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APPARATUS AND METHOD FOR SPLICING WEBS OF INDETERMINATE LENGTH.

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Description

Technical Field

The present invention concerns an apparatus and a method for splicing webs of indeterminate length. More particularly, the invention concerns such apparatus and method in which the tail end of a preceding or old length of web and the lead end of a following or new length of web are trimmed, the trimmed ends are abutted and then are joined by applying a strip of adhesive tape to complete the splice.

Background Art

Over the years many apparatus and methods have been developed for joining ends of flexible, strip like materials such as paper, plastic films, metal foils, photographic film strips and the like, which are collectively referred to in this specification as webs of material. The ends of such webs have been joined by overlapped joints with glue or thermal fusion and by butt joints with tape, for example. The apparatus and methods used have been manual, automatic and combinations of the two and have enjoyed widely varying degrees of success.

For example, U.S. Patent 3,245,861 discloses a web splicer for use in label printing equipment in which the lead end of the following or new length of web is manually trimmed and a length of tape is applied across the trimmed end. The preceding or old length of web is then stopped as its source spool is emptied and its tail end is trimmed. The new lead end and applied strip of tape are then pressed against the old tail end to form an overlapping joint. Such overlapping joints are acceptable in many industrial applications but present problems during subsequent handling of the web in other applications. U.S. Patent 3,939,032 discloses a web butt splicer in which the new lead end is trimmed manually and a length of tape is applied across the lead end. The old tail end is then trimmed at the same location and the two trimmed ends are pressed together to form a butt joint. Published U.S. Application B339,446 shows a web cutting and splicing apparatus in which a hot wire is used to cut two webs and heat their ends sufficiently to facilitate formation of a fused butt joint. U.S. Patent 4,204,898 shows a tape winding and splicing apparatus in which side by side input platens hold tape and leader webs and an opposed, coplanar process platen holds the tail end of the tape or leader most previously cut. In use, a leader running between two reels is cut in an initial position of the input platens in which the leader's input platen is aligned with the process platen.

Then, the platens are moved to a second position to align the tape with the just cut tail end of the leader. A splice tape is applied and winding of the tape proceeds. When winding stops, the tape is cut; and the platens are moved back to the initial position; so that, the previously cut leader is aligned with the just cut tail end of the tape. A splice tape is applied and the process ends. U.S. Patent 4,234,365 shows a web butt joining system in which the old web and the new web are threaded between a pair of cutting wheels which trim their ends and convey the two ends in abutment to a pair of tape applicator wheels which place strips of tape on both sides of the butt joint.

U.S. Patent 4,501,630 discloses an apparatus for splicing a leader to magnetic tape in which the leader and tape are fed along parallel, coplanar guide grooves in a receiving table which is movable transversely to permit either the leader or the tape to move into a coplanar guide groove on an adjacent receiving table. After the lead end of the tape and the tail end of the leader have been trimmed in separate operations, the two ends are abutted and a strip of tape is applied. U.S. Patent 4,629,531 shows an apparatus for joining sheet ends such as might be used in a newspaper printing plant. The new web is stopped and trimmed manually, after which glue is applied to its lead end. Then the old web is stopped and trimmed, after which the lead end of the new web is overlapped with the tail end of the old web. U.S. Patent 4,801,342 discloses a method and an apparatus for forming a butt splice in which the old web and the new web are run along opposite sides of a planar cutting anvil along whose edge cutting wheels are run to trim the lead and tail ends, after which a strip of tape is rolled over the abutted ends.

Splicers of the types shown in these patents typically require intervention by the operator for steps such as trimming the lead or tail ends or applying tape strips to applicator wheels or to the trimmed ends. While this type of operator involvement is acceptable in many applications, certain high speed web handling operations, such as the spooling of photographic film, are slowed undesirably. Particularly when the web handling must take place in the dark, as in photographic applications, the operator's involvement can significantly slow the process.

A variety of tape applicator devices also have been used in splicers of the general sort just described. For example, U.S. Patent 4,328,066 shows a tape splicer in which the tape is pulled onto a rotating vacuum drum which is translated into contact with the abutted ends to complete the splice, after which the vacuum drum is withdrawn to a position where the next strip can be cut. A separate roller is used to smooth out the splice. U.S. Patents

4,475,970 and 4,478,674 show tape splicers in which the tape is cut to lengths on a square block and then press applied to the abutted ends. U.S. Patent 4,533,586 shows an apparatus for applying labels to packages in which a perforated strip of labels is moved past a rotary cutter which cuts the strip into individual labels and passes them to a transfer drum which places the labels on a heated vacuum applicator drum which presses the labels onto the packages. More recently, U.S. Patent 4,848,691 shows a splicer in which the new web is trimmed, a strip of tape is applied to its trimmed end and then the trimmed end and tape are pressed into a lap joint with the still moving old web.

Other types of tape dispensers also have been used extensively. One type, manufactured by the 3M Company, uses knurled disks to move the tape through the dispenser. The operator depresses a ratcheting crank which turns the knurled disks to meter the tape, after which the operator must cut the tape against an adjacent serrated blade. Another type of dispenser, also made by the 3M Company, meters and cuts the tape by means of a metering wheel whose periphery comprises a series of raised ribs which contact the sticky side of the tape. Between these ribs are recesses large enough to permit the operator to insert a finger to peel away a cut strip after a plunge type knife has severed the tape near the preceding rib. Dispensers of these general types are shown in German Patent 963,128. In still another type of dispenser, the free end of a tape is pushed through the throat of a guillotine type cutter, which can lead to stubbing of the tape and improper operation of the dispenser. Other types of tape applicators are described in an article by Walter C. Larsen entitled "A study in machine development", *Modern Packaging*, Volume 33, No. 7, March 1960, pages 201 and forward. Vacuum drums again are used to carry strips of tape, sticky side out, to transfer drums or directly to the place of application of the strips.

Summary of the Invention

The primary objective of this invention is to provide a method and apparatus for splicing webs of material in which operator interaction would be limited to replacement of the sources of web and splicing tape as they are consumed.

A further objective of this invention is to provide such a method and apparatus which automatically trims the ends of the old and new webs and abuts them for application of a strip of splicing tape.

Another objective of this invention is to provide such a method and apparatus which will automati-

cally complete the splice in a matter of seconds without intervention by the operator.

Yet another objective of this invention is to provide such a method and apparatus which will ensure proper registration of edge perforations between new and old webs.

Still another objective of this invention is to provide such an apparatus which is modular and can be relatively simply installed in place of existing splicing equipment.

Still another objective of this invention is to provide such an apparatus and method which can splice with single or double sided tape with little sensitivity to the degree of stickiness of the tape, the flexibility of the tape support or the tendency of the support to curl.

These objectives are given only by way of illustrative examples; thus, other desirable objectives and advantages inherently achieved by the disclosed invention may occur or become apparent to those skilled in the art. Nonetheless, the scope of the invention is to be limited only by the appended claims.

In one embodiment of the invention, an apparatus is provided for trimming the tail end of a first length of web and the lead end of a second length of web and then placing such trimmed ends in abutment. A first input platen is provided for supporting the first length of web and a second input platen is provided for supporting the second length of web. The two platens have trailing edges which are parallel. Means are provided for selectively stopping movement of the first length of web across the input platen and for cutting the first and second lengths of web at the trailing edges of the platens. A process platen is positioned opposite the trailing edges; and means are provided for relatively moving the platens between a first position in which the process platen receives the first length of web from the first platen and a second position in which the process platen receives the second length of web from the second platen. Thus a trimmed end of web on one of the input platens may be abutted with a trimmed tail end of web on the process platen.

Preferably, the platens have perforated bed plates to facilitate application of vacuum to hold the webs during cutting or the passage of air to support the webs during movement. For use with webs having edge perforations, means are provided for registering the perforations of webs on the input platens with those of the web on the process platen. To ensure such registration, the webs are trimmed by a pair of blades which essentially simultaneously engage the webs at the trailing edges of the input platens.

In the method of abutting tail and lead ends of web in accordance with the invention, web is

moved across one input platen and the process platen and on to subsequent process steps. Meantime, a new web is positioned on the other input platen. When the old web is nearly expired, its movement across the one input platen is stopped. Then, the tail end of the old web and the lead end of the new web are trimmed, after which the tail and lead ends are moved into abutment in preparation for application of a strip of tape.

The previously described apparatus for trimming and abutting preferably is combined with the apparatus for cutting and applying strips of tape which comprises a first rotatable drum means for drawing a web of tape from a suitable source. Means adjacent the first drum cut the tape into predetermined lengths while the web is moving on the first drum. A second rotatable drum removes the lengths of tape from the first and passes them to a third tape applicator drum. Means are provided for translating the tape applicator drum away from the second drum and rolling the applicator drum along a surface to apply the lengths of tape. When such an apparatus is combined with the structure described in the preceding paragraphs, the lengths of tape are applied across the abutted ends of the old and new webs.

In the preferred embodiment of the apparatus for cutting and applying lengths of tape, the first and second drums each comprise a plurality of circular disks mounted for rotation, the edges of the disks being interleaved so that lengths of tape of the first drum are transferred to the second. Preferably, the edges of the disks of the two drums are knurled to control the degree of adhesion of the tape to the drums, the adhesion to the first drum being substantially greater than that to the second drum; and the second drum has a substantially higher peripheral velocity to facilitate transfer of the strips. The applicator drum preferably is vacuum actuated and rotated with a somewhat higher peripheral velocity than the second drum, to remove the cut lengths of tape easily from the second drum. Because the tape is metered out and cut while it maintains contact with the knurled surface of the first drum and is peeled free only when needed, the usual difficulties of advancing the free end of a sticky tape are avoided.

The previously described method for trimming and abutting preferably is combined with a step of cutting and applying lengths of tape in accordance with the invention, the lengths of tape being cut on a first drum and then removed sequentially by a second drum and passed to a rotating vacuum drum. The vacuum drum is then translated away from the second drum and rolled along a surface to apply the lengths of tape to such surface.

Brief Description of the Drawings

The foregoing and other objectives, features and advantages of the invention will be apparent from the following more particular description of the preferred embodiments of the invention, as illustrated in the accompanying drawings, in which:

Figure 1 shows a front elevation view of the apparatus according to the invention as configured when a web from an old, expiring roll is running through the splicer and a web from a new, waiting roll has been threaded in place for the next splicing operation.

Figure 2 shows a front elevation view of the apparatus according to the invention, with the splicing tape applicator shown only fragmentarily, as configured when the web from an old, expiring roll has been stopped and the cutting knife has been lowered to trim the tail end of the web from the old, expiring roll and the lead end of the web from the new, waiting roll.

Figure 3 shows a front elevation view of the apparatus according to the invention, with the splicing tape applicator shown only fragmentarily, as configured when the cutting knife has been raised again to the position of Figure 1 and the tape applicator carriage has been lowered to align the tail end of web from the old, expired roll with the lead end of the new, waiting roll, just as the strip of splicing tape is about to be rolled over the butted lead and tail ends.

Figure 4 shows a sectional view taken along line 4-4 of Figure 3, illustrating details of the actuator for the cutting knife.

Figure 5 shows an enlarged front elevation view of the splicing tape applicator according to the invention.

Figure 6 shows an enlarged top plan view of the splicing tape applicator according to the invention.

Figure 7 shows a view taken along line 7-7 of Figure 6.

Figure 8 shows a view taken along line 8-8 of Figure 6.

Figure 9 shows a view taken along line 9-9 of Figure 6, illustrating the plunge knife carrier in its fully withdrawn position.

Figure 10 shows a view taken along line 9-9 of Figure 6, illustrating the plunge knife carrier in its partially inserted position.

Figure 11 shows a view taken along line 9-9 of Figure 6, illustrating the plunge knife carrier in its fully inserted position.

Figure 12 shows a view taken long line 12-12 of Figure 6, illustrating the plunge knife carrier in its fully withdrawn position.

Figure 13 shows a further enlarged, fragmentary top plan view of the apparatus of Figure 5.

Figure 14 shows a view taken along line 14-14 of Figure 6, illustrating the plunge knife carrier in its fully withdrawn position.

Figure 14A shows a fragmentary view of the type of knurling preferred for the peripheries of the disks forming the tape release drum.

Figure 14B shows a fragmentary view of the type of knurling preferred for the peripheries of the disks forming the tape acquisition drum.

Figure 15 shows a simplified view of the structure of Figure 14, illustrating the plunge knife carrier in its partially inserted position.

Figure 16 shows a simplified view of the structure of Figure 14, illustrating the plunge knife carrier in its fully inserted position.

Figure 17 shows a view taken along line 17-17 of Figure 6, illustrating the splicing tape applicator drum in its fully retracted position.

Figure 18 shows a view taken along line 17-17 of Figure 6, illustrating the splicing tape applicator drum in its fully extended and lowered position.

Description of the Preferred Embodiments

The following is a detailed description of the preferred embodiments of the invention, reference being made to the drawings in which the same reference numerals identify the same elements of structure in each of the several Figures.

Referring simultaneously to Figures 1 to 4, the apparatus according to the invention is seen to comprise a rugged base plate 10 positioned preferably between an old or expiring roll or source 12 of web 14 of indeterminate length, such as conventional 35 mm photographic film having edge perforations, not illustrated; and a new or waiting spare roll or source 16 of web 18 also of indeterminate length, such a photographic film. Web 14 is threaded about a flanged roller 20 mounted for rotation on an axis perpendicular to base plate 10 and then over a flanged registration sprocket 22 aligned with roller 20. Sprocket 22 is attached to a ratchet wheel 24 and the assembly is mounted for rotation on an axis perpendicular to base plate 10. Similarly, web 18 is threaded about a pair of flanged rollers 26 mounted for rotation about axes perpendicular to base plate 10 and then over a flanged registration sprocket 28 aligned with rollers 26. Sprocket 28 is attached to a ratchet wheel 30 and the assembly is mounted for rotation on an axis perpendicular to base plate 10.

Laterally spaced from ratchet wheels 24 and 30 is an elongated U-shaped bracket 32 which is rigidly mounted to base plate 10 with the open end of the U facing to the right as illustrated in Figure 1. As seen most clearly in Figure 4, affixed to the front surface 34 of bracket 32 are a pair of verti-

cally spaced, parallel vacuum input platens 36,38. Optionally, to provide added alignment with registration sprockets 22,28, input platens may be provided with edge guides 40,42, shown only in Figure 4 for ease of illustration. Guides 40,42 are aligned with the flanges on sprockets 22,28 to ensure that webs 14 and 18 will run straight and parallel across input platens 36,38. Preferably, input platens 36,38 comprise flat perforated bed plates 44 operatively connected to manifolds 46 which in turn are connected by suitable pneumatic fittings 48 to a conventional source of pressurized air or vacuum (not illustrated). Thus, when vacuum is applied to bed plates 44, webs 14,18 are held firmly in place; but when pressurized air is applied, the webs are supported on a cushion of air during movement across the bed plates.

Within bracket 32 is mounted a cutting knife carrier block 50 having on its front face a vertically extending spline 52 which slidably engages a vertical slot 54 extending into the inside surface of the front wall of bracket 52, as indicated in phantom lines. Carrier block 50 is provided in its rear surface with a vertically extending slot 56, as indicated in phantom lines, which slidably engages a vertically extending spline 58 provided on a flange 60 attached to a side wall of bracket 32. A handle 62 is provided for manually moving carrier block 50 up and down; however, such movement typically is provided in operation by a pneumatic cylinder 64 having its head end 66 pivotably attached to base plate 10 by means of a cylinder mount 68 and its rod end 70 pivotably attached to carrier block 50 by means of a flange 72. Attached to the vertical side of carrier block 50 exposed through the open end of U-shaped bracket 32 is a stiff metal plate 73 having a pair of vertically spaced, laterally extended and resilient arms 74,76 whose lower edges define a pair of cutting knives 78,80 having downwardly angled cutting edges. In the raised position shown in Figure 4, the left hand vertical edge 81 of plate 73 below knife 80 and below knife 78 contacts the trailing edges 82,84 of input platens 36,38 to guide knives 78,80 and prevent their being stubbed as they are moved downward. Arms 74,76 support knives 78,80 so that the edges of the knives are pressed against trailing edges 82,84 as carrier block 50 moves downward to the position of Figure 2, thus ensuring a clean cut of webs 14,18. In all positions of carrier block 50, trailing edges 82,84 are contacted by arms 74,76 or edge 81 to guide knives 78,80 smoothly over the trailing edges.

Positioned adjacent the knife carrier assembly just described are the movable output or process platens and the splicing tape applicator according to the invention. An upper bracket 86 and a lower bracket 88 extend forwardly from base plate 10

and rigidly support between them a vertically extending slide 90, illustrated only schematically, on which a rigid carrier plate 92 is mounted for movement upward and downward as viewed in Figures 1 to 3. Movement of carrier plate 92 between the positions of Figure 1 and Figure 3 is controlled by a pneumatic cylinder 94, shown positioned behind slide 90, whose head end 96 is attached to bracket 88 and whose rod end, not illustrated, is operatively connected to carrier plate 92. Mounted on the front face of carrier plate 92 is a lower trimmed end vacuum platen 98 which is directly opposite to and aligned with input platen 36 in the position of Figure 1, but below input platen 36 in the position of Figure 3. A central process vacuum platen 100 is mounted on the front face of carrier plate 92 directly above and parallel to trimmed end platen 98. Process platen 100 is directly opposite to and aligned with input platen 38 in the position of Figure 1, but directly opposite to and aligned with input platen 36 in the position of Figure 3. An upper trimmed end vacuum platen 102 is mounted on the front face of carrier plate 92 directly above and parallel to process platen 100. Trimmed end platen 102 is directly opposite to and aligned with input platen 38 in the position of Figure 3, but above input platen 38 in the position of Figures 1 and 2. Each of platens 98,100,102 preferably includes a perforated bed plate similar to bed plates 44. To provide proper alignment with registration sprockets 22,28, each of platens 98,100,102 preferably comprises edge guides similar to guides 40,42 which optionally may be provided or input plates 36,38. As in the case of platens 36,38, manifolds 104 connect each platen 98,100,102 via suitable pneumatic fittings 106 to a conventional source of pressurized air or vacuum (not illustrated). Thus, when vacuum is applied to the bed plates, webs 14,18 are held firmly in place; but when pressurized air is applied, the webs are supported on a cushion of air during movement across the bed plates.

To facilitate threading the lead end from a new roll of web so that the edge perforations of the new web will be in registry with those of the old one, trimmed end platens 98,102 are provided at their trailing edges with pairs 108,110 of spaced locator pins for engaging the edge perforations in webs 14,18. The locator pins are positioned so that when perforations of the webs are placed over the pins, the following portions of the webs will also register with registration sprockets 22,30. Also to ensure that the new and old webs will be in proper registry, ratchet wheels 24,30 are provided, respectively, with latch pawls 112,114 having slotted pivots 116 attached to base plate 10 and pneumatic pawl actuator cylinders 118,120 pivotably attached between pawls 112,114 and base plate 10. In Figure

1, pawl 112 is shown disengaged from ratchet wheel 24, thereby permitting old web 14 to pass over input platen 38 and process platen 100; whereas, pawl 114 is shown engaged with ratchet wheel 30, thereby restraining new web 18 from movement across input platen 36 and trimmed end platen 98.

In operation of the structure thus far described, as seen in Figures 1 and 2, the old web 14 is drawn from roll 12, around flanged roller 20, around free-wheeling flanged registration sprocket 22, across input platen 38 and process platen 100, around flanged rollers 122,124,126 and on to subsequent processing equipment. To minimize scratching of web 14 as it moves, a flow of air is maintained through the bed plates of platens 38 and 100 to support the web during movement. Meantime, as seen in Figures 1 and 2, new roll 16 sits waiting with web 18 passed around flanged rollers 26, over stopped flanged registration sprocket 28, across input platen 36 and onto trimmed end platen 98 where one set of edge perforations is placed over locator pins 108. If desired, a vacuum may be applied through the bed plates of platens 36 and 98 to hold the lead end of web 18 in place. When roll 12 has nearly expired, as conventionally detected by sensors not illustrated, pneumatic cylinder 120 is actuated to engage pawl 114 with ratchet wheel 24, thereby bringing web 14 to a rapid but controlled stop. The arrangement of cylinder 120 and slotted pivot 116 of pawl 114 provides sufficient flexibility in the linkage to enable the inherent damping and compliance characteristics of the cylinder to stop the web without damage to its perforations. Also, registration sprockets 22 and 28 are positioned so that at trailing edges 82,84 of input platens 36,38, the edge perforations of webs 14,18 are in perfect registry when both webs are stopped.

Vacuum is then applied through the bed plates of platens 38,100 and 36,98 to hold webs 14,18 securely in place on their respective platens. Pneumatic cylinder 64 is then actuated to cause carrier block 50 to move downward to the position shown in Figures 2 and 4. This movement causes knife blades 78,80 to pass closely over trailing edges 82,84 to cleanly cut web 14 and trim the lead end of web 18, while leaving the edge perforations on the lead end of web 18 and those on the tail end of web 14 in registry. Cylinder 64 then raises the knife assembly back to the position of Figures 1 and 3.

While a vacuum is maintained on platens 38,100 and 36,98, pneumatic cylinder 94 is then actuated to lower carrier plate 92 to the position shown in Figure 3. Thus, the trimmed tail end of the expiring web on process platen 100 now comes into alignment with the trimmed lead end of the

new web on input platen 36. At the same time, as seen in Figure 2, the remainder of the old web on input platen 38 and the trimmed end of the new web on platen 98 are ready for subsequent removal by the operator. Then, the splice tape dispenser and applicator 128 of the invention, to be described shortly, is actuated to extend its vacuum actuated, silicone rubber covered applicator roller 130 and roll a strip of tape across the abutted ends positioned between platens 36 and 100. Once the strip of tape has been rolled on and roller 130 has been rolled back over the joint to ensure good adhesion as roller 130 is withdrawn, the vacuum acting on platens 36,38,98,100 is released and a flow of air is established through the bedplates of platens 36,100, after which the freshly spliced web 14 may again be placed in motion.

The entire operation cycle just described can be accomplished in a second or two, thus yielding considerably reduced down times for splicing of webs, compared to most prior art splicing techniques, which may take a minute or so to complete a splice. After the newly spliced web has begun to move, the operator may return at any convenient time to remove the old roll and any remaining web plus the lead end trimmed from the new roll. A fresh roll 16 may then be installed and threaded onto the available input platen and trimmed end platen, as shown in Figure 3. Thus, the new and expired rolls shift from one side to the other of the apparatus following each splicing cycle.

Turning now to Figures 5 and 6, splice tape dispenser and applicator 128 may be seen to comprise a rugged frame made up of a back plate 132 which is rigidly attached to carrier plate 92 in a position to permit applicator roller 130 to roll across platen 100 and either platen 36 or platen 38 to complete the splice. The frame also comprises a center plate 134 and a laterally elongated front plate 136. Between plates 132 and 134, a plurality of spacers 138 are provided; and between plates 134 and 136, a plurality of spacers 140. On the front surface of front plate 136 is mounted an L-shaped bracket 142 to which a pneumatically driven motor 144 is attached. Motor 144 is operatively connected to drive shaft 146 for dispenser and applicator 128. Shaft 146 is journaled for rotation in rear plate 132, center plate 134 and front plate 136.

As seen in Figure 7, a manual indexing handle 148 is mounted on shaft 146 via a conventional overrunning clutch, not illustrated. A ratchet wheel 150 is fixed on shaft 146 to the rear of handle 148 and a leaf spring 152 is mounted on the front face of front plate 136 in position to function as a reverse rotation stop for ratchet wheel 150. Thus handle 148 may be rotated in the direction indicated as needed to index the overall mechanism,

as would be needed, for example, when threading a new roll of tape.

As shown in Figures 5, 6 and 7, a pneumatic cylinder 154 is mounted on the front surface of front plate 136 for the purpose of extending and retracting tape applicator wheel 130, as will be discussed in more detail shortly. Cylinder 154 is attached to front plate 136 by means of a pivot at the head end 156 of the cylinder. The actuator rod 158 of cylinder 154 passes beneath indexing handle 148 and is pivotably attached to the outboard end of a slidable carrier 160 on which applicator roller 130 is mounted, as best seen in Figures 17 and 18.

At the front side of center plate 134, shaft 146 fixedly supports a timing belt pulley 162, as shown in Figures 6 and 8, about which pulley a timing belt 164 extends into engagement with an idler pulley 166 and a further drive pulley 168 mounted on a shaft 170. Shaft 170 is journaled for rotation in center plate 134 and rear plate 136. The diameters of pulleys 162 and 168 are chosen so that shaft 170 will rotate faster than shaft 146, for a purpose soon to be discussed. Between center plate 134 and rear plate 132, shaft 170 fixedly supports a tape release drum 172 comprising a plurality of axially spaced disks with knurled peripheral surfaces having the general configuration shown in Figure 14A. The knurling preferably is a 96 TPI straight knurl pattern with an included angle alpha for the knurl ridges of about 60 degrees. To the rear of release drum 172 shaft 170 also fixedly supports a knurled drive wheel 174 which engages and rotates applicator roller 130, as best seen in Figures 14 to 18. Drive wheel 174 is sized so that applicator roller 130 will have a peripheral velocity approximately ten per cent higher than that of release drum 172. Note, however, that the surface of applicator roller 130 is in close proximity to but does not contact the surface of release drum 172.

Referring particularly to Figures 6 and 9 to 13, it can be seen that between center plate 134 and rear plate 132, shaft 146 passes loosely through a carrier block return spring 176 having a fixed end 178 positioned against a stop pin 180 extending rearwardly from center plate 134, and a movable end 182 crimped over one edge of an essentially rectangular knife carrier block 184 mounted for free rotation on shaft 146. To the rear of carrier block 184, shaft 146 fixedly supports a ratchet wheel 186 and, further to the rear, fixedly supports a tape acquisition drum 188 comprising a plurality of axially spaced disks with knurled peripheral surfaces having the general configuration shown in Figure 14B. The knurling is of the same general type as used for release drum 172, except that the ridges of the knurls are flattened, preferably having a circumferential width beta of about 0.0508 cm. The

sizes of drive pulley 162, drive pulley 168, release drum 172 and acquisition drum 188 are chosen so that release drum 172 has a peripheral velocity approximately fifty per cent higher than that of acquisition drum 188. As shown in Figures 6 and 13, the disks of drums 172 and 188 are interleaved, for a purpose to be discussed.

As seen in Figure 12 and in phantom in Figures 9 to 11, carrier block 184 includes on its rear side a transverse slot 190 in which a knife carrier plate 192 is slidably mounted and secured by keeper straps 194, 196. Knife carrier 192 includes at one end a rearwardly extending arm 198 on which a plunge knife 200, preferably pointed or arrow head shaped, is mounted. Knife carrier 192 also includes at its opposite end a forwardly projecting tab 202 which extends beyond the forward face of carrier block 184 and is attached to one end of a knife carrier return spring 204, the other end of which is attached to a pin 206 extending from the forward face of carrier block 184.

On the opposite side of knife carrier 192 from rearwardly extending arm 198 is provided a forwardly projecting cam follower pin 208 which cooperates with a flipper cam 210 pivotably mounted on a stub axle 212 extending rearwardly from center plate 134. Flipper cam 210 comprises a flat upper flange 214 extending rearwardly and a flat front flange 216 extending downwardly. A flipper cam return spring 218 is mounted on axle 212 with its fixed end 220 bearing against a stop pin 222 projecting rearwardly from center plate 134 and its movable end 224 captured in a slot 226 provided in the end of flipper cam 210 remote from axle 212. Downward movement of flipper cam 210 is limited by a stop pin 228 projecting rearwardly from center plate 134 just below slot 226.

Also attached to carrier block 184 is a knife carrier return pawl 230 having a pivot pin 232 extending rearwardly from carrier block 184. At its upper end, as best seen in Figures 9 to 13, pawl 230 includes a forwardly projecting tab 234 which extends into close proximity with the rear surface of center plate 134. A pawl return spring 236 is attached to tab 234 at one end, its other end being attached to a pin 238 projecting from one edge of carrier block 184. At a location closer to pivot pin 232, pawl 230 includes a rearwardly projecting dog 240 for engaging ratchet wheel 186.

Rear plate 132 includes an upwardly extending arm on which a source or spool 242 of single or double sided adhesive tape is mounted for rotation. As seen most clearly in Figures 14 to 16, a web 244 of tape of indeterminate length is led from spool 242 and passes, sticky side out, around a roller 246 mounted on a manually movable lever 248 pivoted to rear plate 132 on an axle 250. To thread web 244 into tape dispenser and applicator

130, lever 248 is depressed counterclockwise as viewed in Figure 14 until a stop roller 252 mounted on a side arm 254 of lever 248 contacts acquisition drum 188. A return spring 256 is mounted on an axle 258 projecting forwardly from rear plate 132 and has its fixed end against one of spacers 138 and is movable end bearing on lever 248. With roller 246 raised from acquisition drum 188, web 244 is then passed around roller 246 as shown in Figure 15 and lever 248 is released so that spring 256 presses roller 246 against web 244 whose sticky side then engages the flat tops 260 of the knurls on acquisition drum 188. Once web 244 has been thus engaged with acquisition drum 188, handle 148 shown in Figure 7 may be indexed to rotate shaft 146 and cause drum 188 to rotate clockwise and draw more of web 244 from roll 242.

As shaft 146 rotates, whether under the influence of handle 148 or pneumatic motor 144, the various mechanisms associated with carrier block 184 complete their respective cycles. In the illustrated embodiment of the invention, each rotation of shaft 146 causes four cycles of operation of these mechanisms; however, those skilled in the art will appreciate that fewer or more cycles could be provided by changing the number of teeth on ratchet wheels 150 and 186. Figure 9 shows the mechanism as it appears when a cycle of operation has just finished. As shaft 146 rotates clockwise, ratchet wheel 186 engages dog 240 on pawl 230 and thus pulls carrier block 184 along. As rotation continues, cam follower pin 208 on knife carrier 192 eventually comes into contact with the upper surface of flange 214 of flipper cam 210, thus causing knife carrier 192 to begin to move toward shaft 146 and bringing plunge knife blade 200 closer and closer to the periphery of acquisition drum 188.

As seen in Figures 14 to 16, acquisition drum 188 is provided with a plurality of inwardly extending slots 189, four in the illustrated embodiment, the slots extending axially along the drum through each of its constituent disks. Plunge knife blade 200 is positioned to enter one of slots 189 as knife carrier 192 is forced toward shaft 146 by flipper cam 210. Slots 189 and plunge knife blade 200 preferably are angled slightly away from a radial orientation toward the axis of shaft 146, in the direction so that slots 189 open toward the rotation of shaft 146. This arrangement ensures that if web 244 were to adhere to the knife blade as the blade is extended into the slot, the leading portion of the web would strip from the blade. Conversely, when the blade is withdrawn from the slot in the manner now to be discussed, the trailing portion of the web would strip from the blade.

When the mechanism has reached the position of Figure 11, plunge knife blade 200 has reached

the position shown in Figure 16. The grip of the adhesive on web 244 to flats 260 prevents the web from being drawn into slots 189 as it is being cut and results in clean, straight cuts. Moreover, the arrow head shape of knife blade 200 helps prevent the web from being drawn into the slots, as it significantly reduces the cutting force required. A small additional rotation of shaft 146 then causes cam follower pin 208 to slide off the end of flipper cam 210, thus allowing knife carrier 192 to retract knife blade 200 from slot 189 under the influence of spring 204. A small further rotation of shaft 146 causes tab 234 of pawl 230 to engage a stop pin 264 projecting rearwardly from center plate 134. Pawl 230 thus is lifted so that dog 240 comes out of engagement with ratchet wheel 186. This permits carrier block 184 to rotate counterclockwise under the influence of return spring 176 until the position of Figure 9 is reached again and dog 240 has reengaged ratchet wheel under the influence of spring 236.

While carrier block 184 is returning to its start position, acquisition drum 188 and release drum 172 continue to rotate. Because of the very small area for adhesion to release drum 172 provided by the ridge lines 262 of its knurls, the sticky side of web 244 adheres very little to release drum 172 as its disks, interleaved with and having a higher peripheral velocity than those of acquisition drum 188, lift the leading edge of the strip of tape from drum 188 and guide that edge into the small radial clearance provided between release drum 172 and applicator roller 130, as shown in Figures 15 and 16. There, the still higher peripheral velocity of roller 130 and the vacuum acting at its surface combine to pull the strip from release drum 172. Of course, the distance along the periphery of release drum 172 from acquisition drum 188 to vacuum roller 130 must be substantially less than the desired length of the strips of tape being cut; so that, the trailing edge of each strip will still be adhered to acquisition drum 188 when its leading edge is acquired by vacuum roller 130, thus preventing the strip from peeling away prematurely. The differential adhesion of the web to drums 172 and 188, along with the peripheral velocity overspeed of release drum 172, prevents tape from adhering to release drum 172 and also allows acquisition drum 188 to control the squareness and advance of each cut strip from web 244.

Though the use of knurling on drums 172,188 is the preferred mode for establishing such differential adhesion and is effective for most useful types of adhesive tapes, a similar effect can be achieved by providing a radially spring biased roller 265 in contact with drum 188 just ahead of the point where drum 172 lifts the tape from drum 188. The location for such a roller is shown for illustra-

tive purposes only in Figure 16. By adjusting the tension on such a roller 265, the tape can readily be made to adhere more tenaciously to drum 188, in a manner similar to the differential adhesion achieved by flats 260 and ridges 262. It is also within the scope of the invention to use such a biased roller in combination with knurled or plain surfaces on the disks of acquisition drum 188 or release drum 172 or both.

While applicator roller 130 is positioned as shown in Figures 9 to 17, a hub 266 at its rear portion engages knurled wheel 174 to drive vacuum roller 130 approximately ten per cent faster than release drum 172. See Figure 17 for the engagement of hub 266 and wheel 174. As indicated previously, applicator roller 130 is mounted for translation into and out of contact with the abutted ends of web positioned on process platen 100 and one of input platens 36,38. For this purpose, a slide 268 is attached to the rear surface of front plate 136, within which slidable carrier 160 is mounted for movement between the two positions shown in Figures 17 and 18. A mounting block 270 is attached to the rear surface of carrier 160 and, in turn, supports a leaf spring mounting block 272 having parallel upper and lower surfaces from which a pair of leaf springs 274,276 extend toward release drum 172. Attached to the other ends of leaf springs 274,276 is a conventional bearing block and air fitting 278 which rotatably supports a shaft 280 for applicator roller 130. A vacuum connector 282 is attached to fitting 278 to provide the necessary vacuum for operation of applicator roller 130. A flange 284 extends rearwardly from the lower rear face of slide 268 and ends just below central plate 134. As shown in Figures 7, 17 and 18, flange 284 is provided in its rear face with a cam slot 286. Extending below and attached to bearing block 278 is an arm 288 rotatably supporting at its lower end a cam follower roller 290 which rides in cam slot 286. As shown in Figures 17 and 18, cam slot 286 slopes downwardly from the position of Figure 17 in which hub 266 engages wheel 174 to the position of Figure 18 in which applicator roller 130 moves across the surfaces of platens 100 and 36 or 38, indicated in phantom. Leaf springs 274,276 permit this movement of applicator roller 130 and, once roller 130 contacts platen 100, also provide a continuous downward bias to the roller to ensure that each strip of tape is securely applied to the abutted ends of webs 14 and 18, even if process platen 100 and one of input platens 36,38 are not positioned in precisely the same plane. And, because applicator roller 130 is covered with a compliant silicone rubber, it tends to move rather smoothly over small irregularities and misalignments.

The overall operation of the apparatus according to the invention should now be apparent to those skilled in the art. While the ends of the old and new webs are being trimmed and abutted using the apparatus of Figures 1 to 4, the tape dispenser and applicator or Figures 5 to 18 is actuated to advance the tape, cut a strip 292 as shown in Figures 1 and 15 and transfer strip 292 to vacuum roller 130. Cylinder 154 is then actuated to translate vacuum roller 130 from the position of Figure 17 to that of Figure 18 and then retract vacuum roller 130 to the position of Figure 17 to receive the next cut strip of tape. Under the influence of leaf springs 274,276, the initial translation of vacuum roller 130 applies strip 292 across the abutted ends and the following retraction of vacuum roller 130 presses the strip again to ensure good adhesion.

Claims

1. Apparatus of the type including a first source (12) of web of indeterminate length; a second source (18) of web of indeterminate length; a first input platen (38) for supporting web from said first source, said first platen having a first trailing edge (84); a second input platen (36) for supporting web from said second source, said second platen having a second trailing edge (82); means (112-120) for selectively stopping movement of web from said first and second sources across said first and second platens; a process platen (100) positioned opposite said trailing edges; means (86-96) for relatively moving said platens between a first position in which said process platen receives web from said first platen and a second position in which said process platen receives web from said second platen characterized by:
 - said second trailing edge being parallel to said first trailing edge; and
 - means (50-80) operable in each of said first and second positions for cutting at said trailing edges web extending from both said first and said second sources, respectively, past said first and second trailing edges, whereby a trimmed lead end of web on one of said first and second platens alternately may be abutted with a trimmed tail end of web on said process platen as said means for moving shifts said platens between said first and second positions after actuation of said means for cutting.
2. Apparatus according to Claim 1, further characterized by said input platens and said process platen each comprising a perforated bed plate (44), means (46,48) for applying vacuum to each said bed plate to hold such webs during cutting and for applying air pressure to each said bed plate to support such webs during movement of such webs across said platens.
3. Apparatus according to Claim 1 or 2, wherein said input platens and said process platen are positioned in parallel planes.
4. Apparatus according to one of the preceding claims, further characterized by:
 - a first trimmed end platen (98) positioned on one side of said process platen;
 - a second trimmed end platen (102) positioned on the opposite side of said process platen from said first trimmed end platen; and
 - said means for moving also relatively moves said trimmed end platens and said first and second platens so that in said first position said first trimmed end platen is positioned to receive web from said second platen and in said second position said second trimmed end platen is positioned to receive web from said first platen.
5. Apparatus according to Claim 4, wherein such webs comprise edge perforations, further characterized by locator pins (108,110) on said trimmed end platens for engaging such perforations to position said leading ends for trimming by said cutting means.
6. Apparatus according to one of the preceding claims, wherein such webs comprise edge perforations further characterized by said means for stopping including means for ensuring registration between the perforations of a web from one of said sources and the perforations of a web from the other of said sources.
7. Apparatus according to Claim 6, wherein said means for ensuring registration comprises a first registration sprocket between said first input platen and said first source, a second registration sprocket between said second input platen and said second source and means for braking said sprockets with said perforations in registration.
8. Apparatus according to Claim 7, wherein said means for braking comprises a first ratchet wheel attached to said first registration sprocket, a second ratchet wheel attached to said second registration sprocket, first pawl and actuator means for engaging said first ratchet wheel and second pawl and actuator means for engaging said second ratchet wheel.

9. Apparatus according to one of the preceding claims, wherein said means for cutting comprises a pair of blades for essentially simultaneously engaging webs extending past said first and second trailing edges. 5
10. Apparatus according to one of the preceding claims, wherein said first and second platens are fixed and said means for moving shifts said process platen between said first and second positions. 10
11. Apparatus according to one of the preceding claims, further characterized by:
 - means (128,290) for applying a strip of tape (292) across such abutted trimmed tail and lead ends to splice them together. 15
12. Apparatus according to Claim 11, wherein said means for applying a strip of tape comprises: 20
 - a source (242) of adhesive tape of indeterminate length, said tape having at least one sticky side;
 - first rotatable drum means (188) for drawing a web (244) of such tape from said source with said sticky side contacting said first drum means; 25
 - means (189,200) for cutting such web into strips of predetermined length on said first drum means while such web is being drawn by said first drum means; 30
 - second rotatable drum means (172) for overcoming the adhesion of such strips to said first drum means and thereby removing such strips sequentially from said first drum means with said sticky side contacting said second drum means; 35
 - third rotatable drum means (130) for removing such strips from said second drum means with said sticky side facing away from said third drum means; and 40
 - means (154-160, 268-290) for translating said third drum means away from said second drum means and rolling said third drum means along said abutted trimmed tail and lead ends to apply such strips and splice said trimmed ends together. 45
13. Apparatus according to Claim 12, wherein said first drum means comprises a first plurality of circular disks mounted for rotation on a first shaft (146); and said second drum means comprises a second plurality of circular disks mounted for rotation on a second shaft (170), the edges of the disks of said first plurality being interleaved with those of said second plurality, whereby such strips drawn by said disks of said first drum means are removed by 50
 - said interleaved disks of said second drum means. 55
14. Apparatus according to Claim 12 or 13, further comprising means (260,262) for causing such web to adhere preferentially to said first drum means, relative to said second drum means.
15. Apparatus according to Claim 14, wherein said means for causing comprises knurls with peripheral flats on said disks of said first drum means and knurls with peripheral ridges on said disks of said second drum means.
16. Apparatus according to Claim 14, wherein said means for causing comprises a spring biased roller (246) pressing said strips against said first drum means.
17. Apparatus according to Claim 13, wherein the adhesive bearing side of such strips contacts the peripheral surfaces of at least a portion of the disks of said first and second drum means and the opposite side of such strips contacts the peripheral surface of said third drum means.
18. Apparatus according to one of the claims 13 to 17, wherein said means for cutting comprises at least one slot (189) extending from the peripheral surfaces of the disks of said first drum means toward said first shaft; at least one cutting blade (200); and means (190-240) for plunging said blade into said at least one slot to form such strips as said first drum means rotates.
19. Apparatus according to one of the claims 12 to 18, wherein said means for translating comprises a carriage (160) for said third drum means; means (154-158) for moving said carriage toward and away from said second drum means; and means (270-290) for guiding said carriage during movement between a position in which said third drum means rotates in close proximity to said second drum means to receive such strips and a position in which said third drum means contacts such abutted trimmed tail and lead ends to splice them together.
20. Apparatus according to Claim 18, further comprising a ratchet wheel (186) mounted for rotation in synchronism with said first drum means; a knife carrier block (184) mounted for rotation; spring means (176) for biasing said carrier block against rotation in the direction of rotation of said ratchet wheel; pawl means (230)

mounted on said carrier block for engaging said ratchet wheel to cause said carrier block to rotate in the direction of said ratchet wheel against the bias of said spring means; wherein said means for plunging comprises means (192) slidably mounted on said carrier block for supporting said cutting blade adjacent the periphery of said first drum means; and cam means (210) for moving said means for supporting said cutting blade to cause said blade to enter said slot to cut such strips; and further comprising means (264) for lifting said pawl means out of engagement with said ratchet wheel after each such strip has been cut, to permit said carrier block to counterrotate under the influence of said spring means until said pawl reengages said ratchet wheel and stops said carrier block in position to commence cutting the next such strip.

21. Apparatus according to Claim 20, wherein said knife carrier block is mounted coaxially with said ratchet wheel.

22. Apparatus according to Claim 20, further comprising means for causing such web to adhere preferentially to said first drum means, relative to said second drum means.

23. A method including the steps of providing a first source (12) of web of indeterminate length; providing a second source (18) of web of indeterminate length; providing a first input platen (38) having a first trailing edge (84); providing a second input platen (36) having a second trailing edge (82); providing a process platen (100) positioned opposite said first input platen; moving web from said first source across said first input platen and said process platen; stopping movement of said web from said first source, characterized by: positioning said second trailing edge parallel to said first trailing edge; positioning web from said second source across said second input platen with the end of said web extending past said second trailing edge; while maintaining the positions of said input platens and said process platen, cutting at said trailing edges both of said webs from said first and second sources to produce as a result of said cutting a tail end from said first source on said process platen and a lead end from said second source on said second input platen; and follow said cutting of both of said webs, relatively moving said process platen and said first and second input platens to abut said tail end with said lead end.

24. A method according to Claim 23, further characterized by the step of: joining said tail end to said lead end to complete the splice.

5 25. A method according to Claim 24, wherein said joining step comprises the steps of:

providing a source of adhesive tape of indeterminate length, said tape having at least one sticky side;

10 providing a first rotatable drum means;

drawing a web of such tape from said source by rotating said first drum means with said sticky side contacting said first drum means;

15 cutting such web to provide a strip of predetermined length on said first drum means while such web is being drawn by said first drum means;

providing a second rotatable drum means;

20 overcoming the adhesion of such strips to said first drum means and thereby removing such strip from said first drum means, by rotating said second drum means in proximity to said first drum means with said sticky side contacting said second drum means;

25 providing a rotatable vacuum drum means; removing such strip from said second drum means by rotating said vacuum drum means in proximity to said second drum means with said sticky side facing away from said vacuum drum means; and

30 translating said vacuum drum means away from said second drum means and rolling said vacuum drum means over said abutted tail end and lead end to apply such strip thereto to complete the splice.

Patentansprüche

40 1. Vorrichtung vom Typ, der eine erste Quelle (12) einer Bahn unbestimmter Länge, eine zweite Quelle (18) einer Bahn unbestimmter Länge, eine erste Eingangsplatine (38) zur Stützung der Bahn von der ersten Quelle, wobei die erste Platine eine erste Hinterkante (84) aufweist, eine zweite Eingangsplatine (36) zur Stützung der Bahn von der zweiten Quelle, wobei die zweite Platine eine zweite Hinterkante (82) aufweist, Einrichtungen (112-120) für selektives Anhalten des Laufes der Bahnen von der ersten und der zweiten Quelle über die erste und die zweite Platine, eine den Hinterkanten gegenüberliegend angeordnete Arbeitsplatine (100), Einrichtungen (86-96) für das jeweilige Verschieben der Platinen zwischen einer ersten Stellung, in der die Arbeitsplatine die Bahn von der ersten Platine und einer zweiten Stellung, in der die Arbeitsplatine die

Bahn von der zweiten Platine übernimmt, umfaßt, dadurch gekennzeichnet, daß:

die zweite Hinterkante parallel zur ersten Hinterkante angeordnet ist, und

Einrichtungen (50-80), die sowohl in der ersten als auch der zweiten Stellung betriebsfähig sind, um an den Hinterkanten eine jeweils von der ersten beziehungsweise der zweiten Quelle über die erste beziehungsweise die zweite Hinterkante vorlaufende Bahn zu schneiden,

wobei ein zugeschnittenes vorderes Bahnende abwechselnd auf entweder der ersten oder der zweiten Platine mit dem zugeschnittenen hinteren Bahnende auf der Arbeitsplatine gestoßen werden kann, wenn die Verschiebeeinrichtung die Platinen zwischen der ersten und zweiten Stellung versetzt, nachdem die Schneideeinrichtung betätigt worden ist.

2. Vorrichtung nach Anspruch 1, ferner dadurch gekennzeichnet, daß die Eingangsplatinen und die Arbeitsplatine jeweils eine perforierte Sohlenplatte (44), Einrichtungen (46,48) für den Einsatz von Unterdruck an jeder der Sohlenplatten, um die Bahnen während des Schneidens festzuhalten, sowie für den Einsatz von Druckluft an jeder der Sohlenplatten, um die Bahnen während des Laufes dieser Bahnen über die Platinen zu tragen, umfassen.

3. Vorrichtung entsprechen Anspruch 1 oder 2, wobei die Eingangsplatinen und die Arbeitsplatine auf parallelen Ebenen angeordnet sind.

4. Vorrichtung nach einer der vorangegangenen Ansprüche, gekennzeichnet durch:

eine erste abgetrennte Endplatine (98), die an einer Seite der Arbeitsplatine angeordnet ist,

eine zweite abgetrennte Endplatine (102), die an der der ersten abgetrennten Endplatine gegenüberliegenden Seite der Arbeitsplatine angeordnet ist, und dadurch,

daß die Verschiebeeinrichtung für das Versetzen jeweils auch die abgetrennten Endplatinen und die erste und zweite Platine versetzt, so daß in der ersten Stellung die erste abgetrennte Endplatine so steht, daß sie die Bahn von der zweiten Platine aufnehmen kann, und in der zweiten Stellung die abgetrennte Endplatine so steht, daß sie die Bahn von der ersten Platine aufnehmen kann.

5. Vorrichtung nach Anspruch 4, wobei solche Bahnen Randperforierungen aufweisen, ferner gekennzeichnet durch Fixierstifte (108,110) auf den abgetrennten Endplatinen für den Eingriff

in die Perforierungen, um die vorderen Enden für das Zuschneiden durch die Schneideeinrichtung zu positionieren,

6. Vorrichtung nach einem der vorangegangenen Ansprüche, wobei die Bahnen Randperforierungen aufweisen, ferner dadurch gekennzeichnet, daß die Anhalteeinrichtung eine Einrichtung zur Sicherstellung der Justierung der Perforierungen einer Bahn von einer der Quellen mit den Perforierungen einer Bahn von der anderen der Quellen einschließt.

7. Vorrichtung nach Anspruch 6, wobei die Einrichtung zur Sicherstellung der Justierung ein erstes Justierzahnrad zwischen der ersten Eingangsplatine und der ersten Quelle, ein zweites Justierzahnrad zwischen der zweiten Eingangsplatine und der zweiten Quelle sowie eine Einrichtung zum Bremsen der Justierzahnräder mit justierter Perforierungen umfaßt.

8. Vorrichtung nach Anspruch 7, wobei die Bremseinrichtung eine am ersten Justierzahnrad befestigte erste Zahnscheibe, eine am zweiten Justierzahnrad befestigte zweite Zahnscheibe, eine erste Klaue und Auslöseinrichtung für den Eingriff in das erste Justierzahnrad und eine zweite Klaue und Auslöseinrichtung für den Eingriff in die zweite Zahnscheibe umfaßt.

9. Vorrichtung nach einem der vorangegangenen Ansprüche, wobei die Schneideeinrichtung ein Paar Klingen für das im wesentlichen gleichzeitige Eingreifen in die über die erste und die zweite Hinterkante laufenden Bahnen umfaßt.

10. Vorrichtung nach einem der vorangegangenen Ansprüche, wobei die erste und die zweite Platine fixiert sind und die Verschiebeeinrichtung die Arbeitsplatine zwischen der ersten und der zweiten Stellung verschiebt.

11. Vorrichtung nach einer der vorangegangenen Ansprüche, ferner gekennzeichnet durch:

eine Einrichtung (128,120) für das Aufbringen eines Bandstreifens (292) über die gestoßenen, zugeschnittenen vorderen und hinteren Enden, um diese miteinander zu verbinden.

12. Vorrichtung nach Anspruch 11, wobei die Einrichtung zur Aufbringung eines Streifens umfaßt:

eine Quelle (242) Klebebandes von unbestimmter Länge mit mindestens einer klebrigen Seite,

eine erste drehbare Trommel (188) für das

Abziehen einer Bahn (244) dieses Bandes von der Quelle, wobei die klebrige Seite die erste Trommel berührt;

Einrichtungen (189,200) für das Schneiden der Bahn in Streifen von vorherbestimmter Länge auf der ersten Trommel während die Bahn von der ersten Trommel gezogen wird;

eine zweite drehbare Trommel (172) zur Überwindung der Haftung der Streifen auf der ersten Trommel, wobei die Streifen nacheinander von der ersten Trommel abgezogen werden und mit ihrer klebrigen Seite die zweite Trommel berührt;

eine dritte drehbare Trommel (130) für das Abziehen der Streifen von der zweiten Trommel, wobei die klebrige Seite von der dritten Trommel abgewandt ist; und

Einrichtungen (154-160, 268-290) für das Abrücken der dritten Trommel von der zweiten Trommel und das Rollen der dritten Trommel über die gestoßenen, zugeschnittenen hinteren und vorderen Enden, zur Aufbringung der Streifen und zum Verbinden der zugeschnittenen Enden.

13. Vorrichtung nach Anspruch 12, wobei die erste Trommel eine Mehrzahl von runden Scheiben umfaßt, die drehbar an einer ersten Welle (146) angebracht sind; und wobei die zweite Trommel eine zweite Mehrzahl von runden Scheiben umfaßt, die drehbar auf einer zweiten Welle (170) angebracht sind, wobei die Kanten der ersten Mehrzahl mit denen der zweiten Mehrzahl blätterförmig ineinander eingreifen, wodurch die von den Scheiben der ersten Trommel gezogenen Streifen durch die Scheiben der blätterförmig eingreifenden Scheiben der zweiten Trommel abgezogen werden.

14. Vorrichtung nach Anspruch 12 oder 13, der ferner auch Einrichtungen (260,262) umfaßt, die bewirken, daß die Bahn bevorzugt eher an der ersten Trommel als an der zweiten Trommel haftet.

15. Vorrichtung nach Anspruch 14, wobei die dies bewirkenden Einrichtungen Riffel mit peripheren Abflachungen an den Scheiben der ersten Trommel und Riffel mit peripheren Riffelgraten an den Scheiben der zweiten Trommel aufweist.

16. Vorrichtung nach Anspruch 14, wobei die dies bewirkende Einrichtung eine federgespannte Rolle (246) umfaßt, die die Streifen gegen die erste Trommel drückt.

17. Vorrichtung nach Anspruch 13, wobei die mit dem Klebemittel versehene Seite der Streifen die periphere Flächen wenigstens eines Teiles der Scheiben der ersten und der zweiten Trommel Kontakt berührt und die gegenüberliegende Seite der Streifen die periphere Fläche der dritten Trommel berührt.

18. Vorrichtung nach einem der Ansprüche 13 bis 17, wobei die Schneideeinrichtung wenigstens einen Schlitz (189), der von der peripheren Fläche der Scheiben der ersten Trommel in Richtung der ersten Welle verläuft, wenigstens eine Schneideklinge (200) sowie Einrichtungen (190-240) für das Eintauchen der Klinge in den wenigstens einen Schlitz umfaßt, um die Streifen herzustellen, wenn die erste Trommel sich dreht.

19. Vorrichtung nach einem der Ansprüche 12 bis 18, wobei die Verschiebeeinrichtung einen Träger (160) für die dritte Trommel, Einrichtungen (154-158) für das Verschieben des Trägers hin zu und von von der zweiten Trommel und Einrichtungen (279-290) für das Führen des Trägers während des Verschiebens zwischen einer Stellung, in der die dritte Trommel sich in nächster Nähe zur zweiten Trommel dreht, um die Streifen zu übernehmen, und einer Stellung, in der die dritte Trommel die gestoßenen, zugeschnittenen vorderen und hinteren Enden berührt, um sie miteinander zu verbinden, umfaßt.

20. Vorrichtung nach Anspruch 18, der ferner eine Zahnscheibe (186), die zur synchronen Drehung mit der ersten Trommel angeordnet ist, einen drehbar angeordneten Messerträgerblock (184), Federn (176), deren Vorspannung als Sperre gegen das Drehen des Trägerblocks in Drehrichtung der Zahnscheibe wirkt, an dem Trägerblock angeordnete Klauen (230) für den Eingriff in die Zahnscheibe, die bewirken, daß der Trägerblock sich in der Drehrichtung der Zahnscheibe gegen den Widerstand der Feder dreht, wobei die Eintaucheinrichtung eine Einrichtung (192) umfaßt, die gleitbar am Trägerblock montiert ist zur Befestigung der Schneideklinge nahe der Peripherie der ersten Trommel, sowie einen Daumen (210) für das Verschieben der die Schneideklinge tragenden Einrichtung, die bewirkt, daß die Klinge in den Schlitz eindringt, um die Streifen zu schneiden, und ferner eine Einrichtung (264) für das Herausheben der Klauen aus dem Eingriff in die Zahnscheibe jeweils nach dem Abschneiden des Streifens umfaßt, wodurch es dem Trägerblock ermöglicht wird, sich unter dem Einfluß

der Feder gegenzudrehen, bis die Klaue wieder in die Zahnscheibe eingreift und den Trägerblock in Stellung bringt für den Beginn des Schneidens des nächsten Streifens.

21. Vorrichtung nach Anspruch 20, wobei der Meserträgerblock koaxial zur Zahnscheibe angebracht ist. 5
22. Vorrichtung nach Anspruch 20, der ferner eine Einrichtung umfaßt, die bewirkt, daß die Bahn bevorzugt eher an der ersten Trommel als an der zweiten Trommel haftet. 10
23. Verfahren, das die Schritte umfaßt: Bereitstellen einer ersten Quelle (12) einer Bahn unbestimmter Länge, Bereitstellen einer zweiten Quelle (18) einer Bahn unbestimmter Länge, Bereitstellen einer ersten Eingangsplatine (38), die eine erste Hinterkante (84) aufweist, Bereitstellen einer zweiten Eingangsplatine (36), die eine zweite Hinterkante (82) aufweist, Bereitstellen einer Arbeitsplatine (100), die gegenüber der ersten Eingangsplatine angeordnet ist, Führen der von der ersten Quelle ankommenden Bahn über die erste Eingangsplatine und die Arbeitsplatine, Anhalten des Laufes der Bahn dieser ersten Quelle, gekennzeichnet durch: Positionierung der zweiten Hinterkante parallel zur ersten Hinterkante, Positionierung der von der zweiten Quelle ankommenden Bahn auf der zweiten Eingangsplatine, wobei das Ende der Bahn über die zweite Hinterkante hinausragt, Zuschneiden der beiden Bahnen von der ersten und der zweiten Quelle an den Hinterkanten unter Beibehaltung der Stellungen der Eingangsplatine und der Arbeitsplatine, um als Ergebnis dieses Schneidevorgangs ein hinteres Ende der ersten Quelle auf der Arbeitsplatine und ein vorderes Ende der zweiten Quelle auf der zweiten Eingangsplatine zu erzeugen, und anschließend an das Zuschneiden der beiden Bahnen ein relatives Verschieben der Arbeitsplatine und der ersten und zweiten Eingangsplatine, um das hinteren Endes mit dem vorderen Ende zu Stoßen. 15 20 25 30 35 40 45
24. Verfahren nach Anspruch 23, ferner gekennzeichnet durch den Schritt: Zusammenfügens des hinteren Endes mit dem vorderen Ende, um den Verbindungsvorgang zu vollenden. 50
25. Verfahren nach Anspruch 24, wobei der Verbindungsschritt die Schritte umfaßt:
Bereitstellung einer Quelle Klebebandes von unbestimmter Länge, wobei das Band wenigstens eine klebrige Seite aufweist;
Bereitstellung einer ersten drehbaren

Trommel;

Abziehen einer Bahn dieses Bandes von der Quelle durch Drehung der ersten Trommel, wobei die klebrige Seite die erste Trommel berührt;

Schneiden der Bahn zur Bereitstellung eines Streifens von vorherbestimmter Länge auf der ersten Trommel, während die Bahn von der ersten Trommel gezogen wird

Bereitstellung einer zweiten drehbaren Trommel;

Überwindung der Haftung der Streifen an der ersten Trommel und hierdurch Abziehen des Streifens von der ersten Trommel durch Drehung der zweiten Trommel in der Nähe der ersten Trommel, wobei die klebrige Seite die zweite Trommel berührt;

Bereitstellung einer drehbaren Unterdrucktrommel;

Abziehen der Streifen von der zweiten Trommel durch Drehen der Unterdrucktrommel in der Nähe der zweiten Trommel, wobei die klebrige Seite von der Unterdrucktrommel abgewandt ist; und

Abrücken der Unterdrucktrommel von der zweiten Trommel und Rollen der Unterdrucktrommel über das gestoßene hintere Ende und vordere Ende, um den Streifen darauf aufzubringen, um den Verbindungsvorgang abzuschließen.

Revendications

1. Appareil du type qui comprend une première réserve (12) d'une bande de longueur indéterminée, une seconde réserve (18) d'une bande de longueur indéterminée, un premier plateau d'entrée (38) destiné à supporter la bande provenant de la première réserve, le premier plateau ayant un premier bord arrière (84), un second plateau d'entrée (36) destiné à supporter la bande de la seconde réserve, le second plateau ayant un second bord arrière (82), un dispositif (112-120) d'arrêt sélectif du déplacement de la bande de la première et de la seconde réserve sur le premier et le second plateau, un plateau de traitement (100) placé en face des bords arrière, un dispositif (86-96) de déplacement relatif des plateaux entre une première position dans laquelle le plateau de traitement reçoit la bande du premier plateau et une seconde position dans laquelle le plateau de traitement reçoit la bande du second plateau, caractérisé en ce que :
le second bord arrière est parallèle au premier bord arrière, et
un dispositif (50-80), pouvant fonctionner dans chacune des première et seconde posi-

tions, est destiné à couper, aux bords arrière, la bande provenant de la première et de la seconde réserve respectivement devant le premier et le second bord arrière,

si bien qu'une extrémité avant cisailée de la bande de l'un des premier et second plateaux peut être mise en alternance en butée contre une extrémité arrière cisailée de la bande se trouvant sur le plateau de traitement lorsque le dispositif de déplacement assure un déplacement des plateaux entre la première et la seconde position après la manoeuvre du dispositif de coupe.

2. Appareil selon la revendication 1, caractérisé en outre en ce que les plateaux d'entrée et le plateau de traitement comportent chacun une plaque perforée de support (44), un dispositif (46, 48) d'application de "vide" à la plaque de support afin que les bandes soient maintenues pendant leur coupe et d'application d'air comprimé à chaque plaque de support de manière que les bandes soient supportées lors du déplacement des bandes sur les plateaux.

3. Appareil selon la revendication 1 ou 2, dans lequel les plateaux d'entrée et le plateau de traitement sont disposés dans des plans parallèles.

4. Appareil selon l'une quelconque des revendications précédentes, caractérisé en outre par :
un premier plateau (98) d'extrémité cisailée placé d'un côté du plateau de traitement, et

un second plateau (102) d'extrémité cisailée placé du côté opposé du plateau de traitement par rapport au premier plateau d'extrémité cisailée, et en ce que

le dispositif de déplacement provoque aussi le déplacement relatif des plateaux d'extrémité cisailée et du premier et du second plateau afin que, dans la première position, le premier plateau d'extrémité cisailée ait une position lui permettant de recevoir la bande du second plateau et, dans la seconde position, le second plateau d'extrémité cisailée ait une position lui permettant de recevoir la bande du premier plateau.

5. Appareil selon la revendication 4, dans lequel les bandes ont des perforations latérales et caractérisé en outre par des ergots de positionnement (108, 110) placés sur les plateaux d'extrémité cisailée et destinés à coopérer avec les perforations de manière que les extrémités avant soient positionnées et permettent le cisaillement par le dispositif de coupe.

6. Appareil selon l'une des revendications précédentes, dans lequel les bandes ont des perforations latérales et caractérisé en outre en ce que le dispositif d'arrêt comprend un dispositif destiné à assurer le positionnement des perforations d'une bande de l'une des réserves et des perforations d'une bande de l'autre des réserves.

7. Appareil selon la revendication 6, dans lequel le dispositif destiné à assurer le positionnement comprend un premier pignon de positionnement placé entre le premier plateau d'entrée et la première réserve, un second pignon de positionnement placé entre le second plateau d'entrée et la seconde réserve, et un dispositif de freinage des pignons lorsque les perforations sont positionnées mutuellement.

8. Appareil selon la revendication 7, dans lequel le dispositif de freinage comporte une première roue à rochet fixée au premier pignon de positionnement, une seconde roue à rochet fixée au second pignon de positionnement, un premier dispositif à cliquet et organe de manoeuvre destiné à coopérer avec la première roue à rochet, et un second dispositif à cliquet et organe de manoeuvre destiné à coopérer avec la seconde roue à rochet.

9. Appareil selon l'une des revendications précédentes, dans lequel le dispositif de coupe comporte deux lames destinées à être en contact pratiquement simultanément avec les bandes au niveau du premier et du second bord arrière.

10. Appareil selon l'une quelconque des revendications précédentes, dans lequel le premier et le second plateau sont fixes et le dispositif de déplacement provoque le déplacement du plateau de traitement entre la première et la seconde position.

11. Appareil selon l'une quelconque des revendications précédentes, caractérisé en outre par :
un dispositif (128, 290) destiné à appliquer un morceau de ruban (292) sur les extrémités arrière et avant cisailées placées en butée afin qu'elles soient raccordées l'une à l'autre.

12. Appareil selon la revendication 11, dans lequel le dispositif d'application d'un morceau de ruban comprend :

une réserve (242) d'un ruban adhésif de longueur indéterminée, le ruban ayant au moins une face adhésive,

un premier dispositif à tambour rotatif

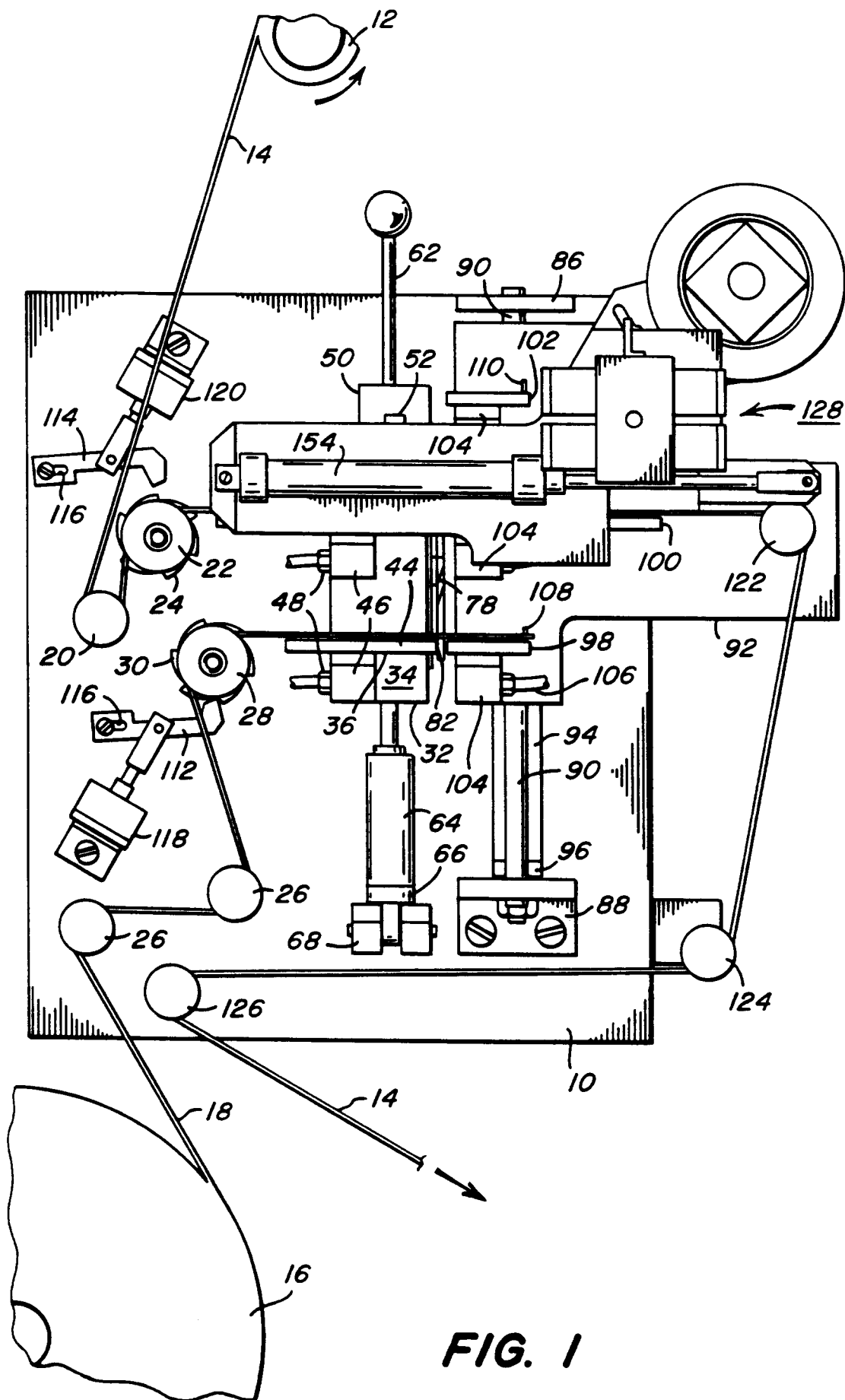
- (188) destiné à tirer une bande (244) du ruban de la réserve avec le face adhésive au contact du premier dispositif à tambour,
- un dispositif (189, 200) destiné à couper la bande en morceaux de longueur prédéterminée sur le premier dispositif à tambour alors que cette bande est tirée par le premier dispositif à tambour,
- un second dispositif à tambour rotatif (172) destiné à appliquer une force supérieure à la force d'adhérence des morceaux de ruban au premier dispositif à tambour et à retirer ainsi ces morceaux successivement du premier dispositif à tambour avec le côté adhésif au contact du second dispositif à tambour,
- un troisième dispositif à tambour rotatif (130) destiné à retirer les morceaux du second dispositif à tambour, la face adhésive étant tournée du côté opposé au troisième dispositif à tambour, et
- un dispositif (154-160, 268-290) destiné à écarter le troisième dispositif à tambour du second dispositif à tambour par déplacement en translation et à faire rouler le troisième dispositif à tambour le long des extrémités avant et arrière cisaillées en butée de manière que les morceaux de ruban soient appliqués et que les extrémités cisaillées soient raccordées mutuellement.
13. Appareil selon la revendication 12, dans lequel le premier dispositif à tambour comprend un premier ensemble de disques circulaires montés afin qu'ils tournent sur un premier arbre (146), et le second dispositif à tambour comprend un second ensemble de disques circulaires montés afin qu'ils tournent sur un second arbre (170), les bords des disques du premier ensemble étant imbriqués dans ceux du second ensemble, si bien que les morceaux de ruban tirés par les disques du premier dispositif à tambour sont retirés par les disques imbriqués du second dispositif à tambour.
14. Appareil selon la revendication 12, ou 13, comprenant en outre un dispositif (260, 262) destiné à provoquer préférentiellement l'adhérence de la bande au premier dispositif à tambour, par rapport au second dispositif à tambour.
15. Appareil selon la revendication 14, dans lequel le dispositif destiné à provoquer l'adhérence comprend des moletages ayant des plats périphériques sur les disques du premier dispositif à tambour et des moletages ayant des arêtes périphériques sur les disques du second dispositif à tambour.
16. Appareil selon la revendication 14, dans lequel le dispositif destiné à provoquer l'adhérence comprend un rouleau (246) rappelé par un ressort et repoussant les morceaux de ruban contre le premier dispositif à tambour.
17. Appareil selon la revendication 13, dans lequel la face des morceaux de ruban portant l'adhésif est au contact des surfaces périphériques d'une partie au moins des disques du premier et du second dispositif à tambour, et la face opposée des morceaux de ruban est au contact de la surface périphérique du troisième dispositif à tambour.
18. Appareil selon l'une des revendications 13 à 17, dans lequel le dispositif de coupe comprend au moins une fente (189) partant des surfaces périphériques des disques du premier dispositif à tambour vers le premier arbre, au moins une lame de coupe (200), et un dispositif (190-240) destiné à faire pénétrer la lame dans ladite fente au moins de manière que les morceaux de ruban soient formés lorsque le premier dispositif à tambour tourne.
19. Appareil selon l'une des revendications 12 à 18, dans lequel le dispositif se déplaçant en translation comporte un chariot (160) pour le troisième dispositif à tambour, un dispositif (154-158) de déplacement du chariot en translation par rapport au second dispositif à tambour, et un dispositif (270-290) de guidage du chariot pendant son déplacement entre une position dans laquelle le troisième dispositif à tambour tourne très près du second dispositif à tambour afin qu'il reçoive les morceaux de ruban et une position dans laquelle le troisième dispositif à tambour est au contact des extrémités arrière et avant cisaillées en butée de manière que celles-ci soient raccordées mutuellement.
20. Appareil selon la revendication 18, comprenant en outre une roue à rochet (186) montée afin qu'elle tourne en synchronisme avec le premier dispositif à tambour, un bloc (184) de support de couteau monté afin qu'il tourne, un dispositif (176) à ressort destiné à rappeler le bloc de support afin qu'il ne tourne pas dans le sens de rotation de la roue à rochet, un dispositif à cliquet (230) monté sur le bloc de support et destiné à coopérer avec la roue à rochet afin que le bloc de support tourne dans le sens de la roue à rochet malgré la force de rappel du dispositif à ressort, et dans lequel le dispositif destiné à faire pénétrer la lame comprend un dispositif (192) monté afin qu'il puis-

se coulisser sur le bloc de support de manière que la lame de coupe soit supportée près de la périphérie du premier dispositif à tambour, et un dispositif à came (210) destiné à déplacer le dispositif de support de la lame de coupe afin que celle-ci pénètre dans la fente et découpe les morceaux de ruban, l'appareil comprenant en outre un dispositif (264) de soulèvement du dispositif à cliquet afin qu'il le sépare de la roue à rochet après que le morceau de ruban a été coupé, et que le bloc de support puisse tourner en sens inverse sous l'action du dispositif à ressort jusqu'à ce que le cliquet revienne en coopération avec la roue à rochet et arrête le bloc de support en position de début de coupe du morceau suivant de ruban.

21. Appareil selon la revendication 20, dans lequel le bloc de support de couteau est monté coaxialement à la roue à rochet.
22. Appareil selon la revendication 20, comprenant en outre un dispositif destiné à provoquer l'adhérence préférentielle de la bande au premier dispositif à tambour, par rapport au second dispositif à tambour.
23. Procédé comprenant les étapes suivantes : la disposition d'une première réserve (12) d'une bande de longueur indéterminée, la disposition d'une seconde réserve (18) d'une bande de longueur indéterminée, la disposition d'un premier plateau d'entrée (38) ayant un premier bord arrière (84), la disposition d'un second plateau d'entrée (36) ayant un second bord arrière (82), la disposition d'un plateau de traitement (100) placé en face du premier plateau d'entrée, le déplacement d'une bande de la première réserve sur le premier plateau d'entrée et le plateau de traitement, et l'arrêt du déplacement de la bande provenant de la première réserve, caractérisé par les étapes suivantes : le positionnement du second bord arrière parallèlement au premier bord arrière, le positionnement de la bande de la seconde réserve sur le second plateau d'entrée avec l'extrémité de la bande qui dépasse du second bord arrière, puis, avec maintien des positions des plateaux d'entrée et du plateau de traitement, la coupe aux bords arrière des deux bandes de la première et de la seconde réserve pour l'obtention, à la suite de l'opération de coupe, d'une extrémité arrière de la bande de la première réserve sur le plateau de traitement et d'une extrémité avant de la bande de la seconde réserve sur le second plateau d'entrée, et, après la coupe des deux bandes, le

déplacement relatif du plateau de traitement et des premier et second plateaux d'entrée afin que l'extrémité arrière soit mise en butée contre l'extrémité avant.

24. Procédé selon la revendication 23, caractérisé en outre par l'étape de raccordement de l'extrémité arrière à l'extrémité avant pour la réalisation de la collure.
25. Procédé selon la revendication 24, dans lequel l'étape de raccordement comprend les étapes suivantes :
la disposition d'une réserve de ruban adhésif de longueur indéterminée, le ruban ayant au moins une face adhésive,
la disposition d'un premier dispositif à tambour rotatif,
le tirage d'une bande du ruban de la réserve par entraînement en rotation du premier dispositif à tambour avec la face adhésive au contact du premier dispositif à tambour,
la coupe de la bande pour la formation d'un morceau de longueur prédéterminée sur le premier dispositif à tambour lorsque la bande est tirée par le premier dispositif à tambour,
la disposition d'un second dispositif à tambour rotatif,
l'application d'une force supérieure à la force d'adhérence des morceaux de ruban au premier dispositif à tambour avec enlèvement de cette manière du morceau de ruban du premier dispositif à tambour, par entraînement en rotation du second dispositif à tambour à proximité du premier dispositif à tambour, la face adhésive étant au contact du second dispositif à tambour,
la disposition d'un dispositif à tambour aspirant rotatif,
l'enlèvement du morceau de ruban du second dispositif à tambour par un entraînement en rotation du dispositif à tambour aspirant à proximité du second dispositif à tambour, la face adhésive étant tournée du côté opposé au dispositif à tambour aspirant, et
le déplacement en translation du dispositif à tambour aspirant afin qu'il s'écarte du second dispositif à tambour, et la rotation du dispositif à tambour aspirant sur l'extrémité arrière et l'extrémité avant qui sont en butée de manière que le morceau de ruban soit appliqué sur ces extrémités et forme la collure.



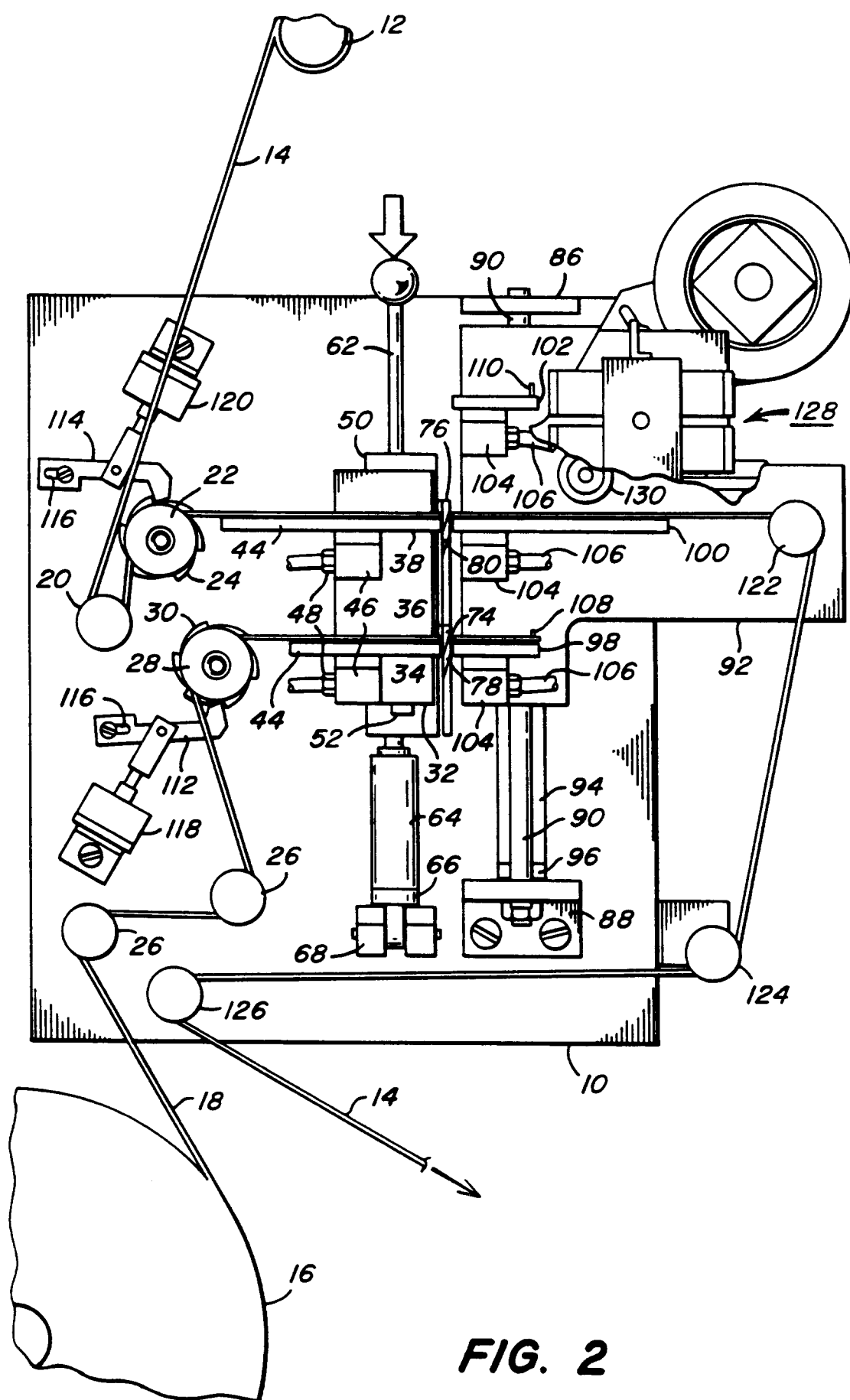


FIG. 2

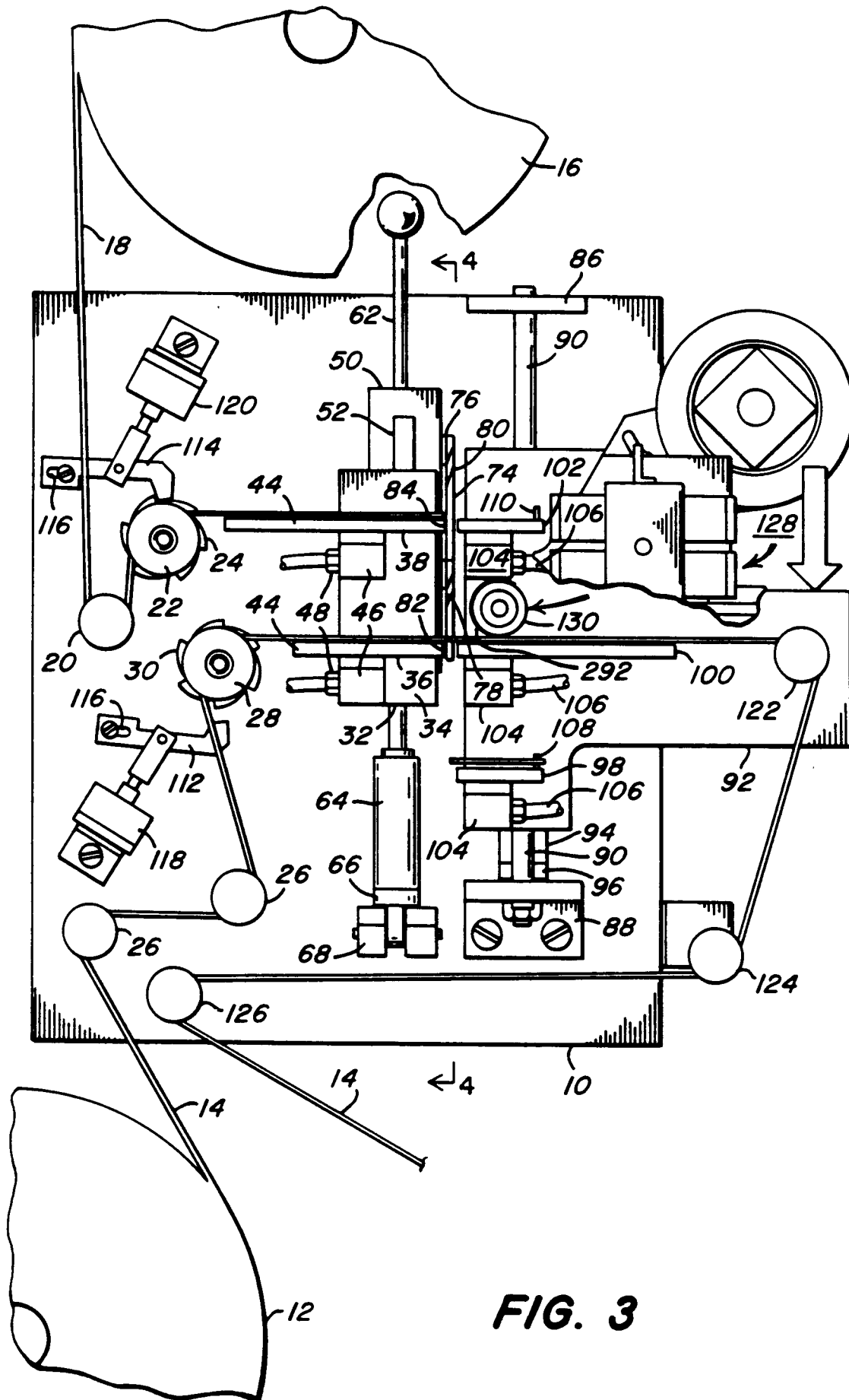


FIG. 3

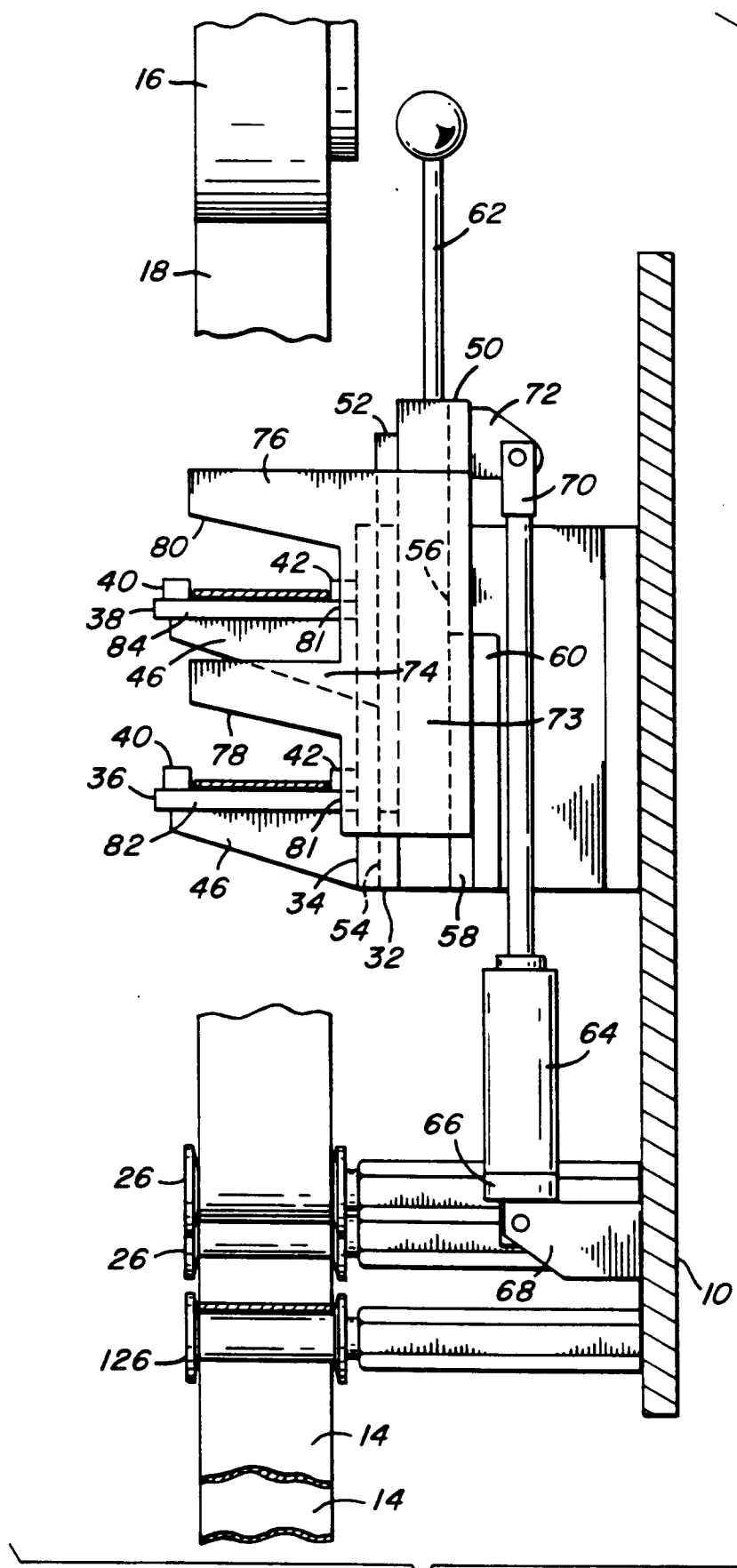
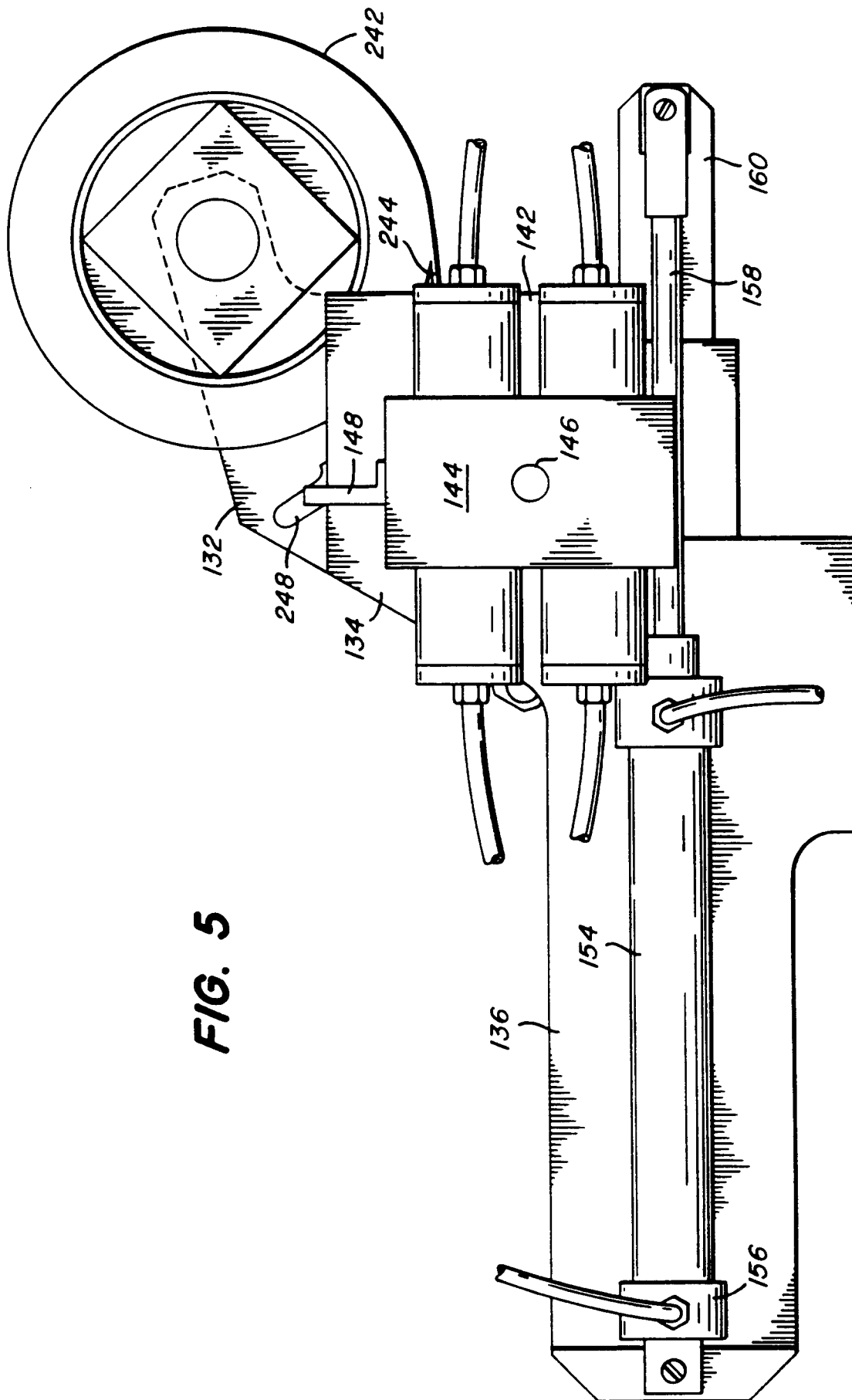


FIG. 4

FIG. 5



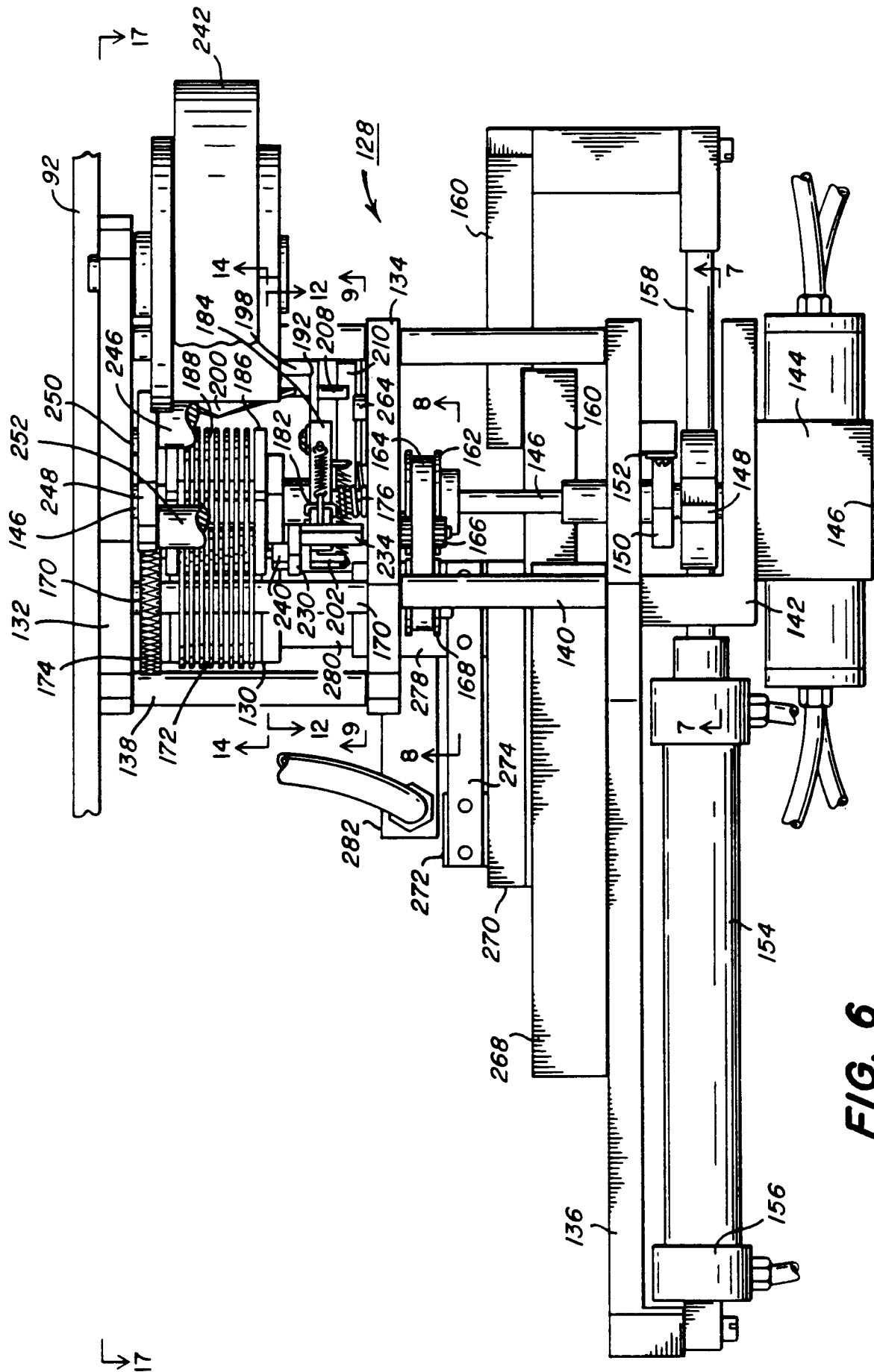


FIG. 6

FIG. 7

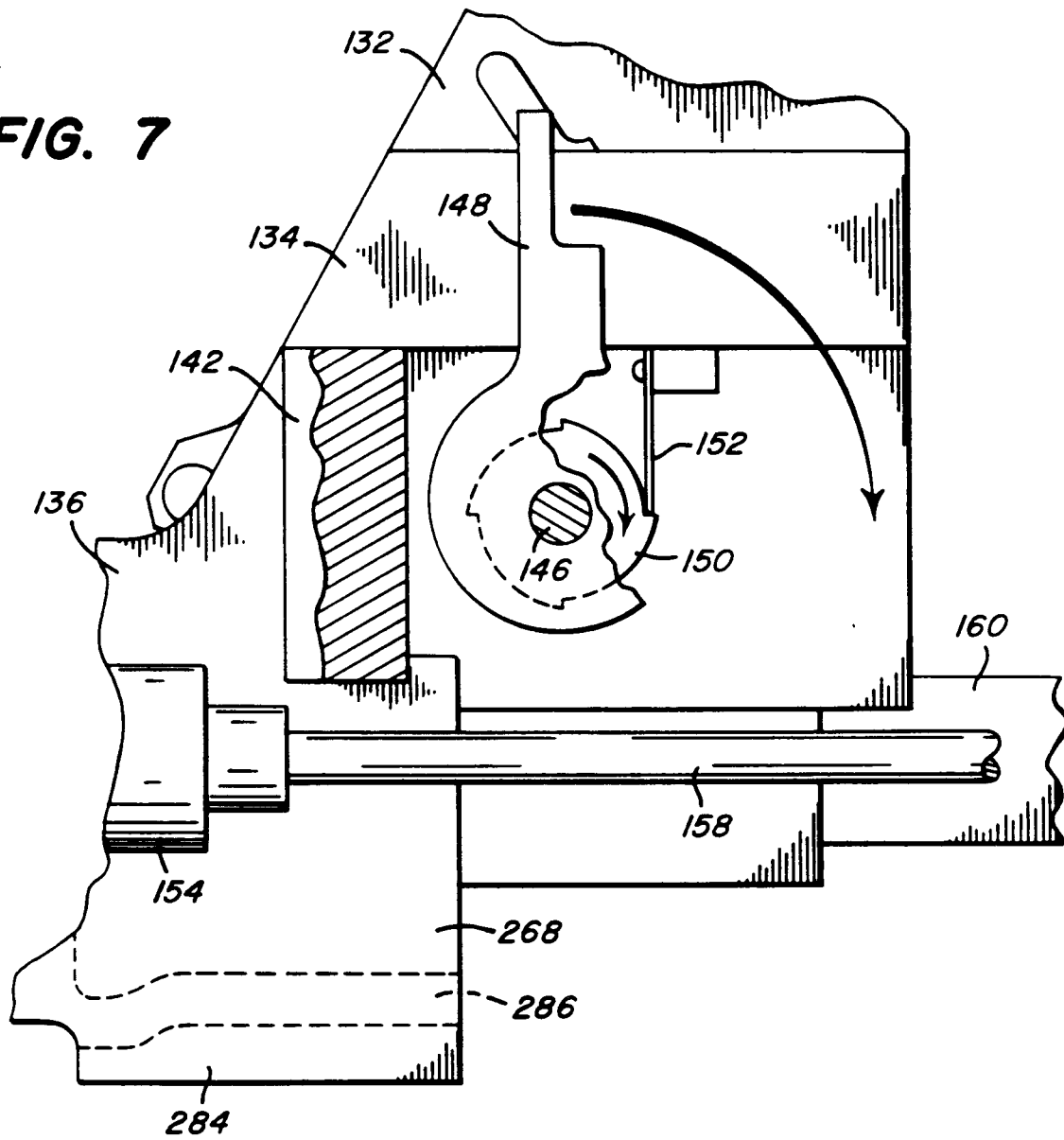
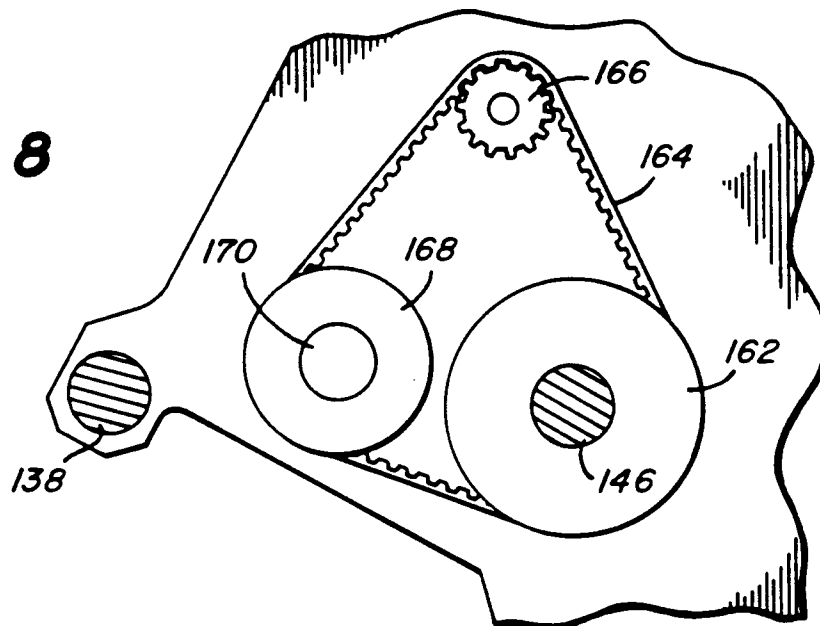


FIG. 8



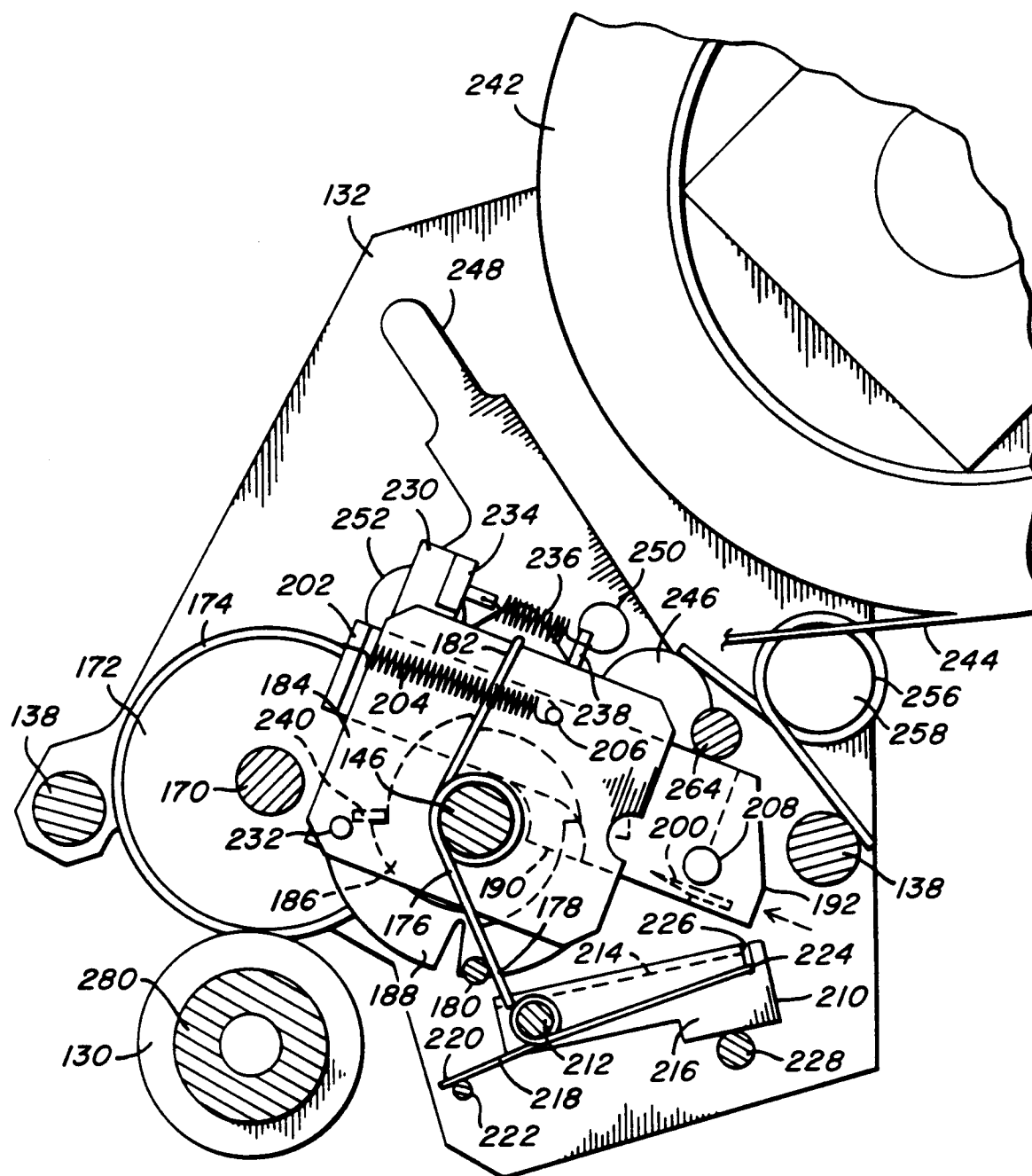


FIG. 9

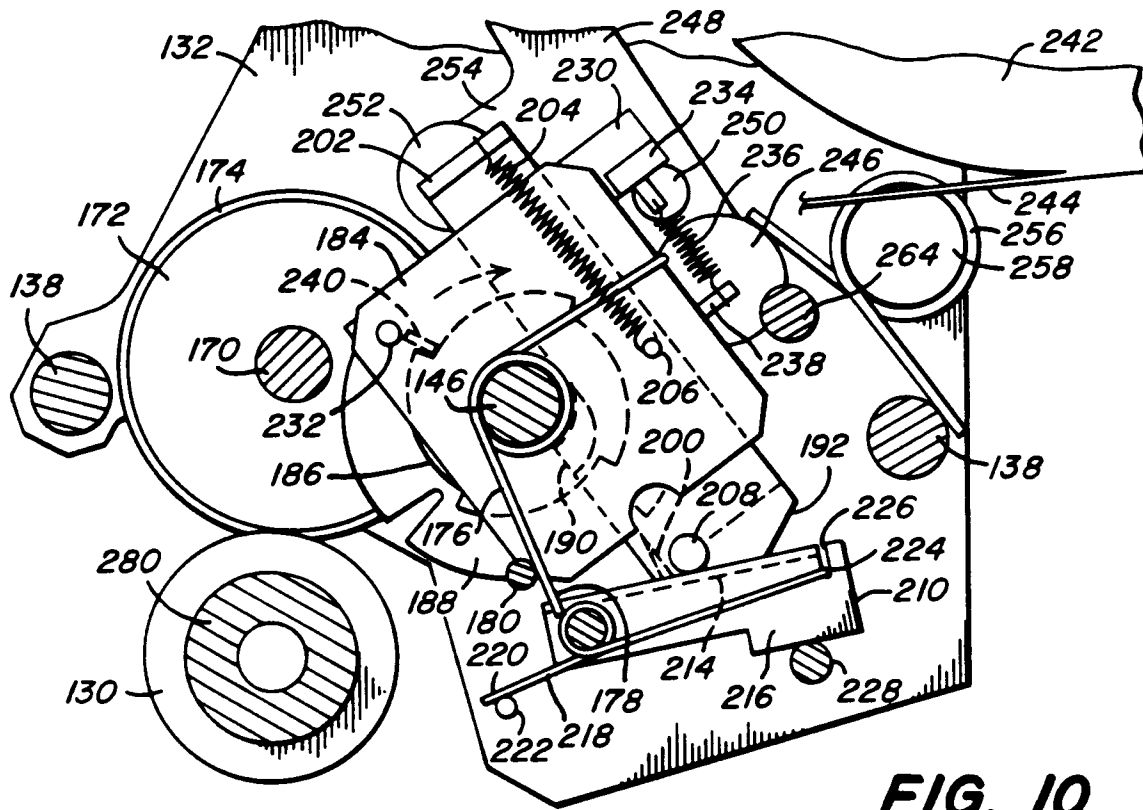


FIG. 10

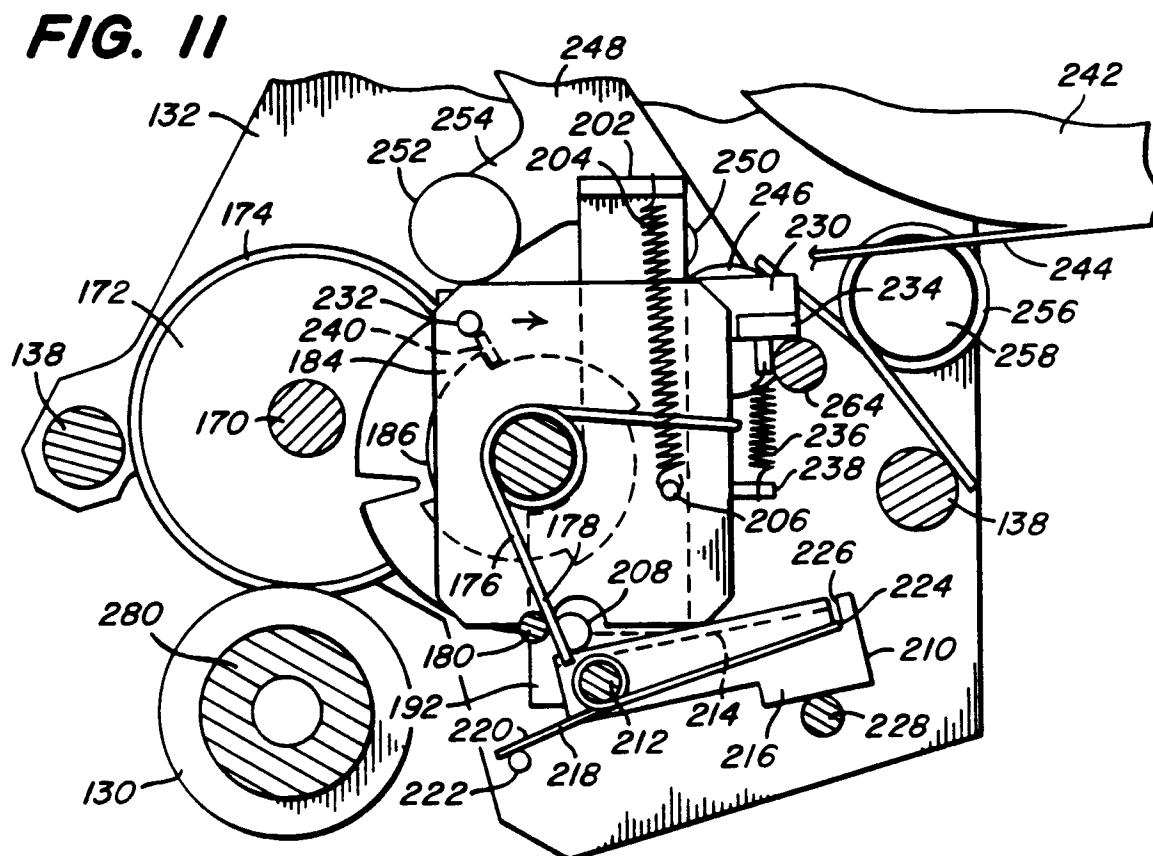


FIG. 11

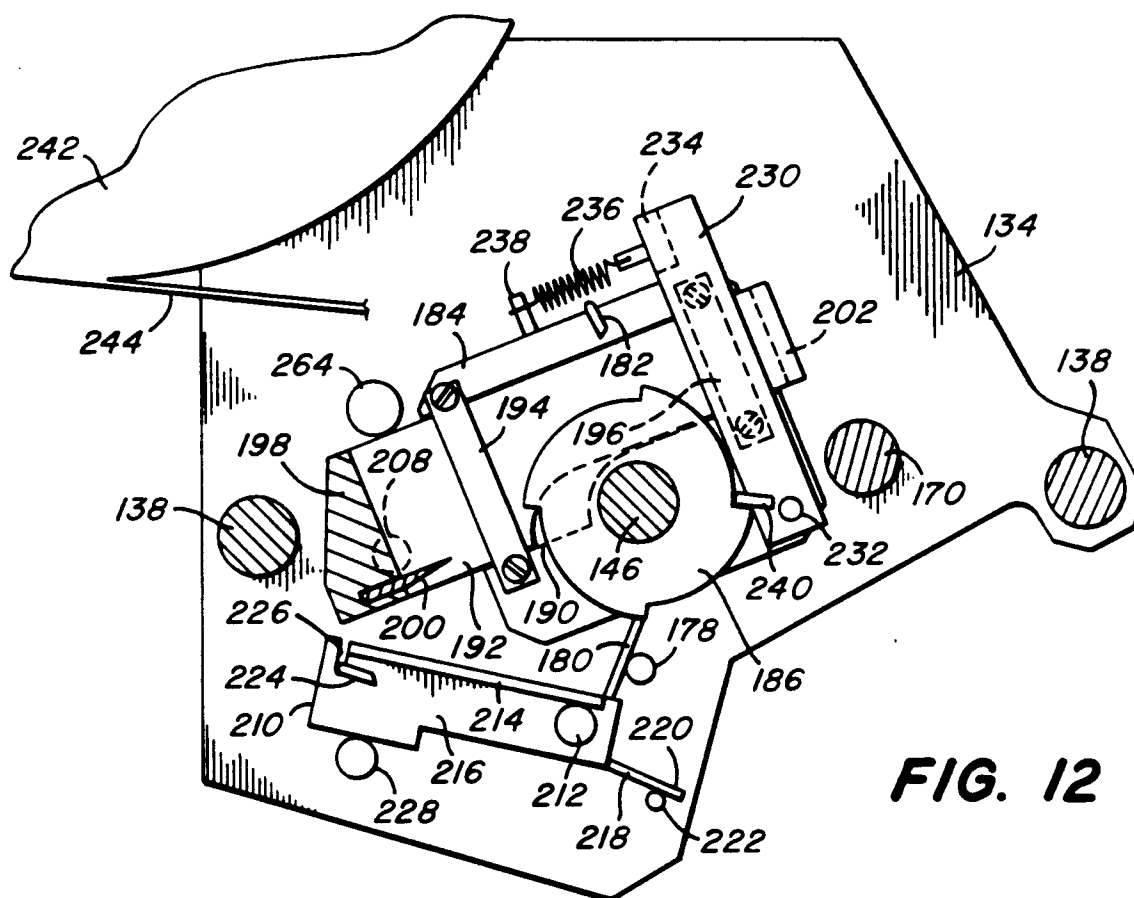


FIG. 12

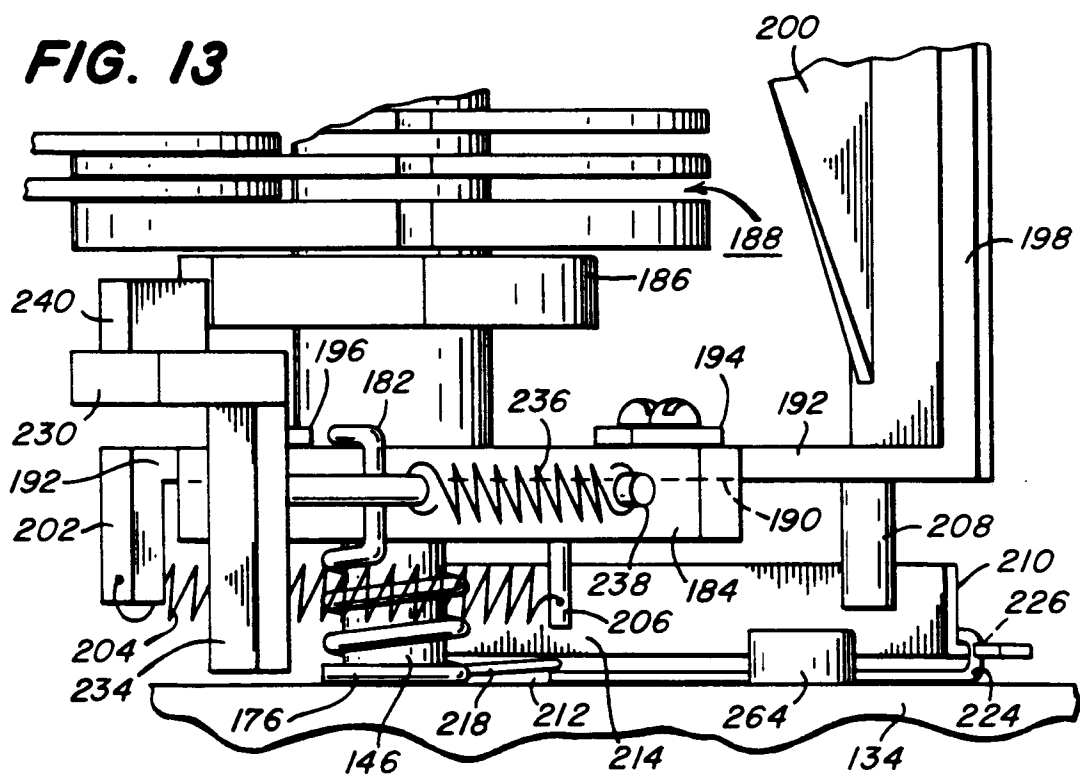
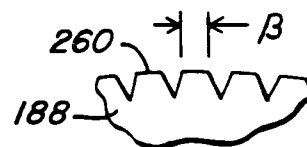
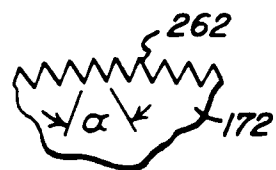
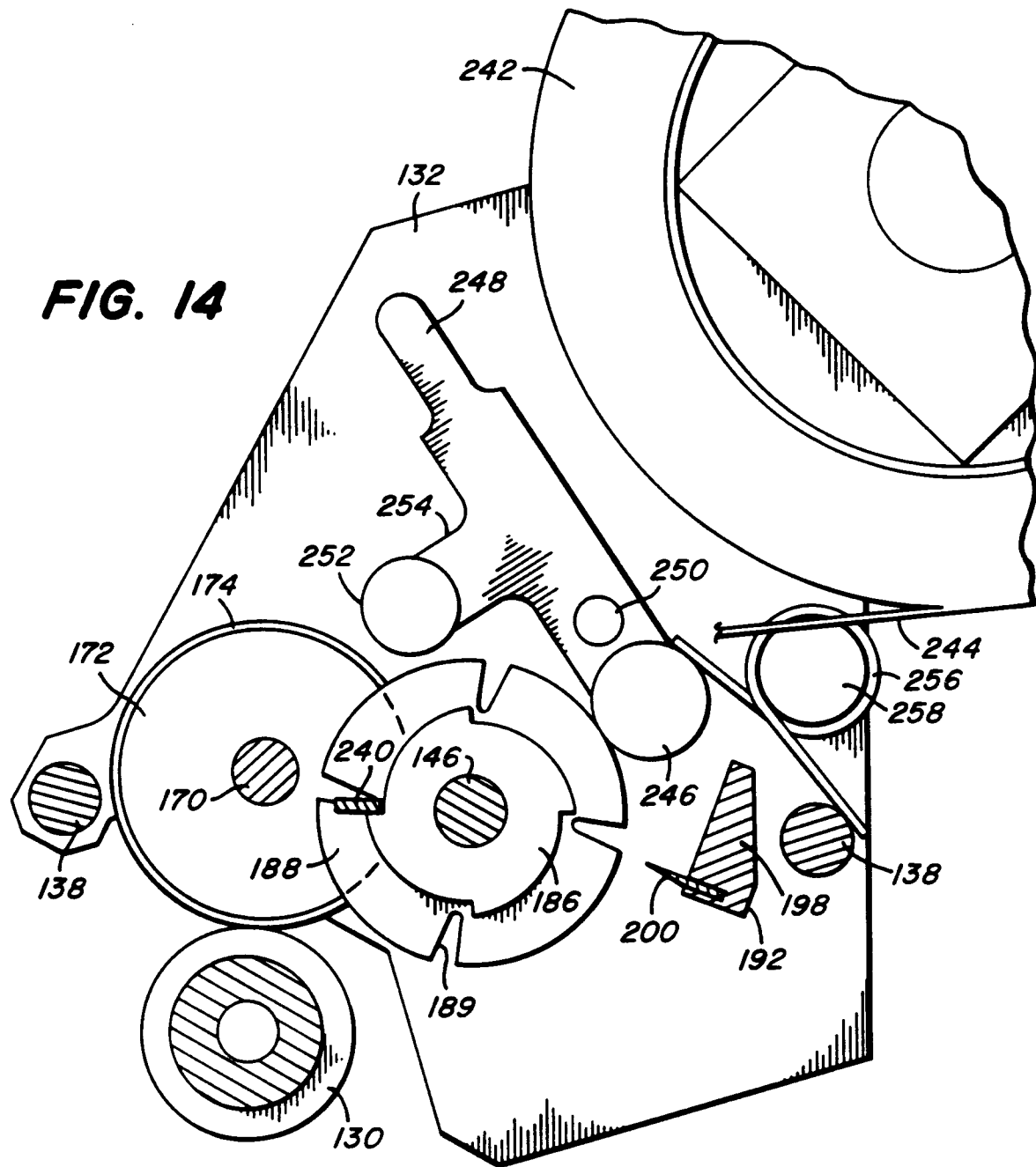


FIG. 13



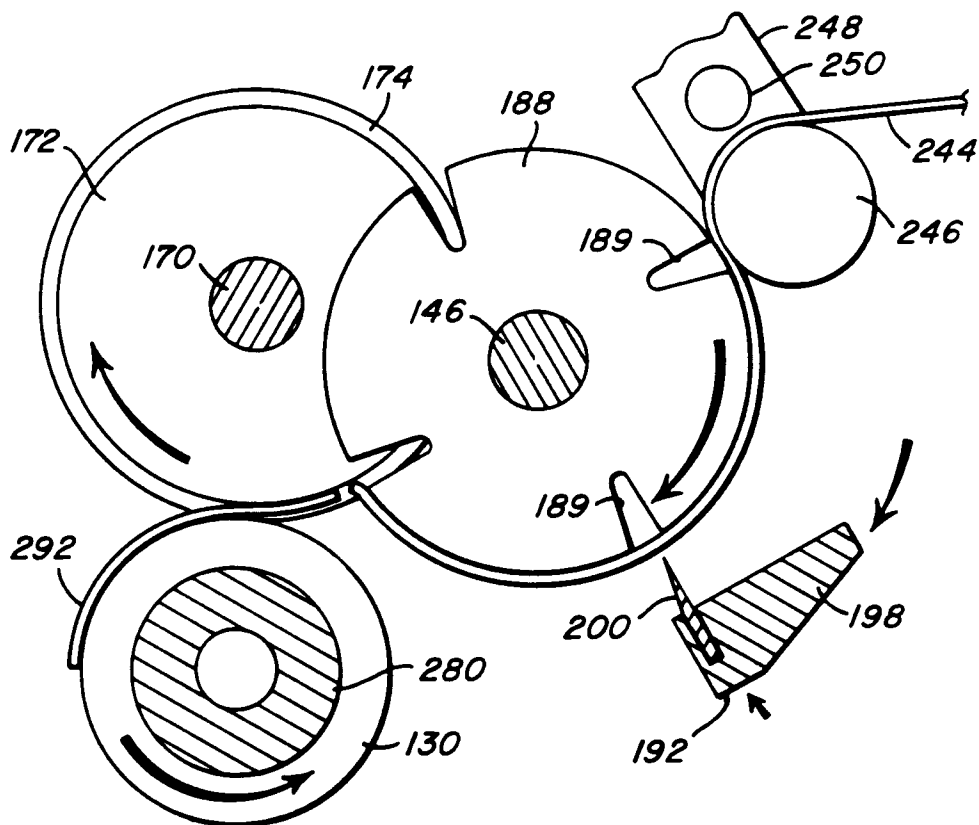


FIG. 15

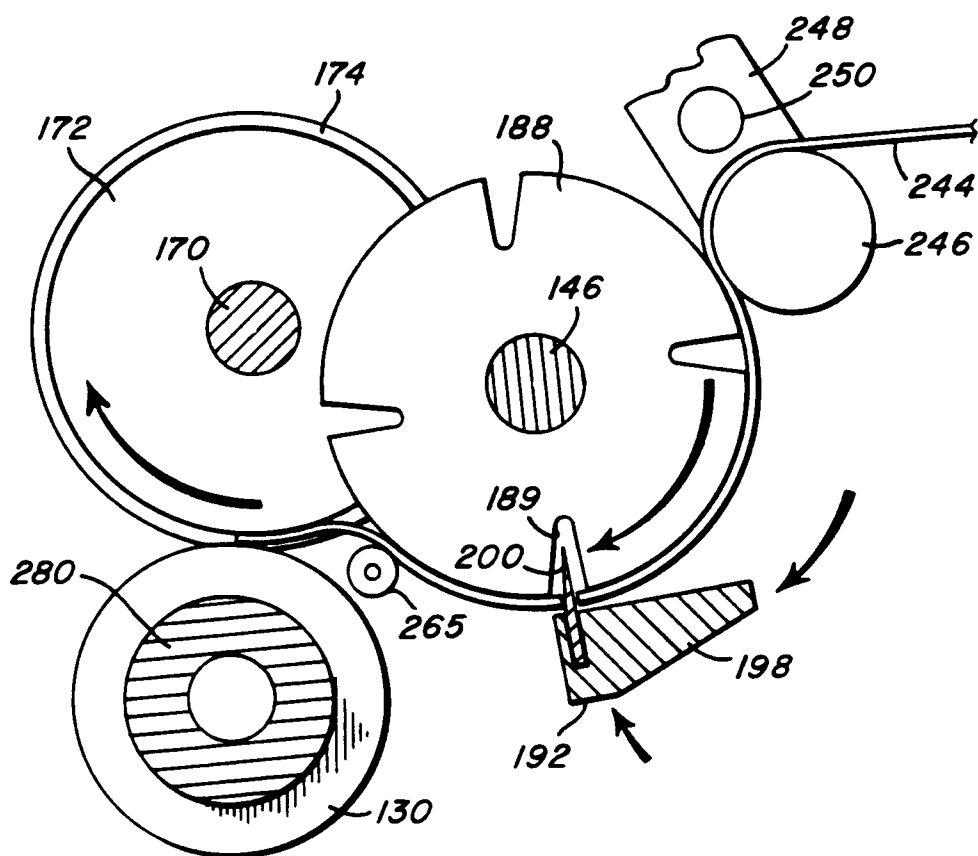


FIG. 16

FIG. 17

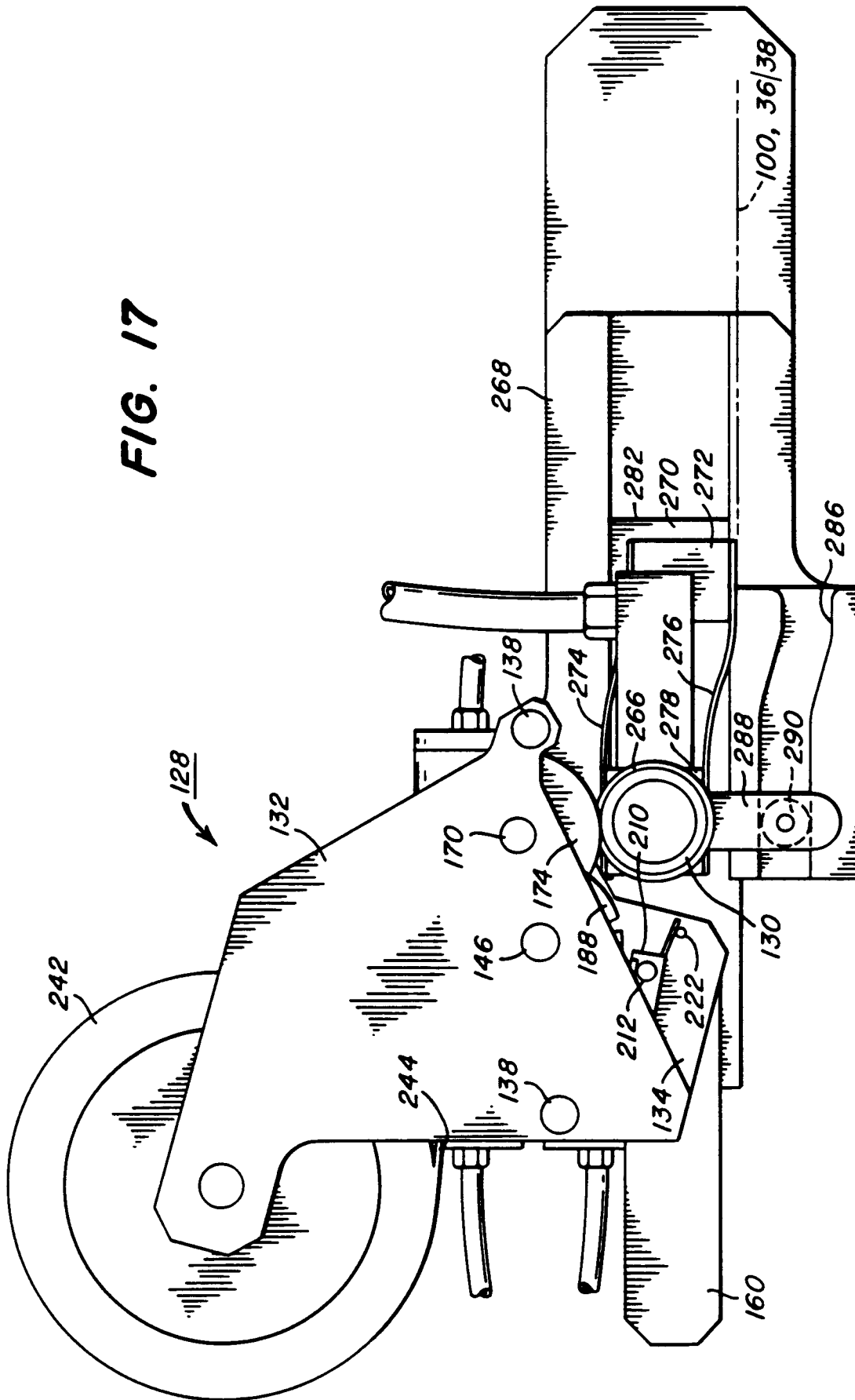


FIG. 18

