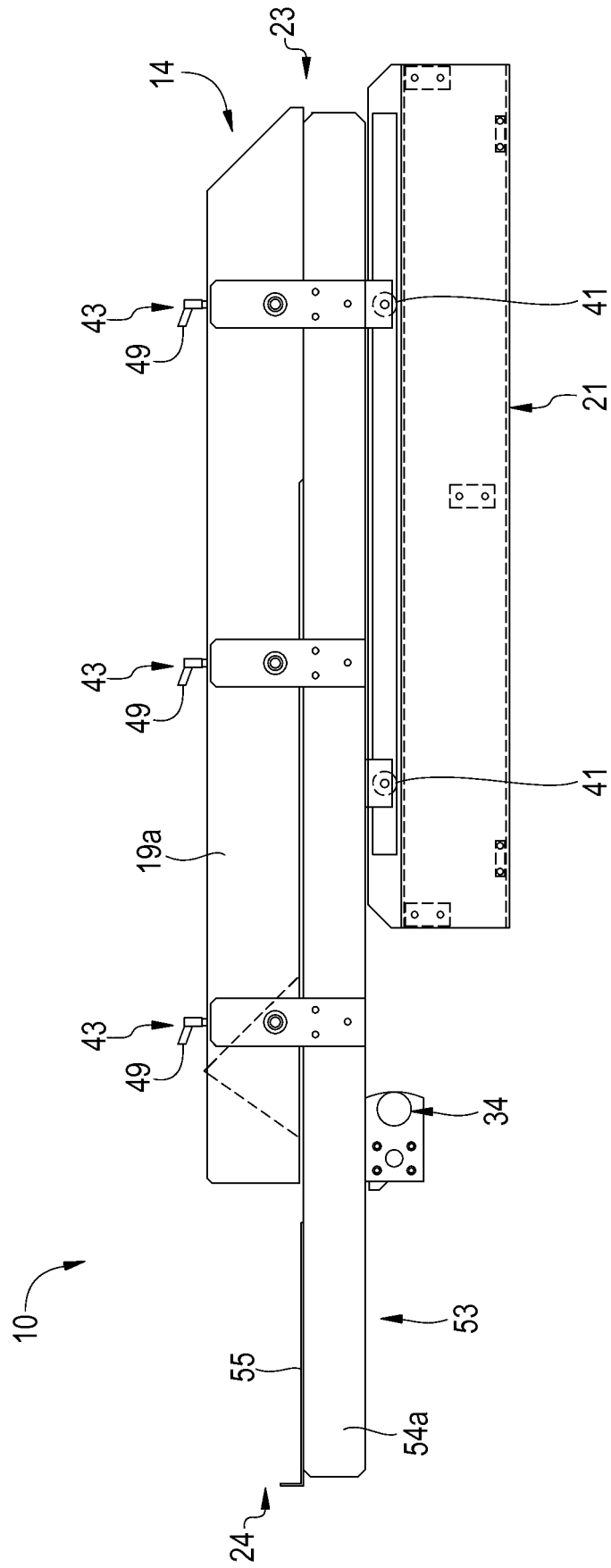


FIG. 4A

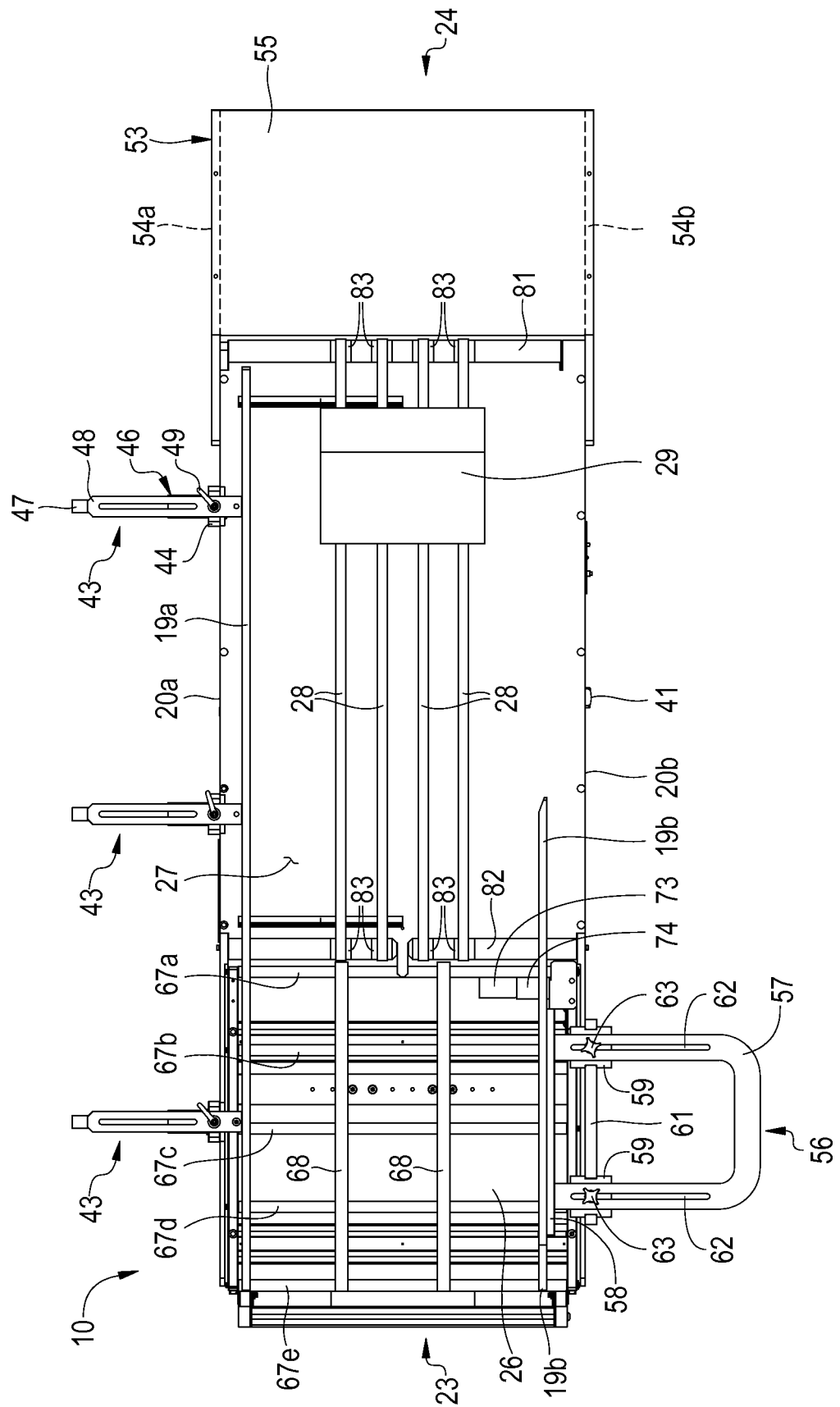


FIG. 4B

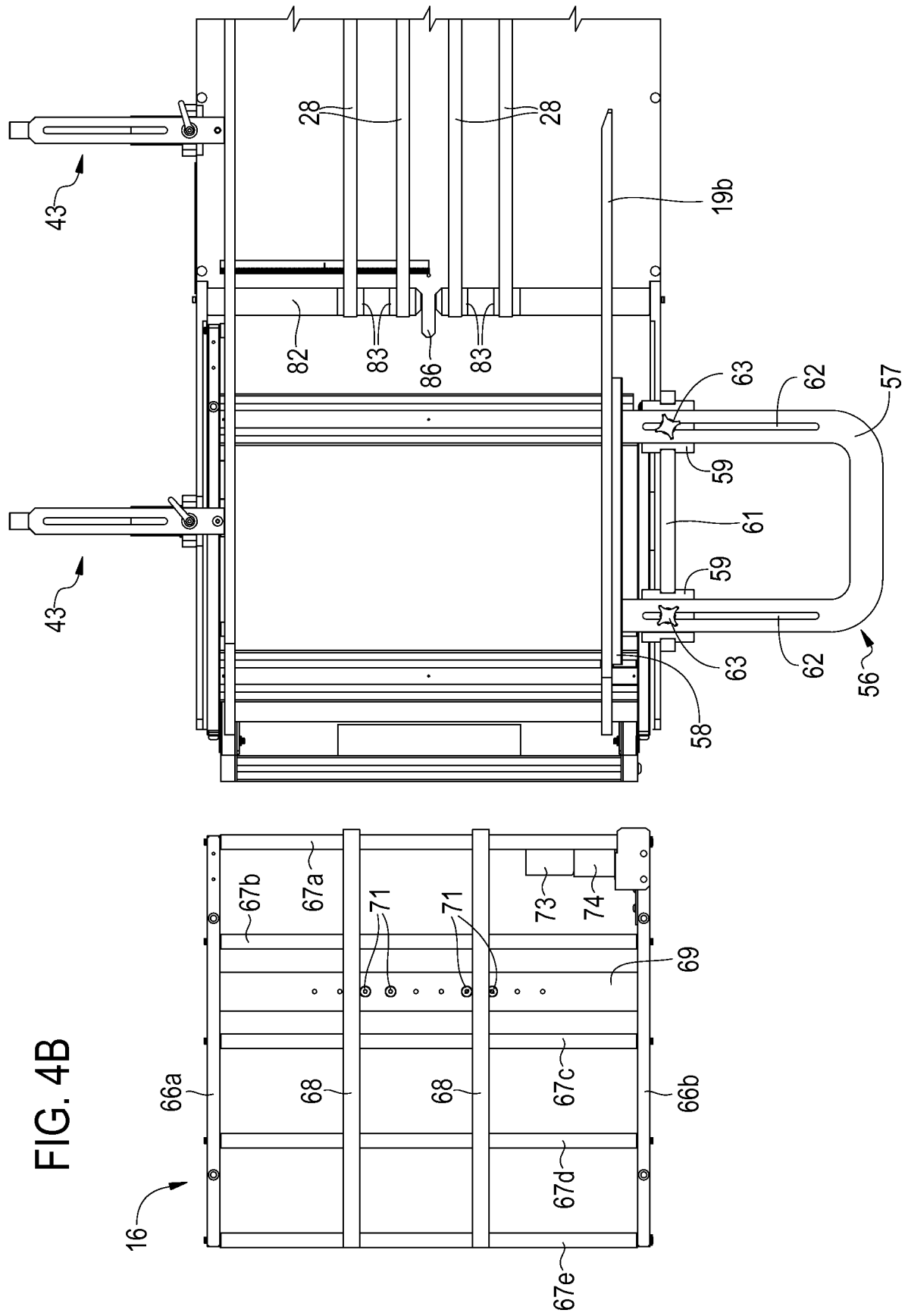


FIG. 5

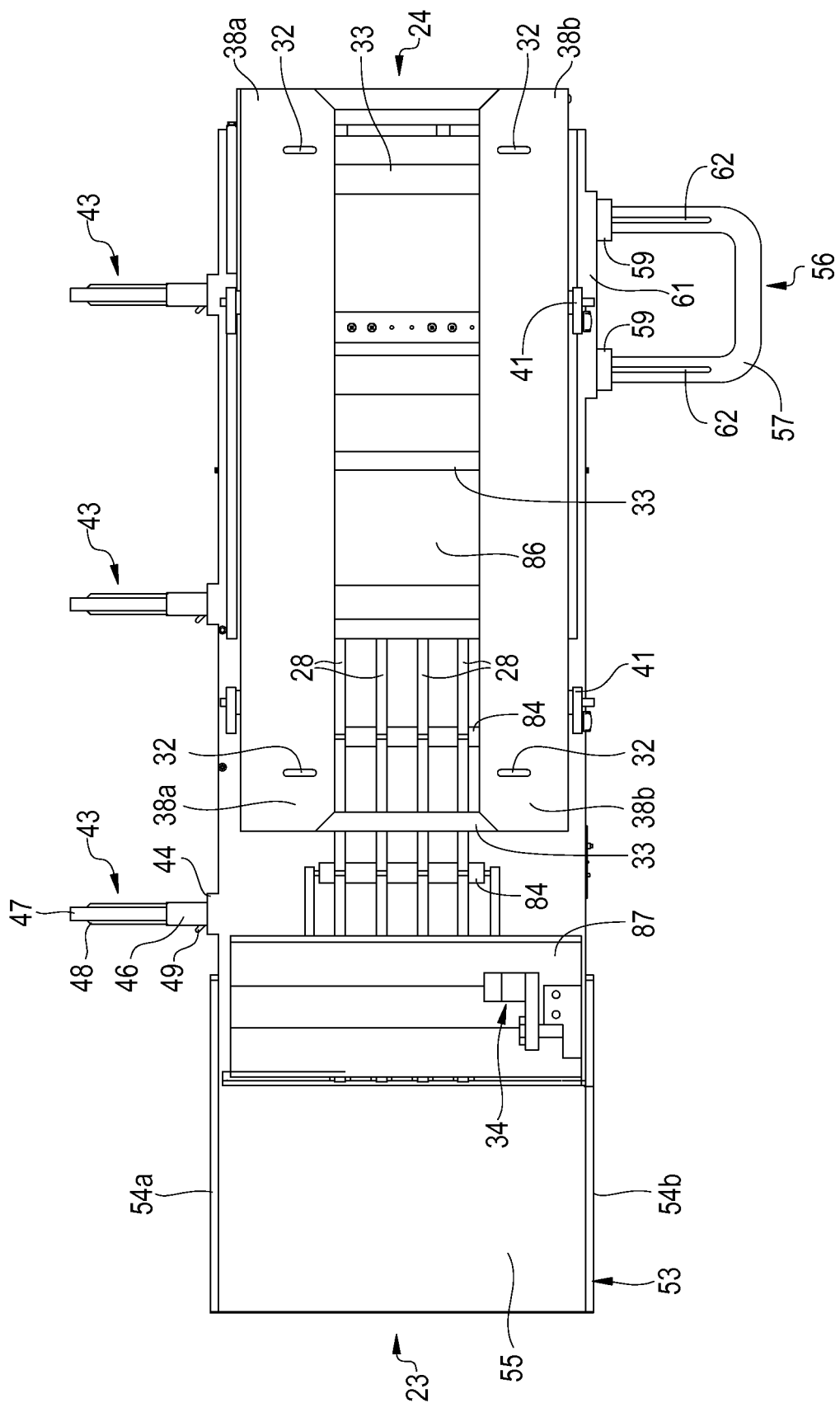
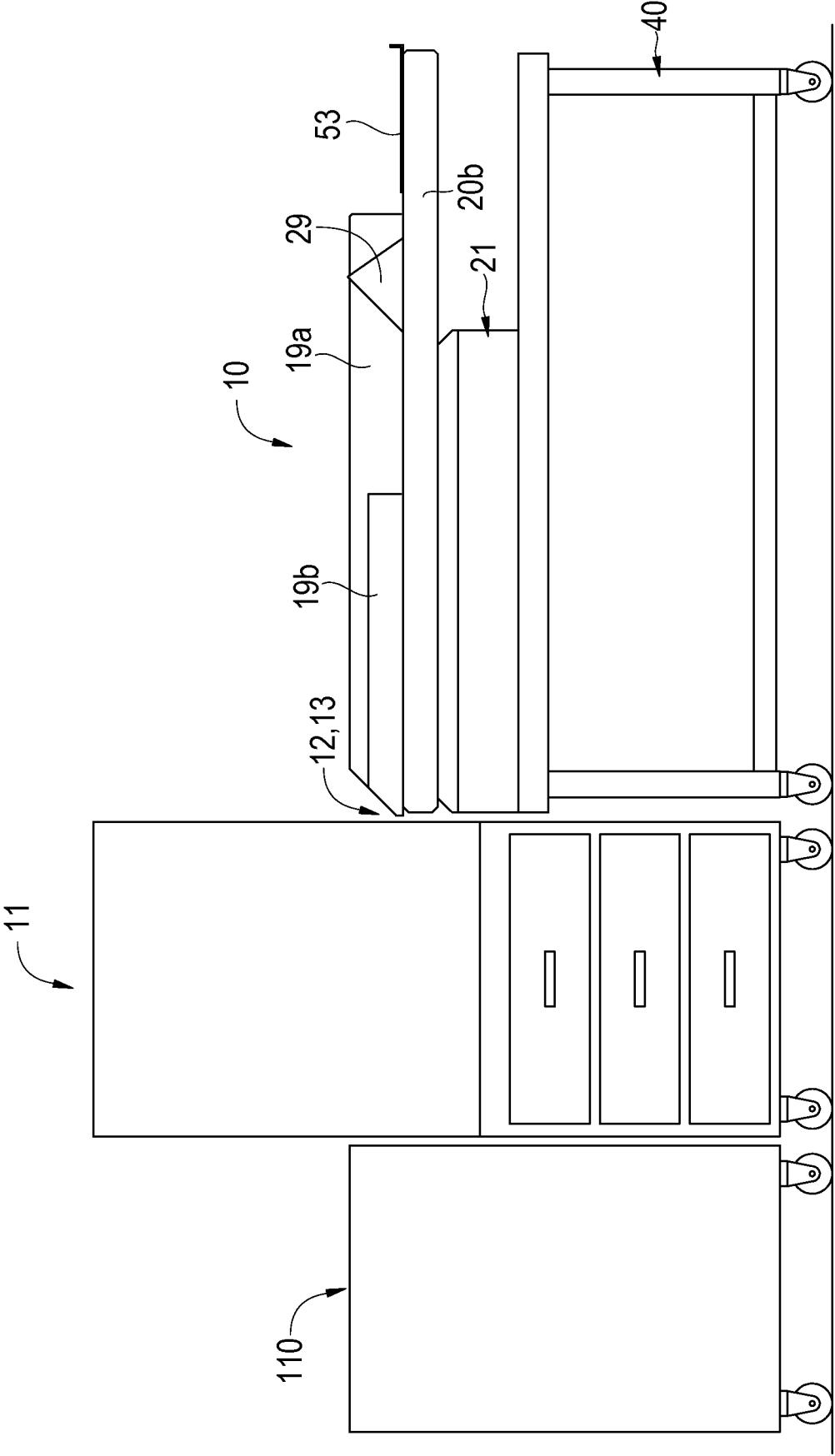


FIG. 6



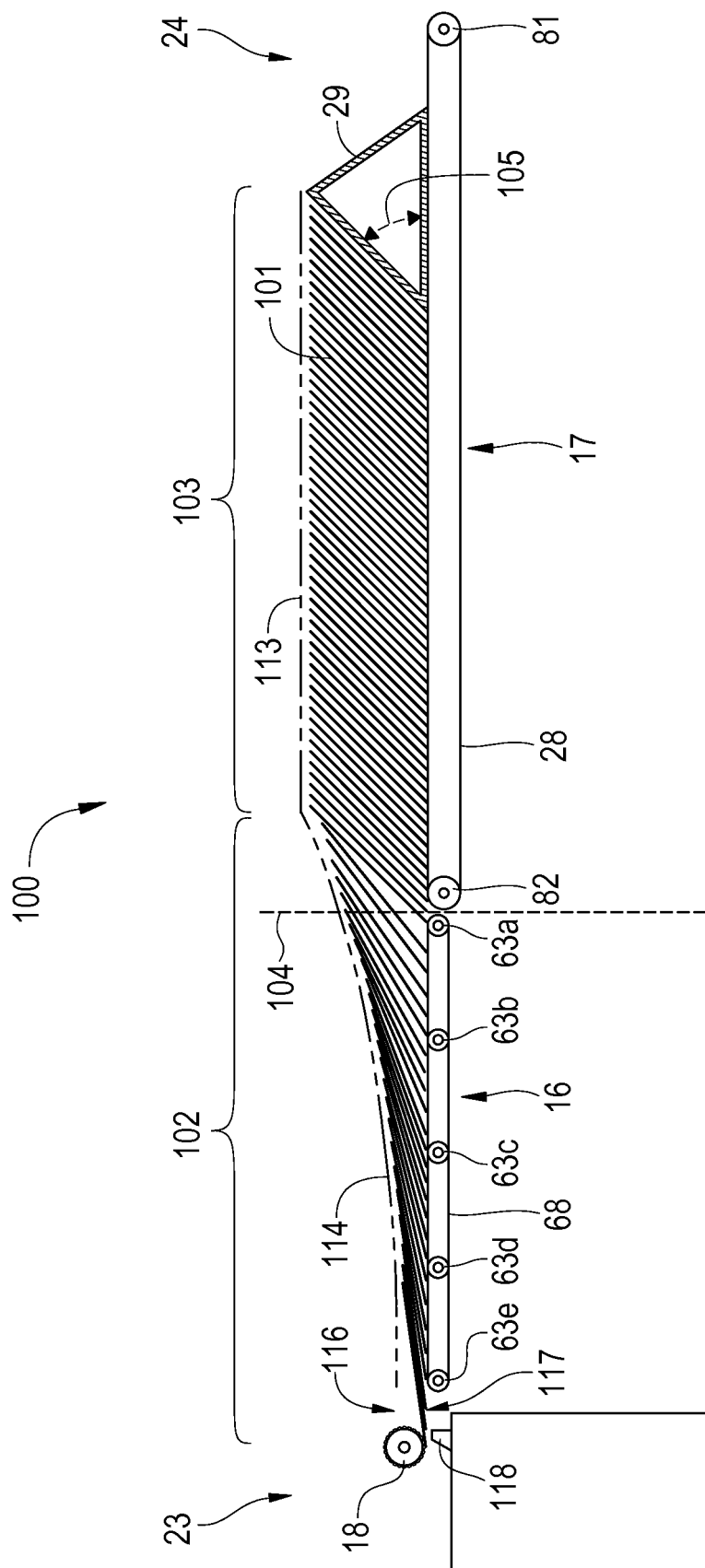


FIG. 7

FIG. 8

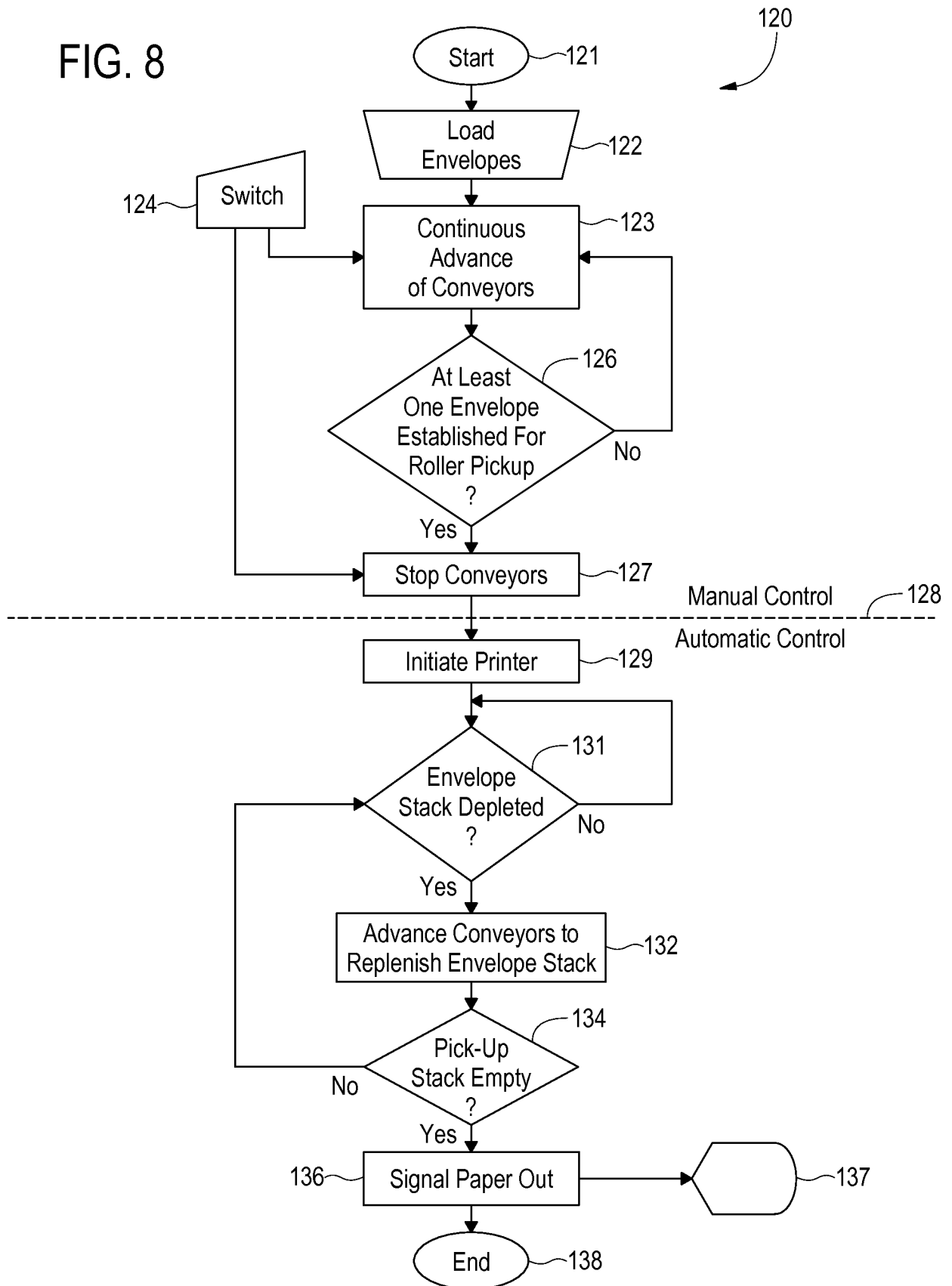


FIG. 9

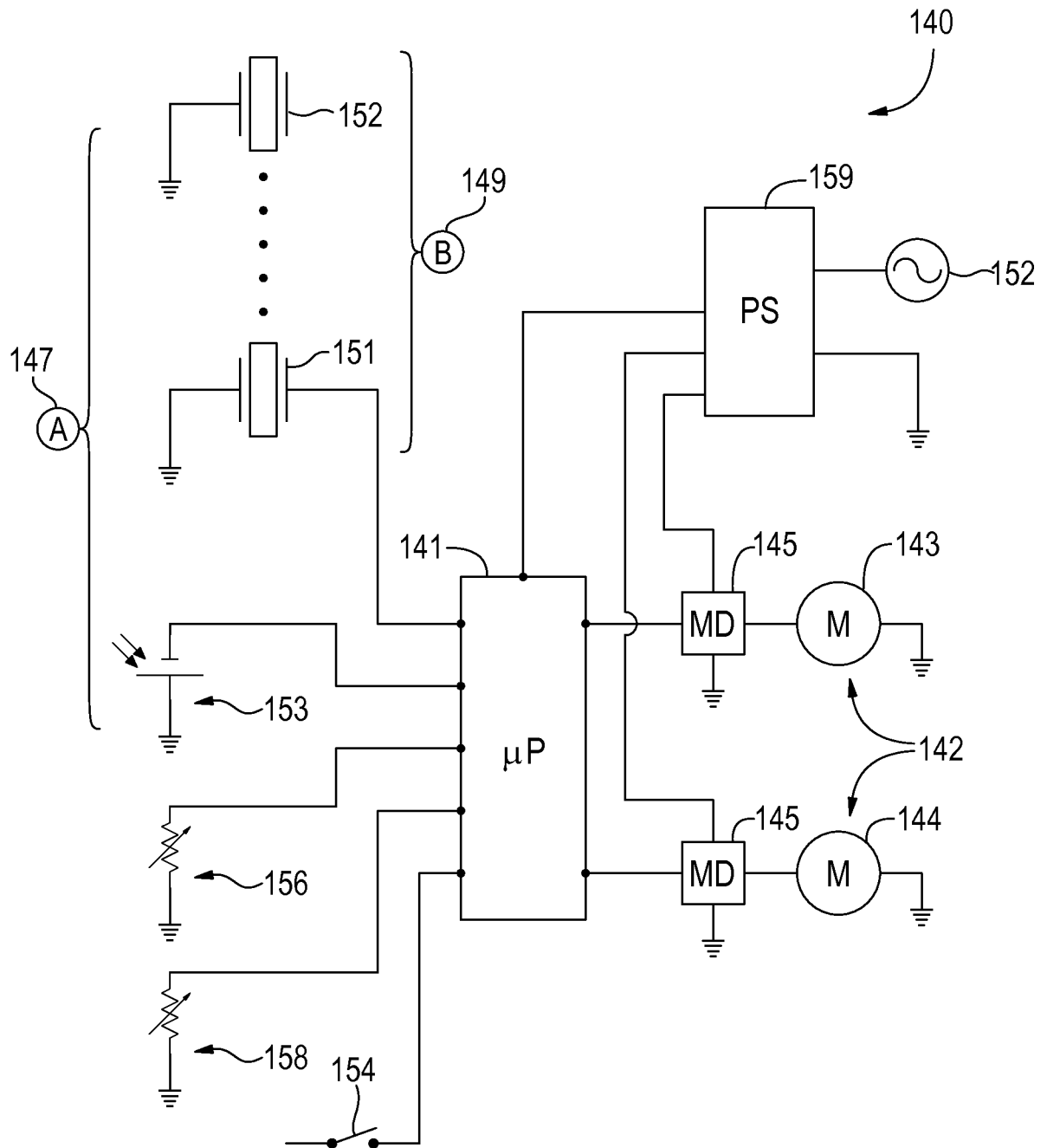
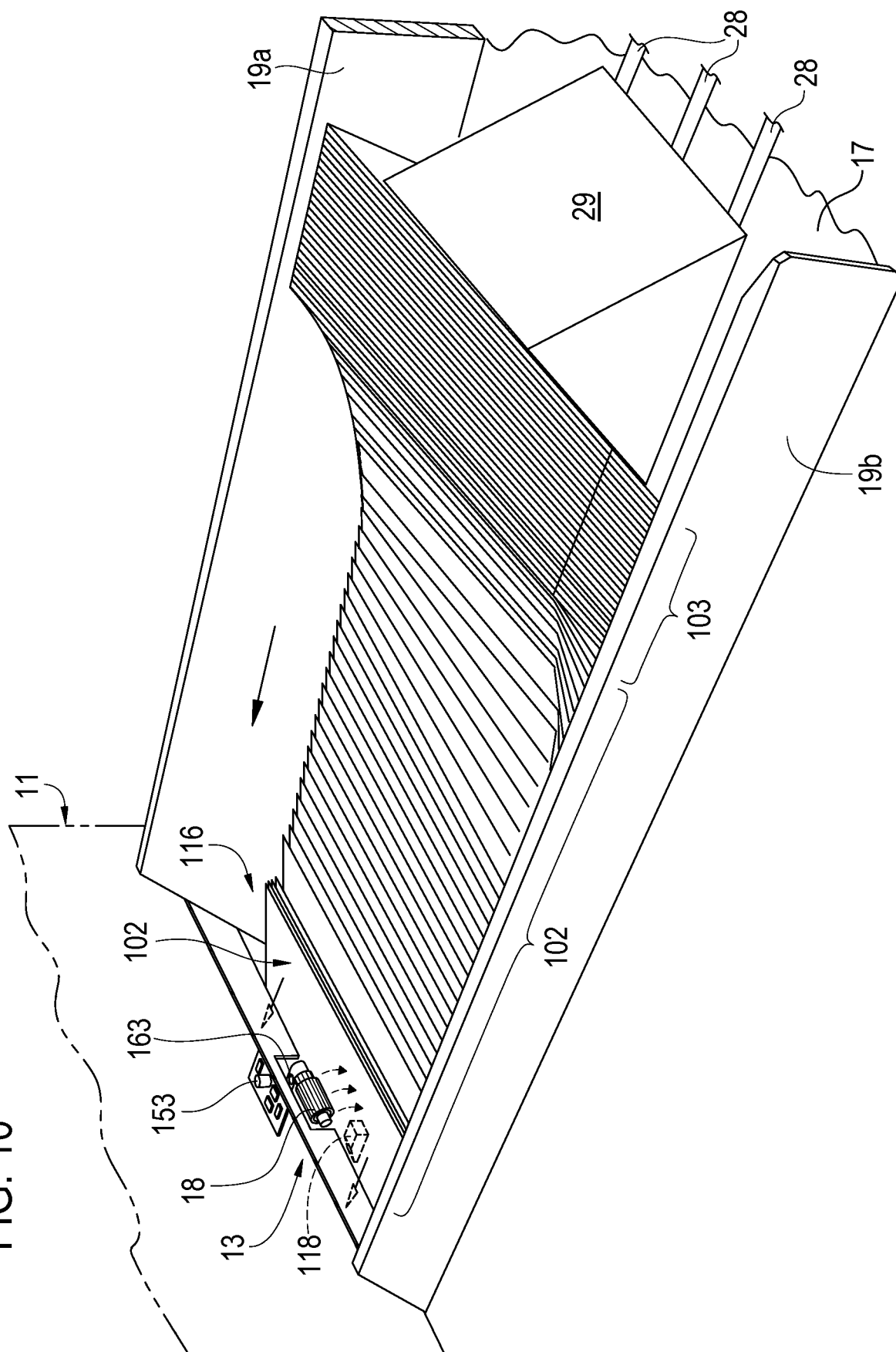


FIG. 10



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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