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(54) An inserter for inserting documents into envelopes

(57) Disclosed herein is a document inserter including an insertion station (120), feed means (240) for feeding an envelope to the insertion station along an envelope feed path (244), a stop (16) arranged in the envelope feed path for arresting the fed envelope in a predetermined position at the insertion station. The stop is adjustable in position for adapting the insertion station to envelopes of varying size (height). For this purpose,

input means (133), such as a keyboard, are provided for enabling an operator to input data defining a stop position. In addition, control means (132) are operative to adjust the stop position in accordance with the input data. Preferably, the stop (16) is carried by a support assembly (118) and can be pivoted upwardly to provide access to the insertion station.

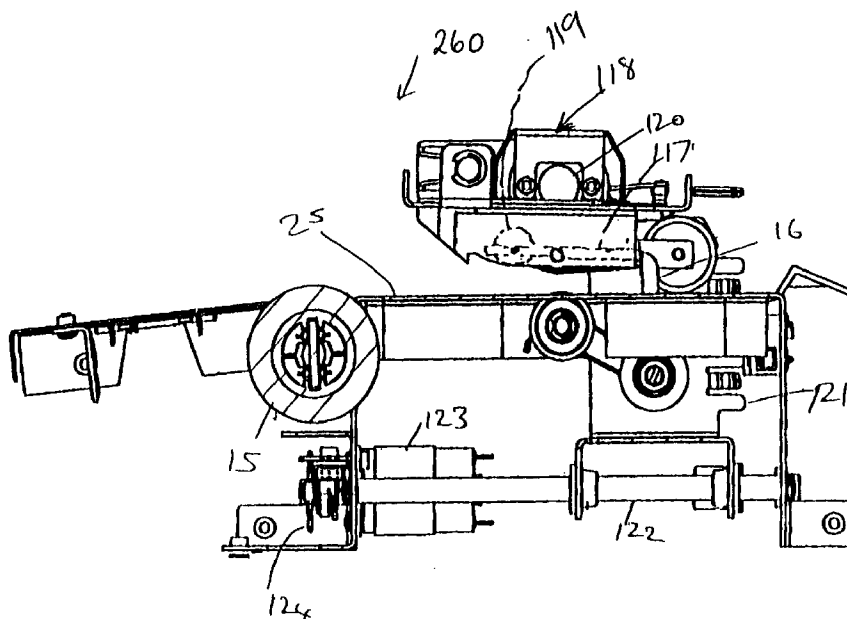


FIG 6

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Description

[0001] This invention relates to an inserter for inserting documents into envelopes.

[0002] Inserters are well known having sheet feeding stations for feeding for example individually typewritten or printed sheets, an optional insert feeder for feeding standard inserts (e.g. advertising material, printed information that is uniform for all addressees etc.), a folding station for folding sheets fed from the sheet feeders and receiving one or more inserts into a fold produced by the folding station, an envelope feeding station, an insertion station to which the envelope is fed, with its flap in an open position, an envelope opening device at the insertion station for separating the front and rear panels of the envelope and a feed path for feeding the folded sheets, and any inserts, into the waiting open mouthed envelope at the insertion station, an optional moistener for receiving the filled envelopes from the insertion station and for moistening the (gummed) envelope flap, an envelope sealing device for sealing the envelope and an outlet through which the filled and sealed envelope is delivered for the application of postage and for subsequent mailing. An example of such an inserter is disclosed in the present Applicants' EP-A-0 700 794.

[0003] In such an apparatus, it is necessary to arrest the fed envelope in a particular position at the insertion station, so that the envelope opening device can act to separate the front and rear panels of the envelope. For envelopes of different size (i.e. height), it is necessary to arrest the envelope at different corresponding positions, in order that the envelope mouth is correctly positioned, i.e. is always at the same position, relative to the envelope opening device. A convenient way of arresting the envelope is to use a stop that is positioned, at the insertion station, in the path of the fed envelope. When the leading edge of the envelope strikes the stop, it is arrested at a predetermined position. To accommodate envelopes of different size, it has been proposed to make the position of the stop along the envelope feed path manually adjustable. However, this means that each time that the inserter is to be used for a batch of envelopes of different size from that of the batch for which the inserter was previously used, the operator has to manually adjust the position of the stop. This procedure is time-consuming and subject to inaccurate setting of the stop, due to operator inexperience or error. If the stop is not set in precisely the correct position, then it is very likely that the insertion process will not function correctly. This can lead to a major jam, with further loss of time to correct the problem. The jam might even damage internal components of the inserter, or the envelope and/or the contents thereof.

[0004] For all these reasons, it is desirable to be able to provide an improved arrangement to enable the position of the stop to be correctly set in a quick, accurate and effective manner.

[0005] In addition, even when the stop is correctly set,

occasionally a jam can occur at the insertion station, for one reason or another. Access is required to the insertion station for the purpose of clearing the jam. In addition, routine maintenance also requires access to the insertion station.

[0006] It is accordingly a principal aim of the present invention to provide an inserter in which the stop at the insertion station can be adjusted in position quickly and accurately to adapt the inserter to different envelope sizes.

[0007] It is a secondary aim to provide ready access to the insertion station.

[0008] According to the invention there is provided an inserter including an insertion station, feed means for feeding an envelope to the insertion station along an envelope feed path, a stop arranged in the envelope feed path for arresting the fed envelope in a predetermined position, the stop being adjustable in position for adapting the insertion station to envelopes of varying size, selecting means for enabling an operator to select a stop position, and actuating means operative to set said stop position in accordance with said selected position.

[0009] The inserter has the advantage that the stop position is adjusted in accordance with the selected stop position chosen by the operator, conveniently through a keyboard. The operator does not have to perform any manual adjustments to the position of the stop, once the required stop position has been selected.

[0010] Preferably, the selecting means comprises an input device for producing an output signal dependent on data, such as numerical data, inputted by the operator and defining a stop position, the actuating means being responsive to the output signal. For example, the arrangement can be such that the operator merely keys in a numerical code defining the needed envelope height. Alternatively, the input data can be merely a number which represents the envelope height expressed in, for example, millimeters, and the control responds to the resulting electrical signal output from the keyboard to position the stop accordingly.

[0011] In a preferred arrangement, the stop is carried by a support assembly, which is located above the envelope feed path and pivotally mounted for pivoting upwardly. This upward pivoting movement brings the support assembly and its stop clear of the insertion station, so as to provide access to the insertion station.

[0012] A convenient way of adjusting the position of the stop is to mount the support assembly by means of a pivotal connection on a carriage which is mounted on a slide arrangement and arranged to be driven along the same under the control of the control means. Preferably, a screwthreaded rod is provided, with whose screwthread the carriage is engaged, and a DC motor is arranged to rotate the rod to drive the carriage along the slide arrangement.

[0013] In order to provide accurate setting of the position of the stop relative to the envelope feed path, a pre-

ferred arrangement provides that, initially, the carriage is driven to a fixed datum position and then the carriage is driven to the required final position according to the signal input through the input means, by determining a predetermined count obtained from an encoder means mounted on the drive shaft of the DC motor.

[0014] Preferably, the pivotal connection between the support assembly and carriage includes a releasable clip to enable the support assembly to be released from the carriage. This arrangement facilitates removal of the support assembly for inspection and repair and also further improves access to the insertion station.

[0015] For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Fig. 1 is an elevational view of a document inserting system forming an embodiment of the present invention;

Figs. 1A and 1B show an envelope as fed from the envelope supply station with its (unsealed) flap closed and the envelope with its flap open as it approaches the insertion station, respectively;

Fig. 2 is a detailed side view of an insertion station in the inserter;

Fig. 3 is a perspective view showing a pair of hold-down fingers and a pair of flippers that cooperate to pucker an envelope at the insertion station, thereby causing it to open ready to receive a collation of documents;

Figs. 4 and 5 are transverse sectional views in the region of the flippers and hold-down fingers used for throating an envelope and as seen when viewed in the direction towards the exit side of the inserter, respectively showing the envelope in its closed and open positions;

Fig. 6 is a simplified view corresponding with Fig. 2 but showing in particular a support assembly carrying an envelope stop, the support assembly being adjustable in position along a section of the envelope transport path;

Fig. 7 shows the support assembly with the stop in its raised position;

Fig. 8 shows the support assembly pivoted into an upward position providing access to the insertion station;

Fig. 9 shows the support assembly released from its pivotal mounting;

Fig. 10 is a perspective view showing details of the drive arrangement for displacing the support assembly axially relative to the document feed path; and

Figure 11 is a diagrammatic view of a control system used for setting the position of the stop in the insertion station.

[0016] Reference is made to the drawings, wherein

there is seen in Fig. 1 an elevational view of a tabletop inserter, designated generally at 210, forming an embodiment of the invention. A brief description will now be given.

[0017] With reference to Fig. 1, tabletop inserter 210 generally consists of an upper housing 212 mounted atop a lower housing 214. Upper housing 212 generally includes first and second sheet feeders 216 and 218, and preferably an insert feeder 220. Individual sheets are preferably conveyed from each sheet feeder 216 and 218 into respectively first and second feed paths 222 and 224. The first and second sheet paths 222 and 224 merge with one another at a collation station 226 having first and second collating rollers 229 and 230. The collating station 226 is operative to align the leading edges of first and second sheets being respectively conveyed from the first and second sheet feeders 216 and 218, via the first and second sheet paths 222 and 224, within the nip formed between the collating rollers 228 and 230. Once aligned, the collating rollers 228 and 229 are actuated to simultaneously feed the aligned sheets in a supply path 330 downstream of the collating station 226. These aligned sheets are also known as a "collation". This sheet collation is then conveyed downstream in the supply path 330 to the folding station 300.

[0018] Like conventional folding stations, the folding station is configured to fold the sheet collation in prescribed configurations, such as C-fold, Z-fold, Half-fold, Double-fold etc. In this constructional example, the folding station 300 comprises a first fold plate 302 and a second fold plate 304. It includes a diverter which is operable for diverting a sheet approaching the first fold plate 302 directly to the second fold plate 304. Depending on the setting of the diverter, the type of fold that is made can be selected. After a collation is folded in the folding station 300, the folded collation is then conveyed to the lower housing 214 of the inserter system 210 for further processing.

[0019] The lower housing 214 of inserter system 210 includes an envelope supply station 240 connecting to an insertion station 260. The envelope supply station 240 contains a supply of envelopes stored with their flaps in their closed (but unsealed) condition. These envelopes are fed to the insertion station 260, via envelope feed path 244 preferably. Each envelope flap is opened by a suitable flap opening device (shown very diagrammatically at 242 in Fig. 2) such as are well known in the art, while in transit on the envelope feed path from the envelope supply station 240 to the insertion station 260. Once received in the insertion station, the envelope has its mouth opened, in preparation for insertion of the aforesaid folded collation being conveyed from the folding station 300. Thus, the folded collation is transported from the folding station 300 to the insertion station 260, via a collation transport path 246 connecting the latter two stations. Preferably the collation transport path 246 includes a pair of conveying rollers 248 and 250 for conveying a folded collation along

the transport path 246.

[0020] The lower housing 214 further includes a sealing station 252 located downstream of the insertion station 260, which sealing station 252 is operative to seal an open envelope received from the insertion station 260. An envelope insertion path connects the insertion station 260 to the sealing station 252. An envelope output path 256 is connected to the sealing station 252 and is operative to convey sealed envelopes from the sealing station 252 through an output opening 258 provided in the lower housing 214 of the insertion system 210. After a sealed envelope has exited from the output opening 258, appropriate postage can then be applied for delivery to a recipient.

[0021] As is conventional, inserter system 210 includes a control system (not shown in Figure 1) for controlling the various components implemented in the inserter system. It is to be appreciated that the control system is to encompass a computer processor driven system. A certain part of the control system to be described below is disclosed in Fig. 11.

[0022] With the general structure of inserter system 210 being described above, a more specific description will now be given with particular reference to the insertion station 260.

[0023] As shown in Figure 1A, each envelope is fed from the envelope supply station 240 with its flap 100a in the closed, but unsealed, position, with the flap on the upper (rear) side of the envelope and its bottom edge 100b leading. The flap opening device 242 on the envelope feed path 244 (see Figure 2) causes the flap 100a to hinge rearwardly to assume the open position shown in Figure 1B in which the flap faces upwardly.

[0024] Conveniently, the flap opening device can be of a particular known type which is arranged to cause the envelope to arch from front to back, tending to cause the back (uppermost) panel to arch upwardly and push the envelope flap up slightly. In addition, the leading edge of the envelope is arranged to strike a lever of the flap opening device, which rotates a blade under the flap. As the envelope continues to travel along the envelope feed path, the blade pivots the flap rearwardly until it resumes a trailing, open, position.

[0025] The envelope is transported further from the flap opening device 242 by drive and driven rollers (not shown in Figure 2) on the upper surface of support plate 10 until the leading edge strikes the pivotally mounted actuating arm 11 of a reed switch 12, which causes the arm to pivot downwardly, actuate the switch and allow the leading edge of the envelope to pass into the nip of drive/driven roller pair 14, 13 which then drives the envelope further across the upper surface of a bending roll 15 of a conveyor 25, until the envelope bottom edge is arrested by a downwardly depending stop 16. The function of reed switch 12 is to control certain operating functions, as disclosed in the applicants' co-pending UK patent application (reference P12776) filed on the same day as the present applica-

tion. However, such operation is not relevant to the present disclosure and is not further described herein.

[0026] Before a collation of folded sheets, optionally with one or more inserts, can be delivered along collation transport path 246 into the envelope waiting at the insertion station 260, it has to be opened by a suitable envelope opening device 17. The construction and operation of this opening device does not form part of the invention and can take the form of that disclosed in the present Applicants' EP-A-0 785 093 or the present Applicants' co-pending application, GB-A- (reference P12772), filed on the same day as the present case, to which reference is hereby directed. However, a brief description of the latter form of envelope opening device will now be described.

[0027] The bending roll 15 is rotatably mounted in the lower housing 214 of the inserter. Driven roll 13 is arranged to be raised and lowered. For feeding the envelope to the insertion station against the stop 16, the roll 13 is held in a raised position (i.e. that shown in Figure 2) conveying the envelope between the driven and drive rolls 13, 14. As shown in Figures 3 and 4, a pair of downwardly pivotable hold-down fingers 19, 20 are in a raised position to allow the envelope to pass thereunder and a pair of pivotally mounted flippers 21, 22 are in a position where their interior ends respectively are raised.

[0028] With the envelope in its waiting position at the insertion station 260, roll 13 is withdrawn downwardly and then the hold-down fingers are rotated downwardly, from the position shown in Figures 3 and 4 to the position shown in Figure 5, whereupon, with assistance from a stepped portion 21a, 22a at the inner end of the flippers, the envelope is puckered, causing the rear panel (positioned uppermost) to "pop" open, assisted by the arching of the front (downwardly facing) panel of the envelope caused by the hold-down fingers 19, 20 arching the envelope over the bending roll 15.

[0029] Additional separation of the envelope panels is effected by a pair of opening horns 23 which are mounted on pivotal arm 24, which pivots the horns through the open mouth of the envelope, while a camming arrangement causes the horns to be raised. In this way, the rear (uppermost) panel of the waiting envelope is fully opened, so that the envelope is waiting to receive the collation being fed along the collation transport path 246 to the conveying rollers 248, 250, and from there they are driven into the open envelope by the roller 14, a leaf spring 290 urging the envelope from below against the drive roller 14.

[0030] Once the envelope has been filled, the stop 16 is raised vertically and the stuffed envelope is transported from the insertion station along the conveyor 25 to exit the inserter into a collection bin or the like, diagrammatically shown at 259 in Fig. 1.

[0031] Referring to Fig. 6, this shows a side view similar to Fig. 2 but omitting the envelope opening device

17, collation transport path 246 and other details. It will be seen that the envelope stop 16, which is positioned at the insertion station in the path of envelopes fed from the envelope feed station, is a downwardly depending portion of an arm 117 that is pivotally mounted on a support assembly 118, the arm carrying an idler roller 119 at its other end. A solenoid 120 on the support assembly 118 can be energised to cause the arm 117 to pivot and raise the stop 116 above the arrested envelope while lowering roller 119 into contact with the envelope, thereby pressing it against the moving upper surface of the conveyor 25. At the same time, the hold-down fingers are raised to release the envelope and roll 13 is raised again to cause the roller pair 13, 14 to impart drive to the envelope flap. Thus, the envelope is driven along the conveyor 25, via the moistener and envelope sealer, to exit the inserter as described above. The described raised position of the arm 117 and stop 116 is shown in Figure 7.

[0032] The support assembly 118, sometimes referred to in the art as a "Q-station", is itself pivotally mounted on side arms 131 (best shown in Figs. 9 and 10) of a carriage 121 which, as best shown in Figure 10, is slidably mounted on slide rods 122. A DC motor 123, fixedly mounted below the envelope feed path 125, carries an encoder disk 124 on its output shaft having an associated optical position detector 129 (Fig. 10) which produces an output pulse each time a tooth of the encoding disk interrupts the optical path of the optical detector. The motor output shaft, via a pulley and belt drive 125, drives a screwthreaded rod or lead screw 126, whose screwthread is engaged with drive nuts (not shown) fixed to the frame of the carriage 121. Accordingly, as the DC motor rotates its output shaft, the drive nuts are driven axially along the screwthreaded drive rod 126 to adjust the position of the carriage and hence the downwardly depending stop 16 longitudinally of the envelope feed path 25.

[0033] With reference to Fig. 11, the DC motor 128 is controlled by a control system 132 in response to input data input by the operator through a suitable interface device, such as a keyboard 133. Typically, the control system will include a microprocessor. The input data uniquely determines the final position of the carriage.

[0034] In order to accurately locate the carriage 121 in its required position, the control system 132 undergoes a routine to firstly establish a home position by displacing the carriage 121 in a direction towards the envelope feed station 240 until an end stop flag 127 (see also Figure 10) on the carriage interrupts the optical path of an end stop sensor 128, which sends an output pulse to the control system 132 to terminate drive from the DC motor 123. At this instant, the control system knows that the carriage 121 is located at its home position. It then causes the DC motor 123 to start again, rotating in the opposite direction to displace the carriage in the direction away from the envelope feed station 240. The position detector 129 produces an output pulse each time

the encoding disk 124 interrupting the optical sensing path of the position detects and these pulses are counted by the control system 132 until the count indicates that the carriage has reached its required final position, whereupon the control system 132 sends an instruction to the DC motor to stop running. The envelope stop 16 is then accurately positioned to suit the size of envelope to be handled, according to the data input by the operator.

[0035] As shown in Figure 8, the pivotal mounting of the support assembly (Q-station) 118 on the carriage permits the operator to pivot the support assembly upwardly, so as to raise the stop 16 and provide access beneath the raised support assembly to the insertion, station.

[0036] According to a preferred arrangement, as shown in Figure 9, the pivotal connection between the support assembly 118 and carriage 121 includes a releasable clip arrangement 130, so that the support assembly can be snapped out of pivotal engagement with the carriage and released from it altogether. This is advantageous for providing even better access to the insertion station or for replacement or maintenance of the support assembly and stop.

[0037] Whilst reference is made hereinabove to stuffing the envelope with a collation, it will be appreciated that the inserter is versatile in operation and can be set so as to feed a single sheet, or a plurality of sheets, with or without folding, in each case with or without one or more inserts. Alternatively, the inserter can be used to place documents, such as an insert or plurality of inserts only, within the envelope.

Claims

1. An inserter including an insertion station (120), feed means (240) for feeding an envelope to the insertion station along an envelope feed path (244), a stop (16) arranged in the envelope feed path for arresting the fed envelope in a predetermined position, the stop being adjustable in position for adapting the insertion station to envelopes of varying size, selecting means (133) for enabling an operator to select a stop position, and actuating means (132) operative to set said stop position in accordance with said selected position.
2. An inserter according to claim 1, wherein said selecting means comprises an input device (133) for producing an output signal dependent on data inputted by the operator and defining a stop position, said actuating means being responsive to said output signal.
3. An inserter according to claim 2, wherein said data is numerical data.
4. An inserter according to any preceding claim,

wherein the stop (16) is carried by a support assembly (118), which is located above the envelope feed path and pivotally mounted for pivoting upwardly.

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5. An inserter according to claim 4, wherein the support assembly (118) is mounted by means of a pivotal connection on a carriage (121) which is mounted on a slide arrangement (122) and arranged to be driven along the same under the control of the actuating means (132). 10
6. An inserter according to claim 5, wherein a screw-threaded rod (122) is provided, with whose screw-thread the carriage (121) is engaged, and a DC motor (123) is arranged to rotate the rod to drive the carriage along the slide arrangement (122). 15
7. An inserter according to claim 6, wherein, in response to data being input by said input means, the actuating means is arranged firstly to drive the carriage to a given home position and then to drive the carriage (121) to a required position when a predetermined count has been obtained from an encoder means (124) mounted on the drive shaft of the DC motor (123). 20 25
8. An inserter according to any one of claims 3 to 5, wherein the pivotal connection includes a releasable clip (130) to enable the support assembly (118) to be released from said carriage (121). 30
9. An inserter according to any preceding means, wherein the input means is a keyboard (133). 35

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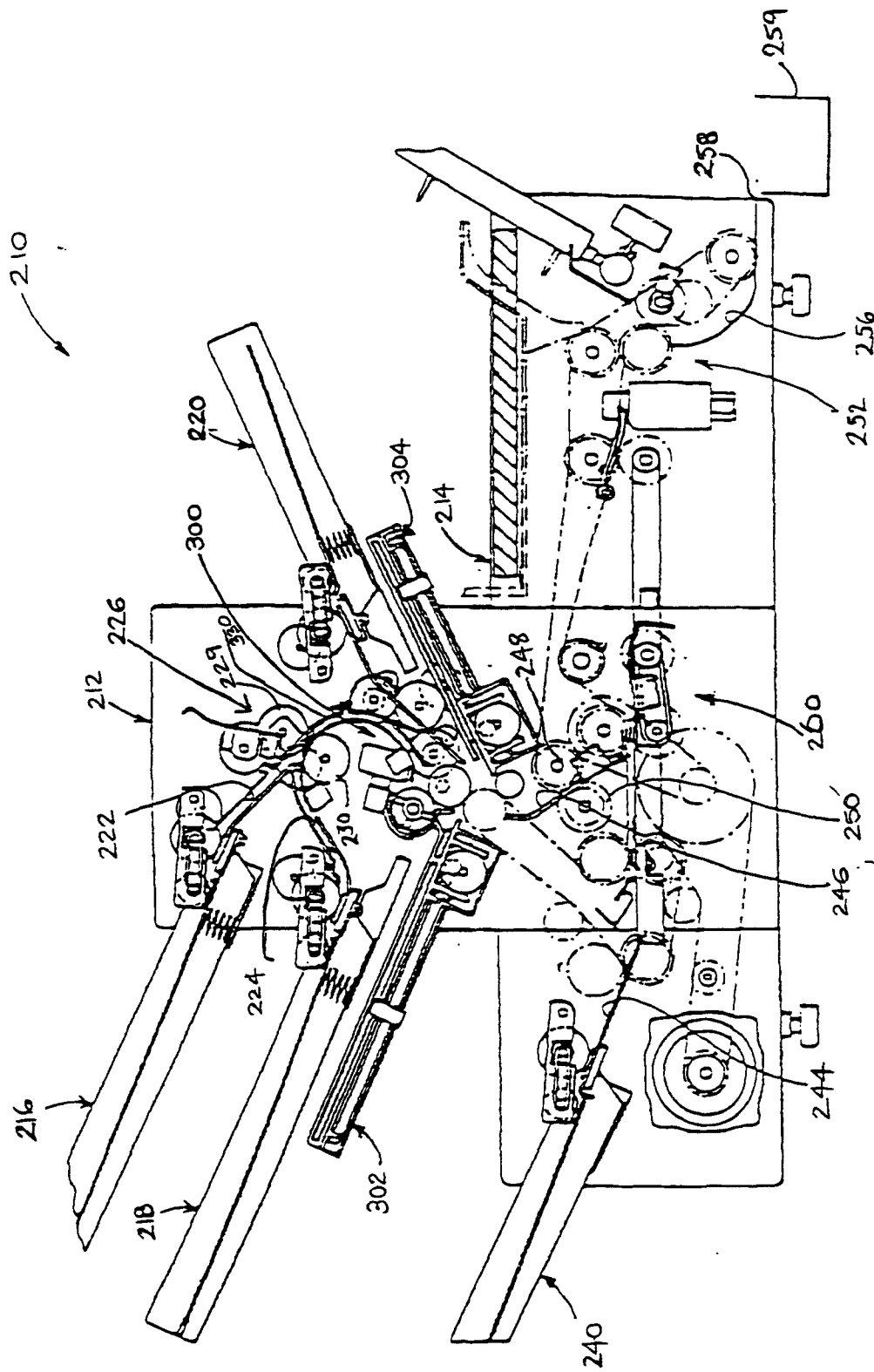


FIG. 1

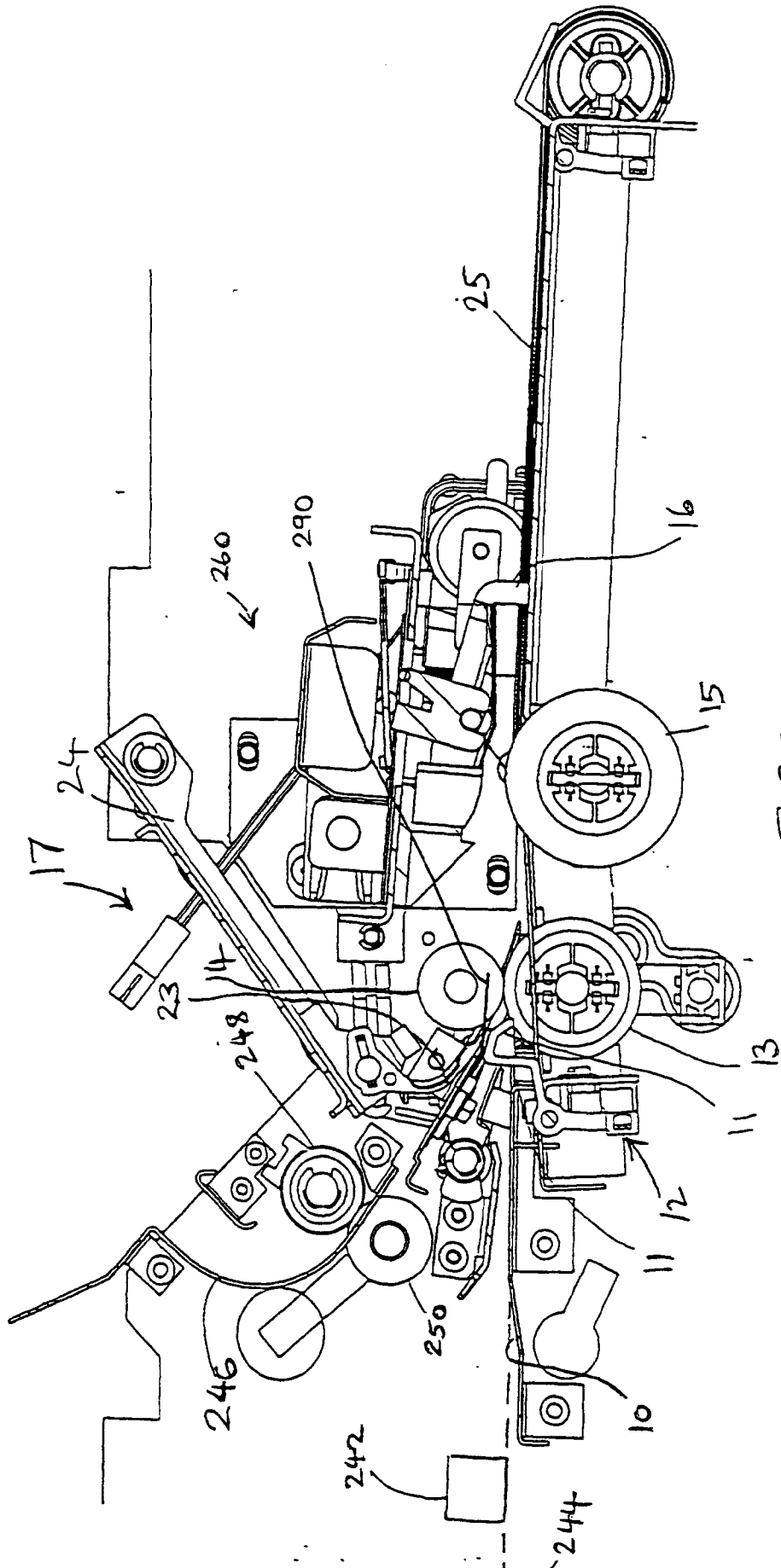


FIG. 2

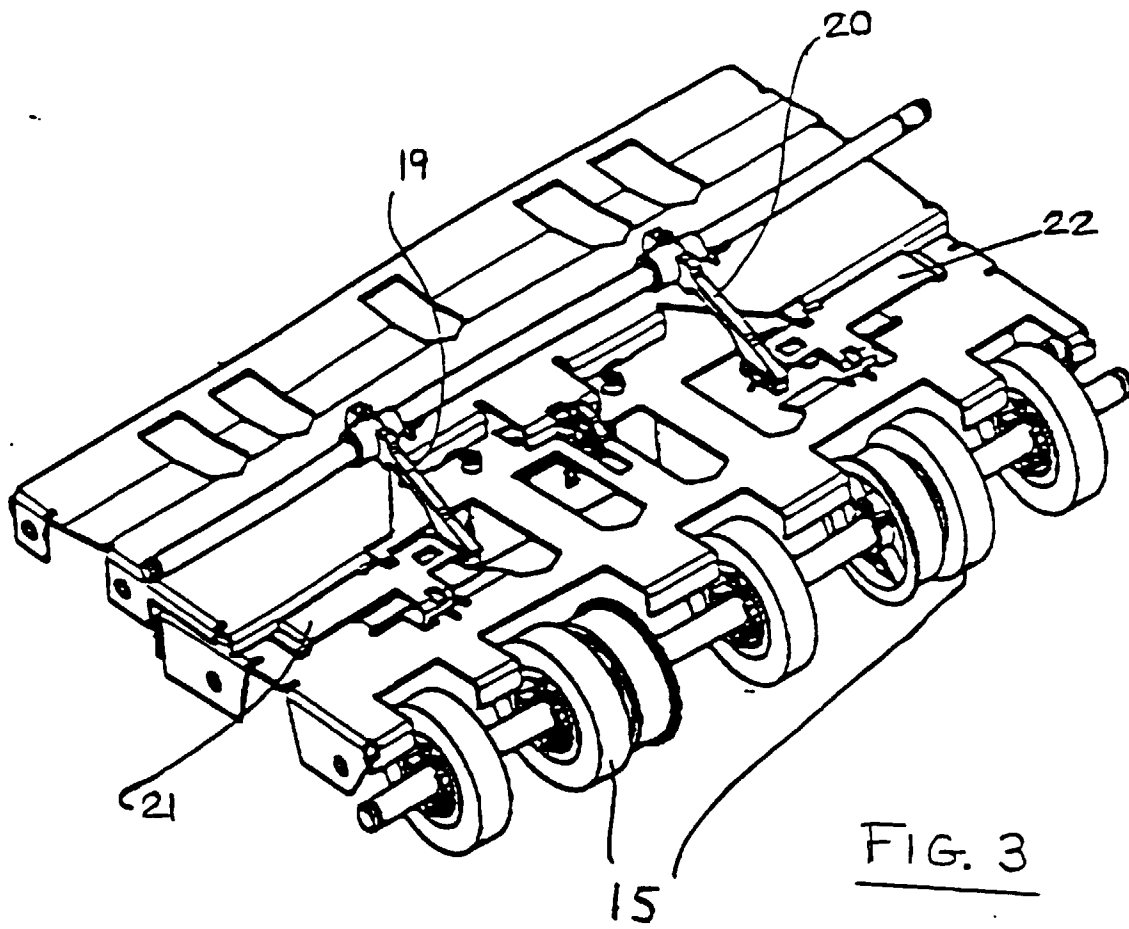


FIG. 4

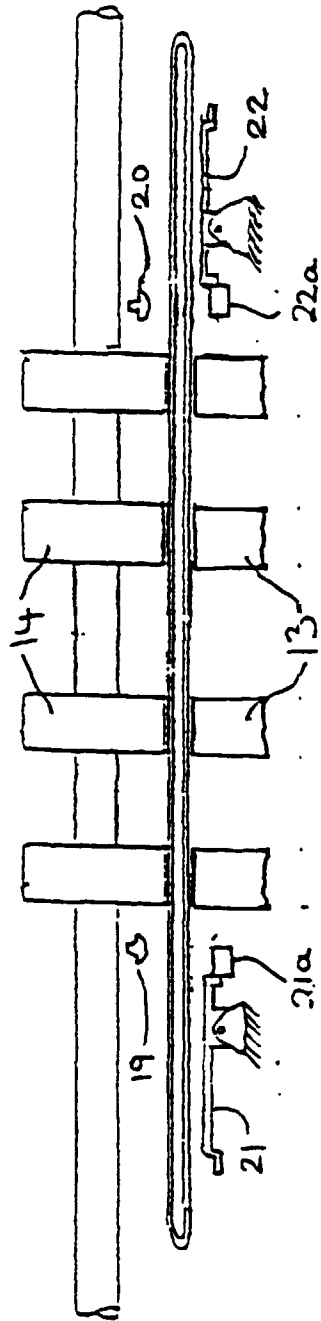
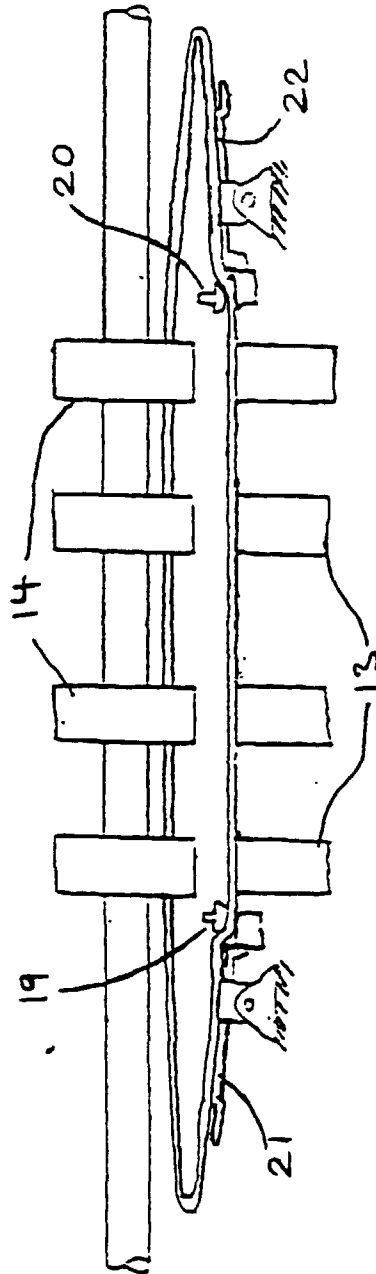


FIG. 5



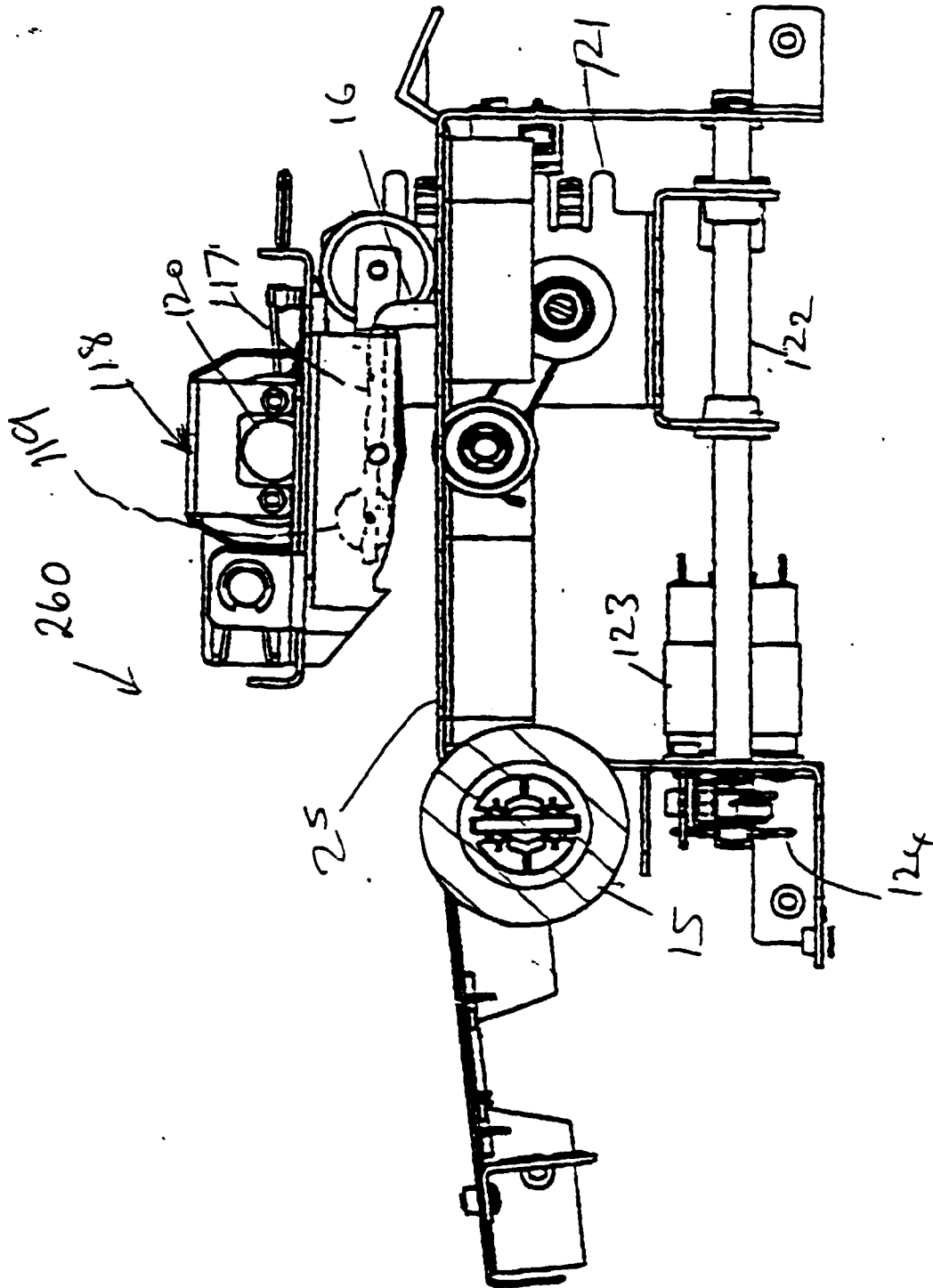


FIG. 5

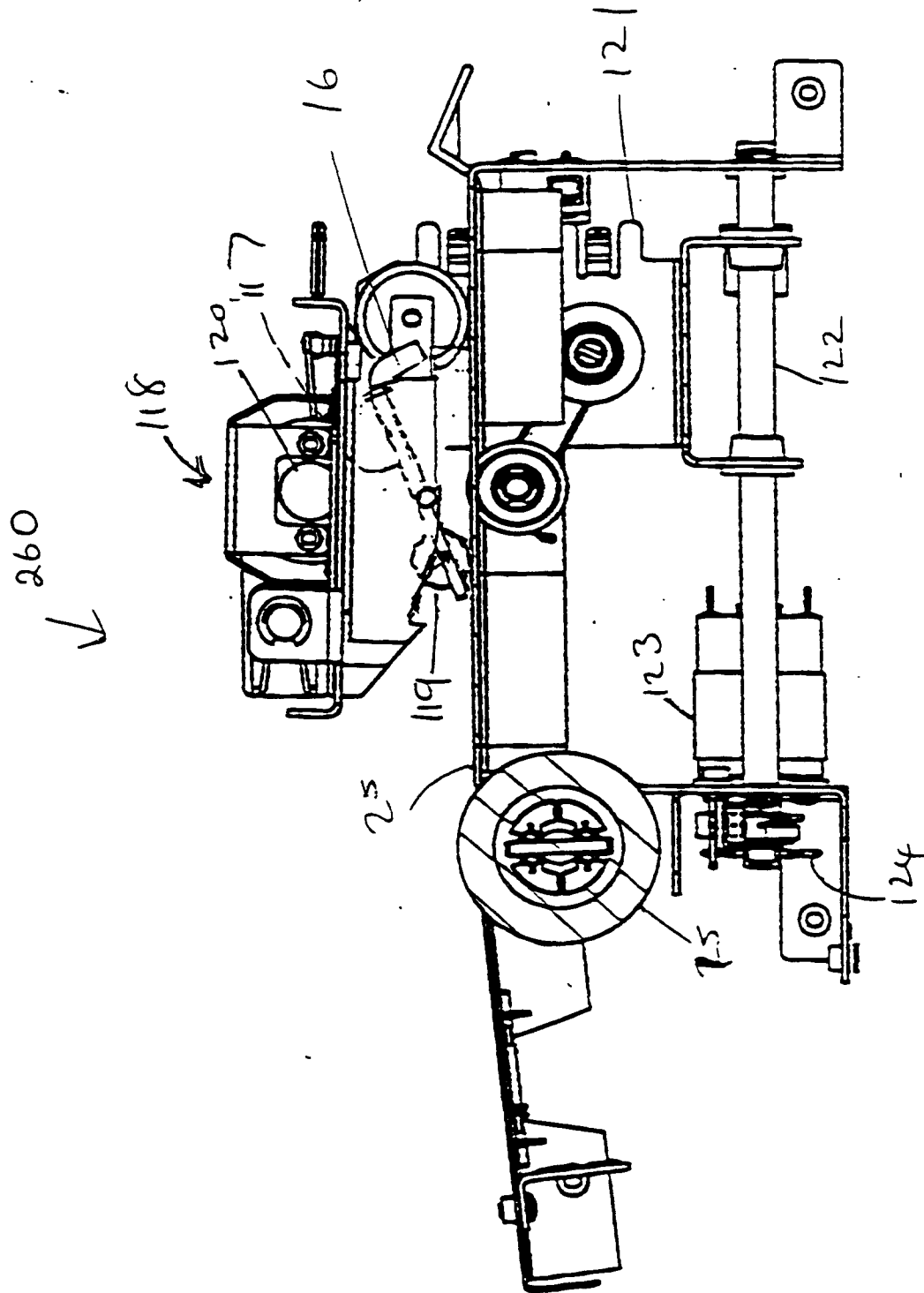
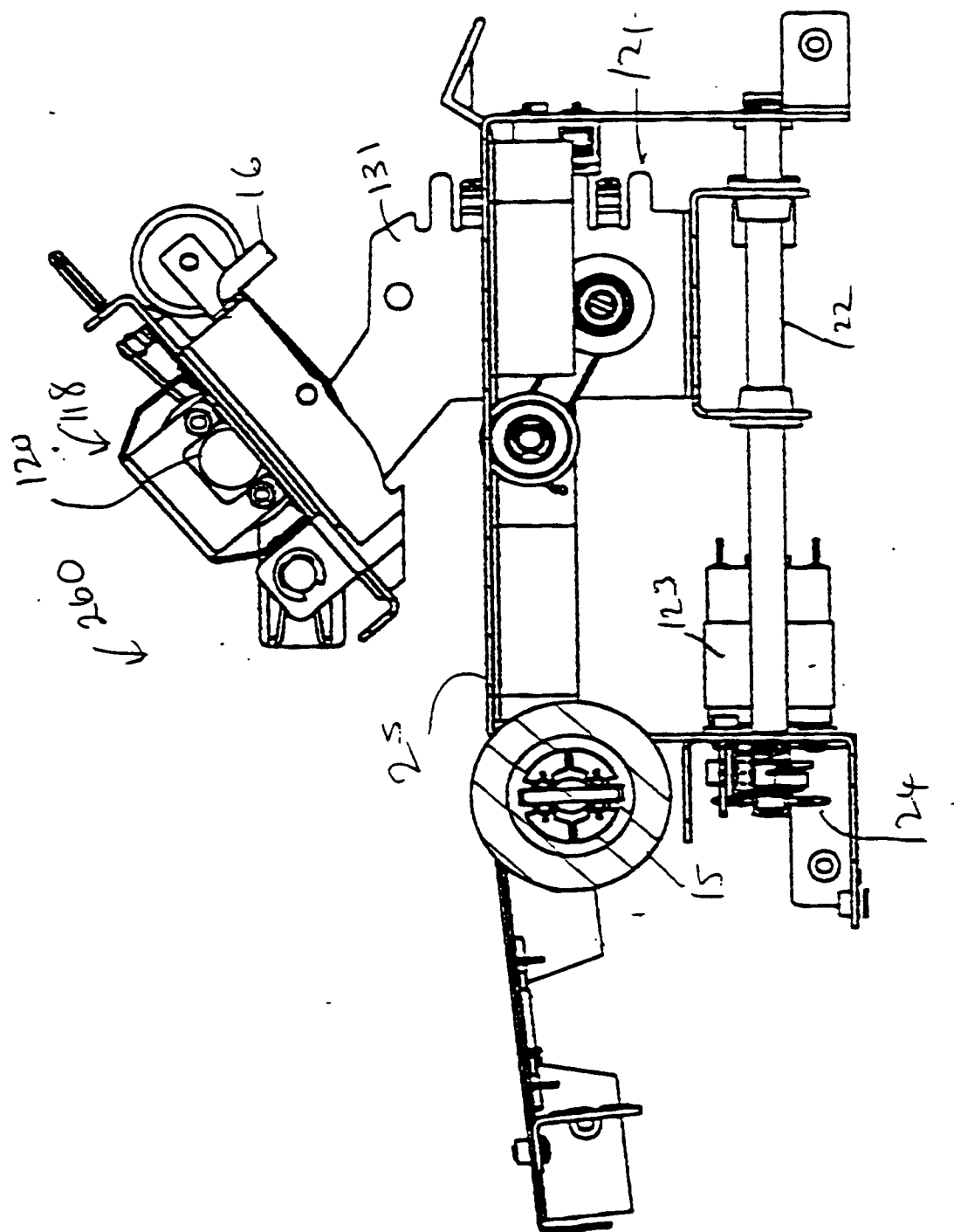


FIG-7



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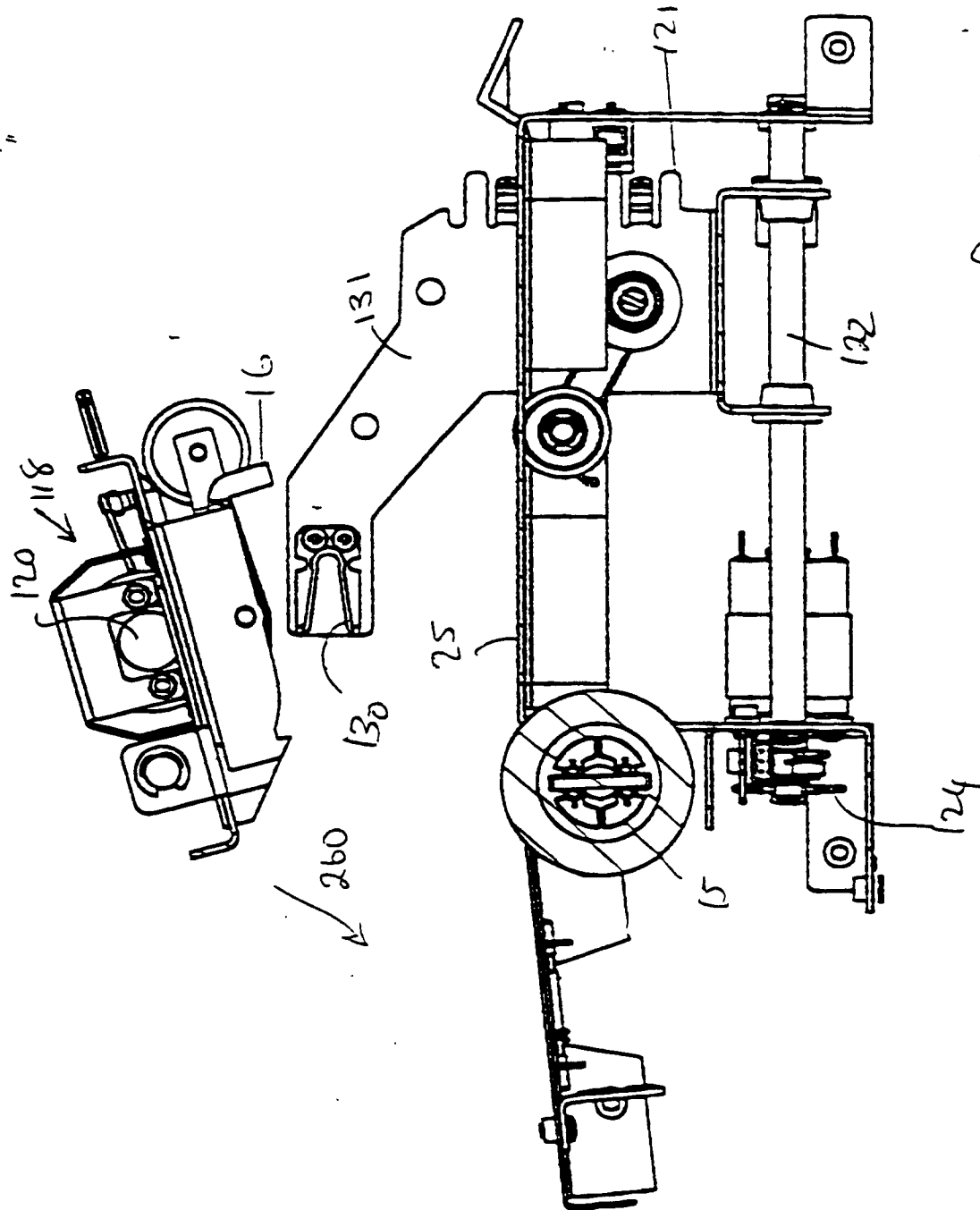
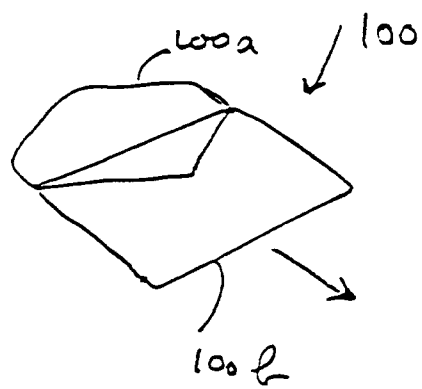
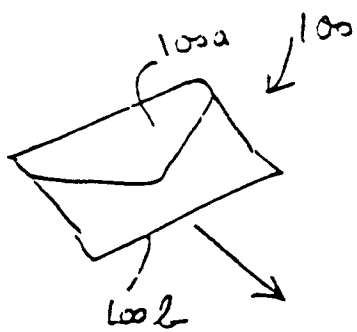
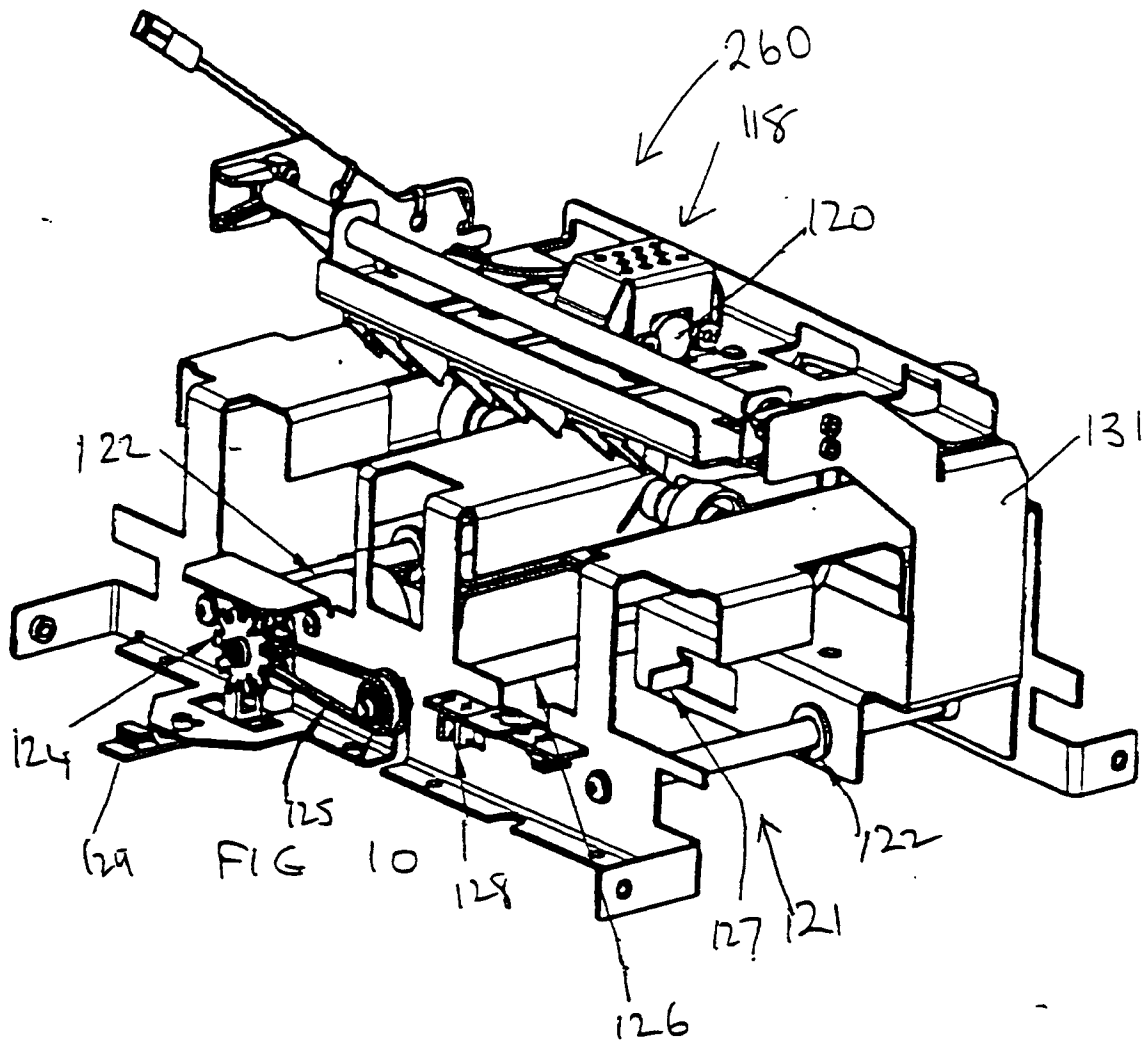


FIG. 9



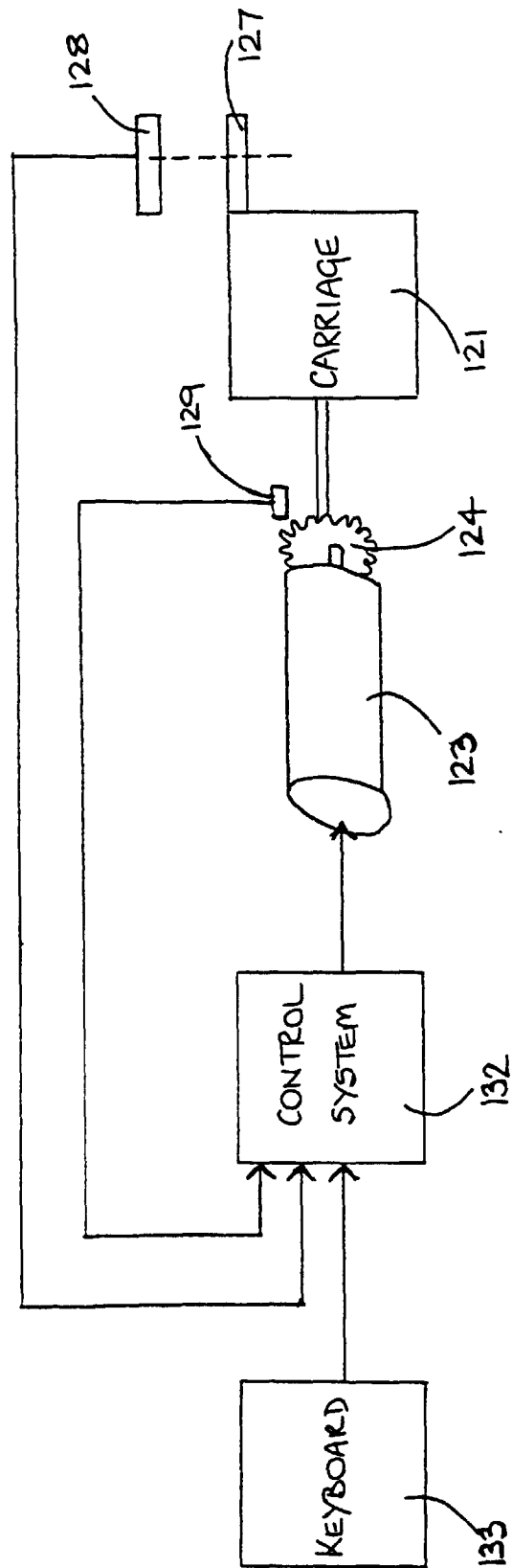


FIG. 11



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 10 4092

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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