

Aug. 12, 1958

J. G. AGUILAR ET AL

2,846,835

BAND APPLYING DEVICE AND METHOD

Filed Nov. 14, 1955

5 Sheets-Sheet 1

FIG_1

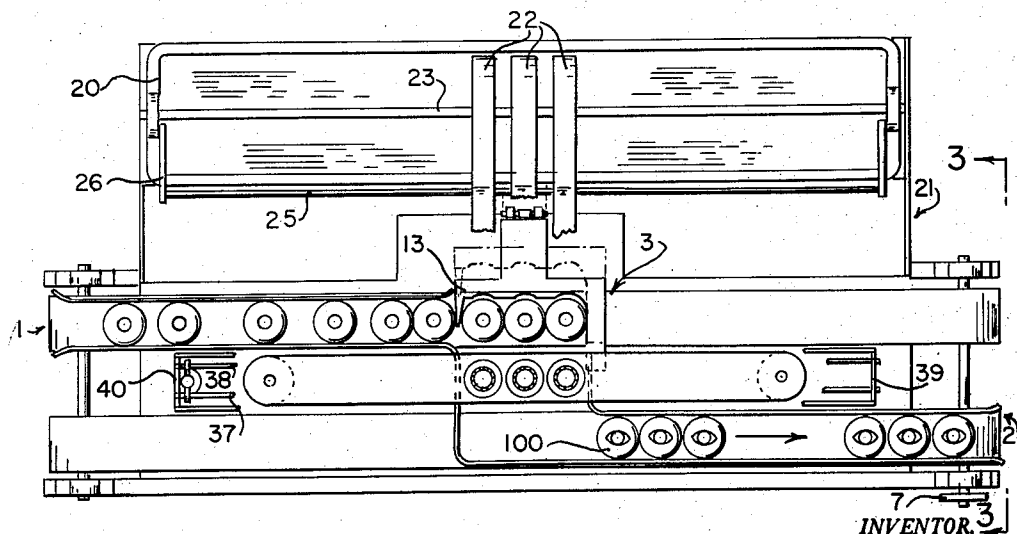
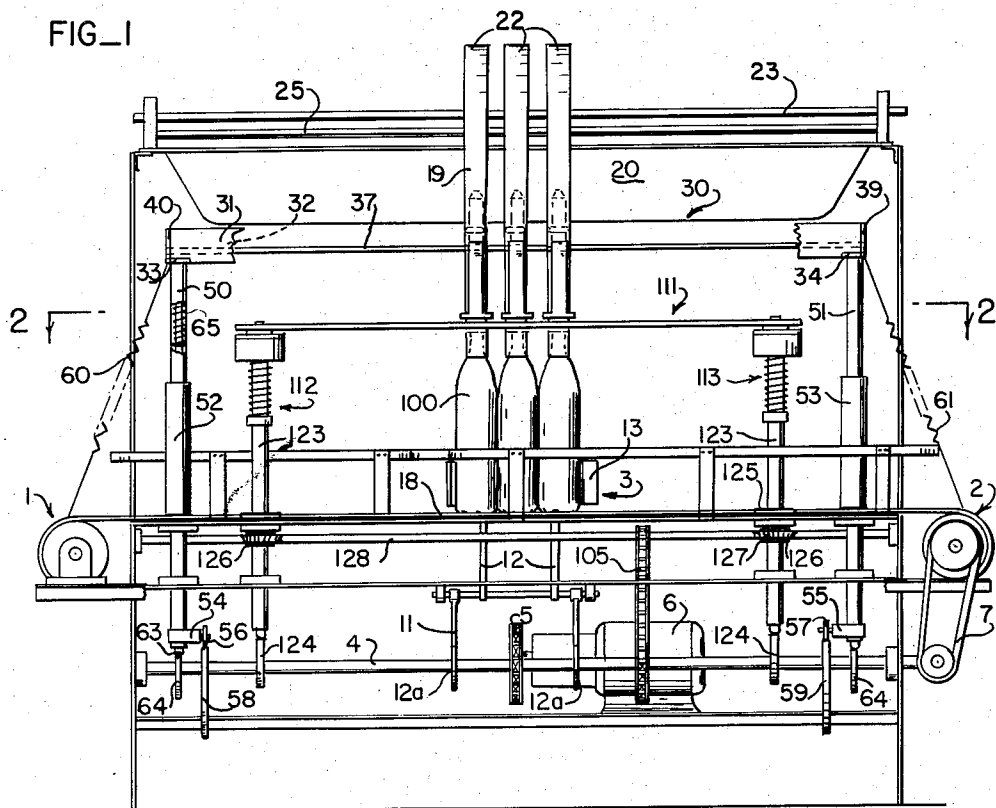


FIG_2

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5 Sheets-Sheet 2

FIG_3

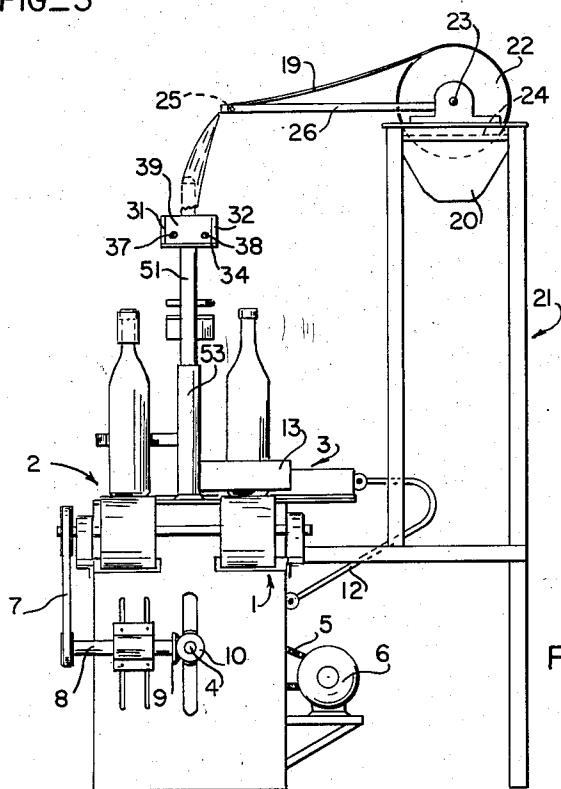


FIG_4

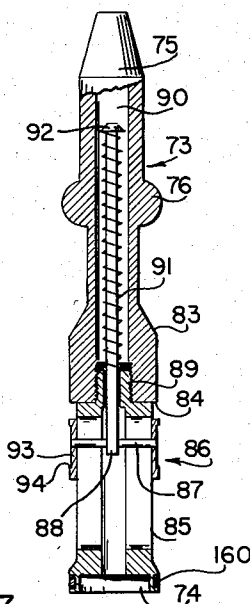


FIG_17

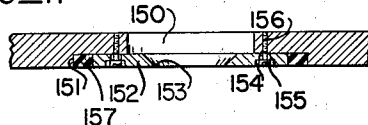


FIG_9

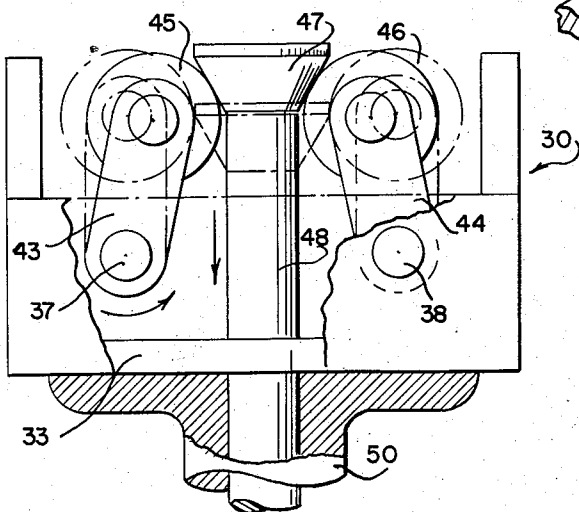


FIG_10

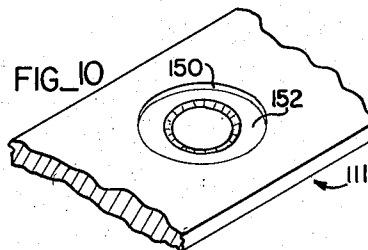
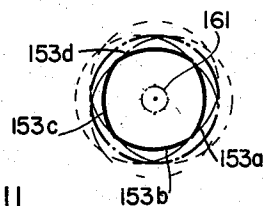


FIG_11



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5 Sheets-Sheet 3

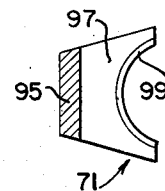
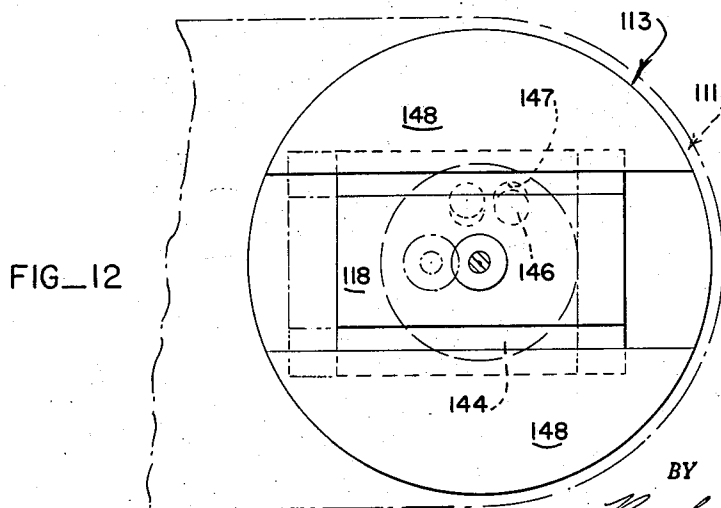
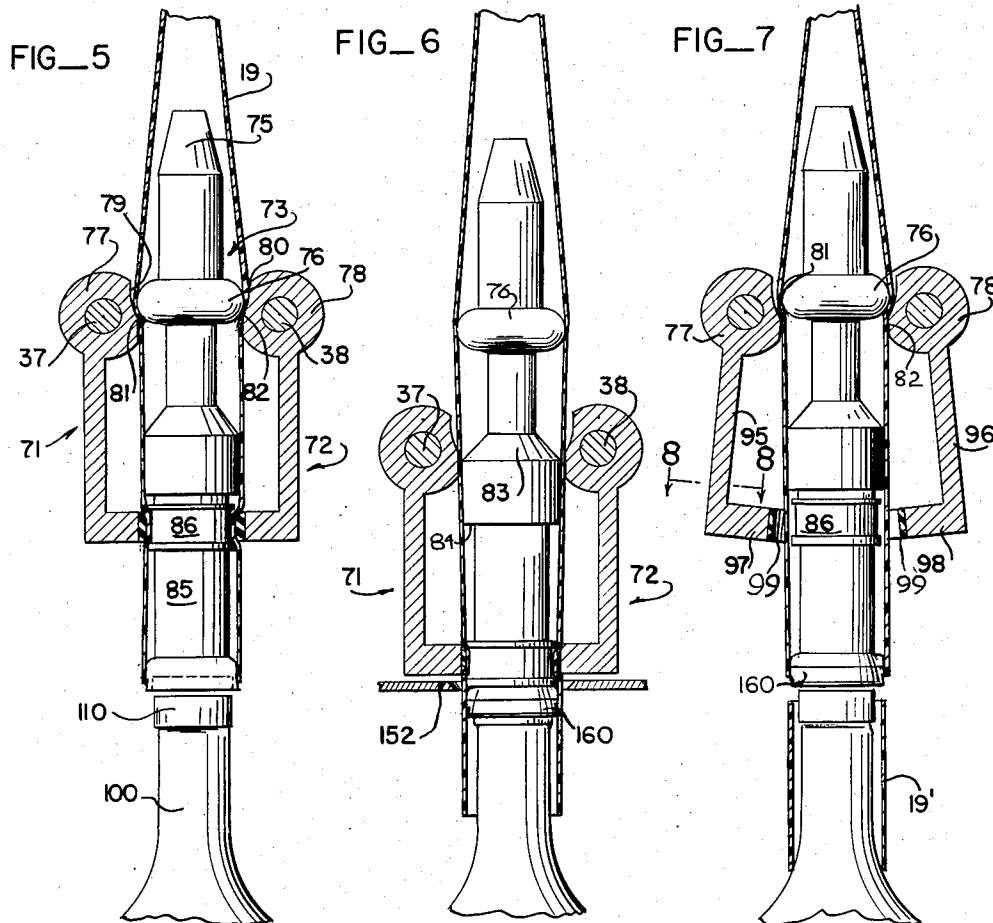


FIG_8

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2,846,835

BAND APPLYING DEVICE AND METHOD

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5 Sheets-Sheet 4

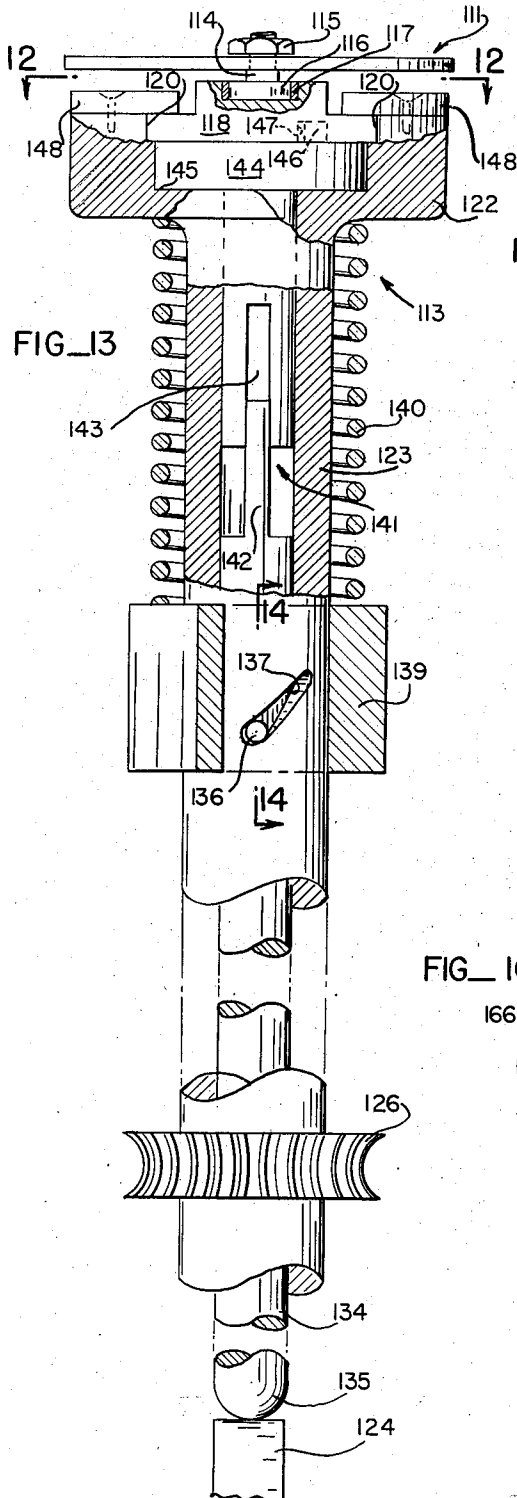


FIG. 14

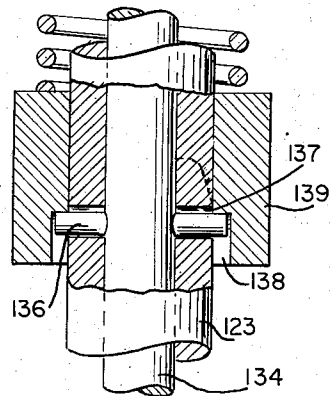


FIG. 15

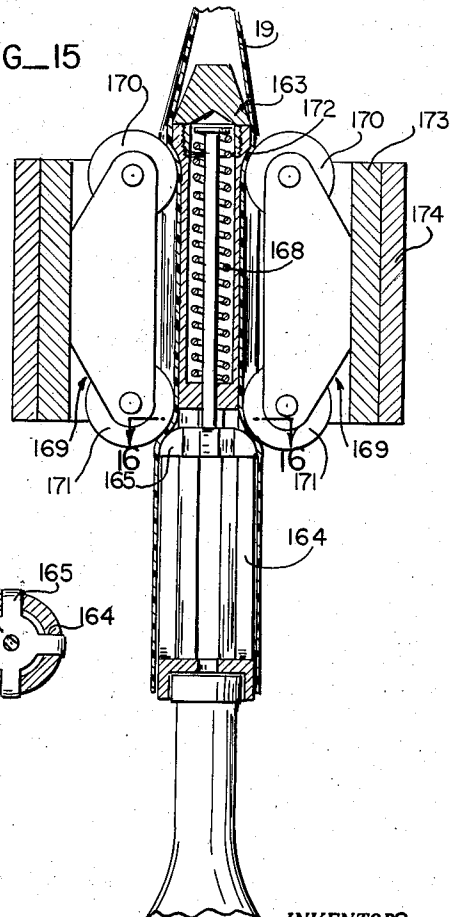
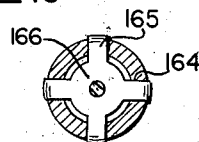


FIG. 16



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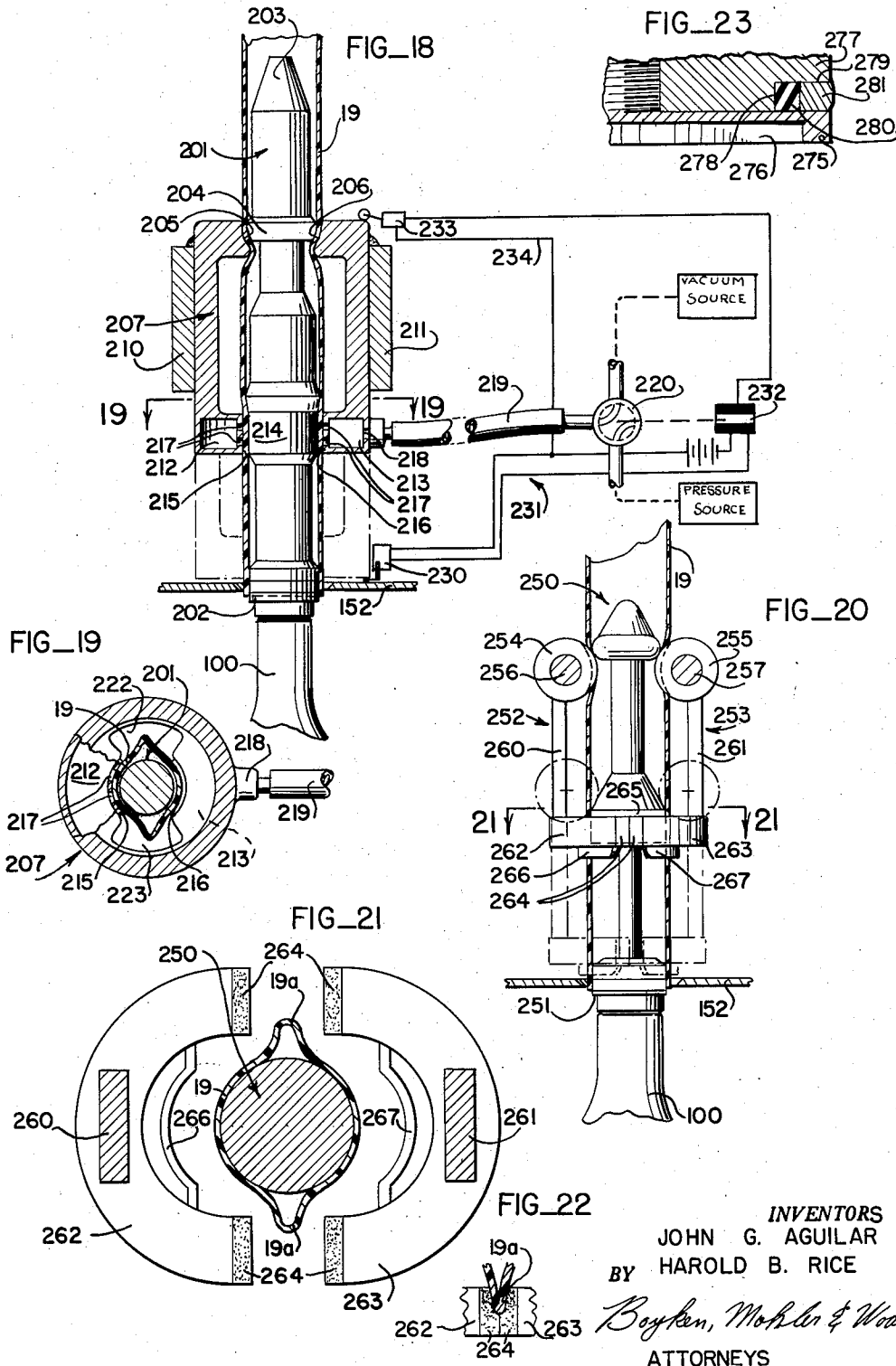
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5 Sheets-Sheet 5



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BAND APPLYING DEVICE AND METHOD

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Application November 14, 1955, Serial No. 546,332

15 Claims. (Cl. 53—291)

This application is a continuation-in-part of application, Serial No. 369,456, filed July 21, 1953, now Patent No. 2,765,607.

In the above noted patent, a method and apparatus were disclosed for applying tubular bands or sleeves to the necks of bottles for sealing the cap or cork of such bottles. In said patent, the preferred method of banding was shown, that is, by employing a flattened ribbon of material that is fed onto the bottle necks with a portion of the ribbon being then cut off to form the band. This improved method distinguishes from the previously attempted method of stacking cut bands in magazines and thereafter opening them and applying them to the bottles.

Said patent discloses an apparatus that includes a pair of feeding rollers for feeding the ribbon of banding material to the bottles. A somewhat similar device is shown in the Holstein Patent No. 2,623,673, dated December 30, 1952. Although the apparatus of Patent No. 2,765,607 is effective for the purpose shown, it is sometimes desirable to provide a more positive means for feeding the ribbon to insure that all bands applied to the bottles are of exactly the same length. For example, if the ribbon carries printed matter, it is desirable that the amount of material fed at each feeding interval be the same. In this same connection, it will be understood that the ribbon of banding material is kept wet at all times so as to retard shrinkage. Since the wet material is extremely slick, it is also desirable to grip the banding material as tightly as possible to effect the feeding without slippage.

The main object of the present invention is therefore to provide a method and apparatus for applying bands which incorporates improvements over prior methods and apparatus in the above noted respects.

Another object of the invention is the provision of a band applying apparatus that is extremely simple and inexpensive to build and foolproof in operation.

Still another object of the present invention is the provision of a novel method and apparatus for feeding tubular material of the type herein contemplated.

Another object of the invention is the provision of a novel method and apparatus for cutting tubular material of the type herein disclosed.

Another object of the invention is the provision of a banding machine for bottles and the like that is capable of operating at speeds in excess of the usual speeds of bottling lines.

Although the present invention will be described in connection with applying bands to bottles adjacent the upper end of the neck thereof, it will be understood that it is equally applicable to jars and other articles and may be employed to applying bands of any desired length. In fact by the teachings of the instant invention, the bands may be long enough to surround the entire article if such length is desired.

Other objects and advantages will be apparent from the following specification and from the drawings:

Fig. 1 is a front elevation of the apparatus of the pres-

2

ent invention showing the same in use with a conventional bottle conveyor.

Fig. 2 is a top plan view of the apparatus of Fig. 1.

Fig. 3 is an end elevation of the apparatus of Fig. 1.

Fig. 4 is an enlarged side elevation of the preferred form of feeding mandrel with portions thereof broken away and in section.

Figs. 5, 6, 7 are enlarged side elevations of the ribbon feeding mechanism with the ribbon shown in section and showing successive positions of the feeding means during the feeding operation.

Fig. 8 is an enlarged fragmentary sectional view of one of the outer gripping elements as taken along lines 8—8 of Fig. 7.

Fig. 9 is an enlarged fragmentary end elevation of the apparatus with portions broken away and in section showing the means for actuating the outer gripping element.

Fig. 10 is a fragmentary perspective of a portion of the cutter bar showing a cutter.

Fig. 11 is a schematic view illustrating successive positions taken by the cutting edge of the cutter during the cutting operation.

Fig. 12 is an enlarged top plan view of one end of the cutter bar showing the adjusting means for oscillating the same.

Fig. 13 is an enlarged elevation of one of the cutter bar supports partly broken away and in section to show internal structure.

Fig. 14 is a vertical section through the push rod and sleeve of the support of Fig. 13.

Fig. 15 is a side elevation of a modified form of mandrel partly broken away and in section.

Fig. 16 is a cross section through the structure of Fig. 15 as taken along lines 16—16 thereof.

Fig. 17 is an enlarged fragmentary sectional view taken substantially along the medial line of the cutter bar showing the method for yieldably supporting the cutting elements within said bar.

Fig. 18 is a semischematic, partly sectional view of a mandrel and band applying device showing a modified form of this invention.

Fig. 19 is a cross section of the device of Fig. 18 taken along lines 19—19 of Fig. 18.

Fig. 20 is a vertical sectional view of another modified mandrel and band applying device.

Fig. 21 is an enlarged cross section taken along lines 21—21 of Fig. 20.

Fig. 22 is a partly sectional fragmentary view showing the band gripping elements of the modified form of Fig. 20, gripping a portion of the tubular banding material.

Fig. 23 is a greatly enlarged sectional fragmentary view of the lower backing portion of the mandrel showing the means by which the backing member for the knife is yieldably supported.

Although the particular manner in which bottles or other articles to be banded are fed to the banding device is not critical, the invention is illustrated in use with a feed conveyor generally designated 1 and a discharge conveyor generally designated 2.

Conveyors 1, 2 are spaced apart in parallel relation and one or more bottles may be transferred at a time from conveyor 1 to conveyor 2, during which transfer the band applying operation is performed. As best seen in Fig. 2, means is shown for transferring three bottles at a time by means of a pusher device generally designated 3. The pusher device 3 is actuated from a cam shaft 4 (Fig. 1) driven through a sprocket chain 5 from a motor reducer combination 6. The conveyors 1, 2 may be driven through a sprocket chain or belt 7 from a shaft 8 (Fig. 3). Shaft 8 is driven through bevel gears 9, 10 from camshaft 4.

Pusher device 3 includes lower arms 11 in engagement

with radial cams 12a on cam shaft 4 and upper arms 12 which are connected at their upper ends to a sliding pusher element 13 for engaging three bottles on feed conveyor 1. It will be noted that for each rotation of cam shaft 4 the pusher device 3 will feed three bottles from conveyor 1 onto a platform 18 that is stationarily mounted between conveyors 1 and 2.

Mounted above and laterally offset from the apparatus above described is a tank 20 supported on a frame 21. The tubular material from which the bands are cut is in the form of a flattened ribbon 19 rolled in a roll 22 that in turn is rotatably supported on a shaft 23 so as to dip into tank 20. Tank 20 contains a charge of liquid having a level indicated at 24 (Fig. 3) and which liquid may be alcohol, glycerine or whatever other liquid is employed to prevent premature shrinkage of the plastic banding material.

From the roll 22 the ribbon of plastic material 19 is fed over a roller 25 supported at the end of a laterally outwardly projecting extension 26 so as to be accessible to the apparatus now to be described.

Mounted above the platform 18 is a head structure 30 that includes a pair of longitudinally extending bars 31, 32 (Figs. 1, 3) connected together at their ends by cross pieces 33, 34.

A pair of parallel longitudinally extending shafts 37, 38 are mounted in head 30 and rotatably supported at one end in bearing block 39 and at the opposite end in bearing block 40. Outwardly from bearing block 40 the shafts 37, 38 are provided with upwardly extending arms 43, 44 respectively that are provided at their free ends with rollers 45, 46 (Fig. 9). These rollers are adapted to be engaged by a conical portion 47 carried at the upper end of a vertically extending shaft 48 which extends downwardly through the head 30.

The adjacent end of head 30 is supported on the upper end of a hollow shaft 50 and the opposite end of the head is supported on a similar shaft 51. Shafts 50, 51 are telescopically received within shafts 52, 53, respectively.

Shafts 50, 51 are provided at their lower ends with lateral extensions 54, 55, respectively, which in turn carry cam follower rollers 56, 57. These rollers engage radial cams 58, 59 carried by cam shaft 4 hereinbefore described. Cams 58, 59 are provided with two distinct cam surfaces arranged so as to raise the head 30 during a portion of one revolution of shaft 4 and permit the head to be lowered during the remainder of the revolution. Extension springs 60, 61 extending downwardly from opposite ends of head 30 and secured at their lower ends to the frame of the machine urge the head 30 downwardly at all times thus causing continued engagement of rollers 56, 57 with cams 58, 59. It should be noted at this point that the vertical movement of head 30 is independent of the movement of shaft 48 which is reciprocally received within shaft 50.

The lower end of shaft 48 is rounded at its lower end as at 63 (Fig. 1) and is adapted to intermittently engage a radial cam 64 also carried by cam shaft 4. The position of cam shaft 4 as seen in Fig. 1 shows the radial cams 58, 59 and 64 in their lower dwell positions. In this position of cam shaft 4, the head portion 30 is also in its lower position with the band applying portion attached thereto having just completed the band applying cycle thereby allowing the step of severing the bottle sealing band from the remaining ribbon to be accomplished. As cam shaft 4 then continues to rotate, the radial cam 64 is adapted to act upon shaft 48 causing the latter to be raised against the urgency of spring 65 mounted within hollow shaft 50. The lower dwell period of cams 58, 59 is slightly longer than the period for dwell of cam 64 thereby insuring that shaft 50, with reciprocable shaft 48 contained therein, is not moved upwardly before cam 64 can act upon shaft 48.

After cam 64 has begun to raise shaft 48 upwardly, cams 58, 59 begin to act upon shafts 50, through the

previously described linking elements, causing said shaft 50 to be also raised. So as not to cause the lower end 63 of shaft 48 to be prematurely disengaged from cam 64, the relative vertical displacement of cams 64 and 58, 59 are preferably the same until the upper dwell or maximum vertical displacement of cam 64 is reached, after this point further raising of shaft 50 by cams 58, 59 causes shaft 48 to become disengaged from cam 64 thereby allowing said shaft 48 to be yieldably urged downward within shaft 50. The disengagement of cam 64 from shaft 48 permits the conical portion 47 thereof to move downwardly thereby spreading rollers 45, 46 apart causing shafts 37, 38 to rotate, in a limited arc, for a purpose now to be described.

Secured to shafts 37, 38 intermediate the ends thereof are a plurality of pairs of gripping members generally designated 71, 72 (Figs. 5-7). Although three such pairs are shown in Fig. 1, only one pair will be described in detail, it being understood that as many pairs of gripping members as desired may be employed depending upon how many bottles are to be simultaneously banded.

The gripping members 71, 72 are adapted to be used in conjunction with a vertically disposed mandrel 73 that is in some respects similar to the mandrel of Patent No. 2,765,607, above noted.

Mandrel 73 comprises a tubular member provided at its lower end with a downwardly opening recess 74 (Fig. 4) into which the cap or cork of the bottle or the top of whatever article is to be banded may be received. The opposite upper end of the mandrel is reduced in diameter as at 75 to facilitate passage therearound of the ribbon 19 of tubular plastic material.

At a point spaced downwardly from the upper end of the mandrel 73 the same is enlarged to form a smooth annular head 76. The cooperating gripping members 71, 72 are provided with bosses 77, 78 for receiving shafts 37, 38 therethrough and which bosses in turn are formed with recesses 79, 80 respectively to provide generally upwardly and oppositely inwardly directed shoulders 81, 82. In the position of Fig. 7 it will be noted that shoulders 81, 82 serve to support the weight of mandrel 73. It should further be noted that the tubular banding material 19 is at all times between shoulders 81, 82 and the annular enlargement 76 on mandrel 73. However, it will be seen from the operation of the device that the presence of the material 19 does not impair the supporting function of the shoulders 81, 82.

At a point spaced downwardly from the annular enlargement 76 the mandrel is enlarged and then reduced to provide a downwardly directed annular shoulder 84 (Fig. 4) and a smooth cylindrical section 85. Slidably supported on section 85 is a sleeve 86 which, as best seen in Fig. 4, is provided with a diametrically extending pin 87 which in turn is connected to the lower end of a relatively thin elongated rod 88.

The cylindrical section 85 is provided with an upwardly projecting externally threaded boss 89 which is threadedly received in a complementarily threaded axially extending passageway 90 in the upper portion of the mandrel (Fig. 4). This structure provides ready assembly of the mandrel. Boss 89 is centrally apertured to receive rod 88 which extends upwardly therethrough into passageway 90. A compression spring 91 extending between the upper upset end 92 of rod 88 and the top of threaded boss 89 urges the rod upwardly at all times. In this manner the sleeve 86 is urged against shoulder 84 which provides a stop for limiting the upward movement of said sleeve.

Sleeve 86 is provided with a central reduced portion 93 thus forming an upwardly directed annular shoulder 94.

As best seen in Figs. 5-7, the gripping members 71, 72 include generally vertically disposed straight sections 95, 96 respectively, rigid with bosses 77, 78 and oppositely inwardly directed flanges 97, 98. The opposed edges of

5

flanges 97, 98 are recessed (Fig. 8) so as to provide a socket generally complementary to the periphery of the reduced portion 93 of sleeve 86. A strip 99 of resilient material such as rubber may be fixed to the recessed portion so as to increase friction.

The operation of the above described apparatus may now be described. During a revolution of cam shaft 4, pusher element 13 transfers one or more bottles 100 to platform 18. Each bottle is positioned by said pusher element so that it is directly under a mandrel 73 which is being supported in an up position by shoulders 81, 82 on gripping members 71, 72 as shown in Fig. 7. Upon further rotation of cam shaft 4, cam 64 releases the lower end of shaft 48 (Figs. 1, 9) urging the rollers 45, 56 oppositely outwardly (Fig. 9) and oscillating shafts 37, 38 so as to urge gripping members 71, 72 toward each other into the position of Fig. 5. In this position the gripping elements 99 on the members 71, 72 tightly engage the outer side of the banding material 19 adjacent the sleeve 86 and grip said material between said elements and said sleeve.

While the banding material is thus gripped and upon further rotation of cam shaft 4, cams 58, 59 permit the hollow shafts 50, 51 and head 30 to move downwardly under the urging of springs 60, 61. Such downward movement causes the cap 110 of bottle 100 to be received in recess 74 of mandrel 73 and, upon further downward movement of head 30, mandrel 73 is held stationary by the top of the bottle and the gripping members continue downwardly feeding the tubular banding material onto and around the neck of bottle 100 (Fig. 6).

After the desired length of band has been fed onto the bottle neck, cam 64 engages shaft 48 and urges it upwardly thus releasing the gripping elements 99 and permitting the inner gripping sleeve 86 to snap upwardly against shoulder 84 of the mandrel (Fig. 7). When the gripping elements 99 have been spread apart as shown in Fig. 7 continued rotation of cam shaft 4 causes cams 58, 59 to urge shafts 50, 51 and head 30 upwardly so that shoulders 81, 82 on the gripping members engage annular enlargement 76 on mandrel 73 through the banding material 19 and raise the mandrel clear of the bottle on which it is supported.

However, before the mandrel 73 is raised it is necessary to sever the length of tubular material that is to constitute the band from the ribbon of material 19. The cut band is indicated at 19' in Fig. 7 and the method and means for cutting the same will now be described.

Spaced downwardly below the head 30 is an elongated horizontally disposed cutter plate generally designated 111, which extends parallel to and between the conveyors 1, 2 and which is disposed above platform 18 on which the bottles 100 are positioned during the banding operation. The opposite ends of said cutter plate 111 are supported on a pair of assemblies generally designated 112, 113. Inasmuch as both assemblies are similar only assembly 113 will be described in detail.

Referring now to Figs. 12, 13, the cutter bar 111 is secured to assembling 113 by means of a stud 114 which is fastened to plate 111 by means of nut 115. The lower end of stud 114 is secured within a journal 116 rotatably supported in a bearing 117 which in turn is fixedly secured within a block 118.

Block 118 is slidably supported in ways 120 cut in a head 122. Head 122 is an enlargement of a hollow shaft 123 which extends downwardly to a point adjacent a cam 124 carried by cam shaft 4. Shaft 123 is rotatably supported intermediate its ends in a thrust bearing 125 carried by platform 18 (Fig. 1).

Below bearing 125 the shaft 123 is provided with a worm gear 126 which is in mesh with a mating worm 127 carried by a longitudinally extending shaft 128. Shaft 128 is driven constantly as by means of sprocket chain 105 mounted between cam shaft 4 and said shaft 128.

Slidably carried within the lower end of shaft 123 is another shaft 134 (Fig. 13) that is rounded at its

6

lower end as at 135 to slidably engage the cam face of cam 124. Above bearing 125 shaft 134 is transversely apertured to receive therethrough a pin 136, the ends of which extend through a slot 137 in hollow shaft 123 and into a downwardly opening recess 138 in a sleeve 139 slidably carried by shaft 123.

Sleeve 139 is urged downwardly at all times by a helical compression spring 140 extending between said sleeve and the underside of the enlarged head 120 of shaft 123.

As best seen in Fig. 13, slot 137 slants relative to the longitudinal axis of shaft 134 and spring 140 acting through sleeve 139 urges the pin 136 downwardly against the bottom of said slot to the position shown in Fig. 13.

At a point above pin 136 inner shaft 134 is provided with a coupling 141 that comprises an elongated tongue 142 on the lower portion of shaft 134 and a complementarily formed slot 143 in the upper portion. Vertical movement of the lower portion of shaft 134 relative to the upper portion is thus provided.

The upper portion of shaft 134 carries an enlarged journal 144 seated within a complementarily formed seat 145 in head 120. Projecting upwardly from the upper face of journal 144 is a pin 146 that is received in a downwardly opening slot 147 formed in the sliding block 118 hereinabove referred to. Plates 148 secured to head 120 on opposite sides of block 118 serve to hold the latter in place.

When pin 136 on inner shaft 134 is in its lowermost position, pin 146 on journal 144 cooperates with slot 147 in block 118 and positions the latter so that the centerline of journal 116 is in alignment with the centerline of shaft 123. In such a case it will be apparent that cutter plate 111 remains stationary. However, upon upward movement of inner shaft 134 under the urging of cam 124, pin 136 follows slot 137 so as to turn shaft 134. As best seen in Fig. 12, turning of shaft 134 causes pin 146 to shift the position of block 118, for example to the left as seen in Fig. 12. The result of such movement is to move the journal 116 away from the central axis of driving shaft 123 thus causing the adjacent end of cutter plate 111 to revolve about the center of shaft 123 with an eccentricity proportional to the throw of cam 124 (Fig. 13), and the initial radial placement of pin 146 (Fig. 12).

It will be understood that cutter plate mounting assemblies 112, 113 are similarly constructed so that cutter plate 111 is always parallel to its original stationary position during the above described oscillation.

At spaced points along the length of cutter bar 111 the same is apertured as at 150 (Figs. 10, 17) to receive the tops of bottles 100. It should again be noted that although three bottles 100 may be simultaneously handled by the apparatus shown in which cutter bar has three apertures 150 it will be understood that the devices may handle only one or two or more than three bottles.

At each aperture 150 the underside of cutter plate 111 is provided with a concentric recess 151 for receiving therein an annular cutter 152 having a continuous radially inwardly directed cutting edge 153 (Fig. 17).

Cutter 152 is provided with a plurality of counterbored holes 154 receiving therethrough screws 155 which in turn are screwthreadedly received in threaded holes 156 in cutter plate 111. Between the outer periphery of cutter 152 and the radially inwardly directed walls of recess 151 there is interposed an annular resilient backing element 157 of rubber or the like. By this structure the cutter 152 is permitted to shift slightly against the yieldable resistance of backing element 157 which functions to center cutter 152 with the centerline of hole 150. Holes 154 are made slightly larger than the shanks of screws 155 so as to permit the above mentioned shifting.

Cutter plate 111 is positioned with the holes 150 in axial alignment with the centerline of mandrels 73 so that each mandrel 73 is received within the circular cutting edge 153.

Adjacent the bottom of each mandrel 73 the same is formed with an annular radially outwardly opening recess for receiving therein an annular ring 160 of plastic or the like which serves as a backing element for the tubular material 19 as the same is cut (Fig. 6).

In operation, after the head 30 (Fig. 1) has been lowered to bring the mandrel 73 into seating engagement with the top 110 of the bottle 100, and after the band 19' has been fed downwardly onto the bottle neck, cams 124 move the inner shafts 134 of cutter plate mounting assemblies 112, 113 upwardly (Fig. 13) causing cutter plate 111 to oscillate and bring cutting edge 153 of cutter 152 into engagement with the banding material 19. It will be understood that one point of cutting edge 153 engages the tubular member 19 backed up by the annular plastic ring 160 and then cutter 152 revolves around ring 160 so that the entire length of edge 153 progressively engages the periphery of ring 160 cutting the tubular banding member 19 therebetween.

Important advantages are gained by the above described method of cutting the plastic. First the bottles 100 need not be spaced apart during the banding and cutting operations because no clearance is required to house rotary cutters or the like. Second, there is no limit to the number of bottles that may be banded and cut simultaneously, thus permitting the apparatus shown to be employed in any bottling line regardless of the speed of the latter. Third, the number of bottles to be banded and cut simultaneously may be varied as desired.

Although the resilient backing element 157 is desirable to prevent undue pressure between cutting edge 153 and plastic ring 160 on mandrel 73, such backing element 157 may be omitted if the cutting edge 153 is accurately positioned. Furthermore, mandrel 73 deflects during the cutting operation thus providing yieldability which, if sufficient, may obviate the use of backing element 157. It will also be noted that resilient gripping elements 99 carried by gripping members 71, 72 provide a firm but yieldable support for the mandrel 73 during the cutting operation.

Additional support, preventing undue deflection of mandrel 73 during the cutting operation is obtained from the close proximity of the enlargement 83 of the mandrel to the bosses 77, 78 (Fig. 6). In other words, the bosses 77, 78 restrain undue sidewise movement of mandrel 73 during the cutting operation.

Returning to the band feeding operation, the apparatus above described carries out the steps of: gripping the sidewalls of the tubular banding member 19 between inner and outer gripping elements, translating said elements while the member is so gripped toward the top of the bottle, releasing the gripping elements and returning them to their original position.

The cutting device carries out the steps of: enclosing the tubular plastic member 19 within a continuous inwardly directed cutting edge 153, engaging the tubular member 19 with said cutting edge at one side of the member and causing relative movement between the plastic ring 160 and said edge 153 by shifting the sliding block 118 (Fig. 13) so that the length of said cutting edge is progressively engaged with the tubular member as it revolves about centers having a locus consisting of a circle concentric with the center of shaft 123. This particular movement is schematically illustrated in Fig. 11 wherein the locus is indicated at 161. Four successive positions (153A, 153B, 153C, 153D) of the cutting edge 153 are shown.

With respect to the method of feeding the tubular plastic banding material above noted, it will be readily seen that the method may be carried out by apparatus other than that shown. For example, a modified form of the feeding apparatus is shown in Figs. 15, 16 wherein the mandrel is generally designated 163.

In the modified form of mandrel the same is pro-

vided with a plurality of longitudinally extending slots 164 in which are received radially outwardly projecting lugs 165 of an inner gripping element 166. The latter is yieldably urged to its upper position by compression spring 168.

Translation of the gripping element 166 is effected by one or more carriages 169 each of which is provided with a pair of longitudinally spaced upper and lower rollers 170, 171. In the uppermost position of carriage 169 upper roller 170 is adapted to engage a complementarily formed downwardly directed shoulder 172 which provides a stop for such roller limiting upward movement thereof. Lower roller 171 engages one of the lugs 165 of element 166 at all times.

Carriage 169 may be fixedly secured to an inner annular member 173 which is slidably disposed within an outer annular member 174. Vertical reciprocation of member 173 may be effected in any convenient manner (not shown) such as by use of a head similar to head 30 (Fig. 1).

In operation, the device of Fig. 15 performs the same steps as that disclosed in Figs. 5-7 except that it is not necessary to move the outer gripping elements (lower rollers 171) radially outwardly to release the tubular member 19 after the feeding step has been performed. Instead, carriages 169 merely translate to their upper position as shown in Fig. 15. It will be noted that upon such return movement there is no tendency for the tubular member to be urged upwardly since rollers 170, 171 do not offer any drag. Furthermore, since the lower roller 171 precedes the gripping element 166 on the upward stroke, there is no gripping action between said rollers and inner element 166. However, it will be noted that the downward movement of rollers 171 effect a wedging action with lugs 165 securely gripping the banding material therebetween.

The above described apparatus and methods have been successfully employed at relatively high speeds to apply banding sleeves to bottles. As above noted, the apparatus may be employed at any line speed inasmuch as there is no limit to the number of bottles that may be banded simultaneously.

The cost of constructing the instant apparatus is only a fraction of the cost of apparatus presently employed and there is very little maintenance required.

Although the apparatus herein shown (Figs. 5-7) is arranged to sever the banding material at a point about the top of the bottle cap or cork this position is not critical. By shifting cam shaft 4 and head 30 upwardly or downwardly the band may be severed at any desired point. Means for making such adjustment are not shown, but involve expedients known to those skilled in the art.

When the bands are to be provided with printed matter the above described apparatus readily lends itself to use with electronic devices adapted to compensate for creepage. In this connection bottle support platform 18 readily lends itself to automatic vertical shifting motivated by such electronic equipment.

Modified forms of the invention are illustrated in Figs. 18-23.

With reference to the modified form of the band applying device shown in Fig. 18, a vacuum operated band applying device is shown.

The mandrel, generally designated 201, of this particular modification is similar to the mandrel 73 described in the preferred form of the invention, except that the inner slidable sleeve 86 is not required.

Like mandrel 73 of the preferred form, mandrel 201 comprises a tubular member provided at its lower end with a downwardly opening recess 202 into which the cap or cork of a bottle 100 may be received. The opposite upper end of the mandrel 201 is reduced in diameter to provide a frusto-conical portion 203. At a point spaced downwardly from the frusto-conical portion 203,

an annular bead 204 is formed corresponding to the annular bead 76 of the previously described mandrel 73.

As in the case of mandrel 73, mandrel 201 is adapted to be surrounded by the ribbon 19 of tubular plastic material at all times.

The weight of mandrel 201 is at times supported by a pair of generally upwardly and oppositely inwardly directed shoulders 205, 206 which are formed at the upper end of a substantially cylindrical vertical housing 207 surrounding the central portion of mandrel 201. Housing 207 is in turn fixedly supported on a reciprocating head means, such as parallel bars 210, 211 which correspond to parallel bars 31, 32 of the preferred form of the invention. The mechanical components used to reciprocate bars 210, 211 in a vertical plane may be the same as described previously herein for the preferred form.

At a point spaced downwardly from shoulders 205, 206, a pair of opposed, interconnected, radially inwardly extending chambers 212, 213 are formed so as to partially surround the enlarged diameter section 214 of mandrel 201 (Figs. 18, 19). The inwardly facing opposed concave surfaces 215, 216 of chambers 212, 213, respectively, are provided with one or more apertures 217. The spacing between the opposed concave surfaces 215, 216 is such that housing 207 is freely slidable with respect to mandrel 201 when the ribbon 19 of tubular plastic material is interposed therebetween.

In operation, air is exhausted from the interconnected chambers 212, 213 as by means of port 218, flexible hose connection 219, and a four way valve, shown schematically at 220, which is in turn connected to a conventional vacuum source such as a vacuum pump. When a vacuum is created in chambers 212, 213, the moist ribbon 19 of tubular plastic material is drawn against the opposed concave surfaces 215, 216 and frictionally held there by the combined forces of surface tension of the moisture and the vacuum within the said chambers tending to draw the material of ribbon 19 into the aperture 217.

After this frictional engagement between the ribbon 19 and surfaces 215, 216 has been accomplished, the parallel bars 210, 211 travel downwardly to move housing 207 to the dot-dash line position indicated in Fig. 18, thus feeding ribbon 19 downwardly to be placed about the neck of a bottle 100.

At the lower end of its stroke housing 207 (or boss 218 thereof) is arranged to engage a switch 230 in an electrical circuit 231 for actuating a solenoid 232 associated with valve 220 in the conventional manner. Upon actuation of switch 230, the valve 220 connects chambers 212, 213 with the pressure source shown to disengage the tubular banding material from the housing 207.

The cutting operation is now performed by cutter 152 in the aforementioned manner described for the preferred form of the invention.

The frictional engagement between the ribbon 19 and surfaces 215, 216 may be broken after the cutting operation if desired by employing a time delay switch in lieu of switch 230. The force of the compressed air escaping through aperture 217 need only be sufficient to positively break the seal that is made between ribbon 19 and surfaces 215, 216 when the vacuum is applied. However, in some installations, it may not be necessary to charge the chambers 212, 213 with compressed air as the mere admission of atmospheric pressure may be sufficient. Considerations such as this are largely dependent upon the resiliency of the ribbon material, and the speed at which the operation is to be carried out.

After the frictional engagement between the ribbon 19 and surfaces 215, 216 is broken, the parallel arms 210, 211 again return housing 207 to its initial position in preparation for the succeeding cycle of operations. In its up position housing 207 engages switch 233 which

is connected through circuit 234 with solenoid 232. Upon actuation of the latter valve 220 is actuated to again connect the chambers 212, 213 with the source of vacuum and the above described steps are repeated.

Due to the moisture on the ribbon 19, which provides a lubricated surface, the concave surfaces 215, 216 do not have any tendency to pull the ribbon 19 of tubular plastic material backup with them.

As previously stated, the ribbon 19 of tubular plastic banding material comes in long lengths which are tightly coiled to form a roll. This causes the material to be flattened, and when the ribbon 19 is passed over the mandrels which serve to open it up, a pair of oppositely outwardly directed ridges 19a result.

It is because of these ridges that it is necessary to relieve the chambers 212, 213 which would otherwise completely surround the mandrel 201 and ribbon 19. This said relief is indicated at 222, 223 (Fig. 19) and is sufficient to prevent portions of housing 207 that are adjacent to the ridges of the ribbon 19, from interfering with the banding operation.

Referring now to Figs. 20, 21, 22, another modification of the band gripping and applying means is provided.

The mandrel 250 of this form of the invention may be somewhat shorter in overall length than mandrels 73 or 201 previously described.

Mandrel 250 comprises a lower tubular member with a downwardly opening recess 251 formed therein into which a cap or cork of a bottle 100 may be received.

The gripping members 252, 253 of this present modification are mounted as by means of bosses 254, 255 to a pair of horizontally extending parallel shafts 256, 257 respectively, similar to shafts 37, 38 of the preferred form of the invention. Bosses 254, 255 are formed so as to support the weight of the ribbon covered mandrel 250. Essentially the ribbon gripping means 252, 253 of this modification differ from that of the preferred form in that the band 19 is gripped at the edges of the oppositely outwardly directed ridges 19a (Fig. 21) instead of along the arcuate circumference as in the preferred form.

Substantially vertical, downwardly extending straight sections 260, 261, corresponding to sections 95, 96 of the preferred form support the C-shaped oppositely facing band gripping elements 262, 263 respectively.

The inwardly directed terminal ends of the C-shaped elements 262, 263 may be faced with rubber pads 264 or the like to facilitate the gripping of the ribbon 19 therebetween.

When the gripping elements 252, 253 are in the upper mandrel supported position the lower C-shaped elements 262, 263 are adapted to be adjacent the enlarged diameter portion 265 of the mandrel 250.

In operation, the gripping elements 252, 253 are swung in a limited arc, by the same means, and in the same sequence as elements 71, 72 of the preferred form of the invention.

When a band is to be applied to a bottle 100 the C-shaped elements 262, 263 are swung towards each other to engage and grip the projecting ridges 19a of the ribbon 19 (Fig. 22). Then, as in the preferred form of the invention, the head assembly (not shown) descends moving the gripping elements 252, 253 to the dot-dash line position indicated in Fig. 20. This of course slides the lower end of the ribbon 19 over the neck of the bottle 100. The cutting operation is now performed as before, the parallel shafts 256, 257 are oscillated outwardly to move the C-shaped elements apart as shown in Fig. 21, and the head (not shown) of the machine again raises to once again return the mandrel 250 and gripping elements 252, 253 to the initial position.

As a means to further stabilize the slower portion of the mandrel 250 during the cutting operation, a pair of downwardly directed concave supporting ribs 266, 267 may be provided on the lower surface portions of the

C-shaped elements 262, 263. Ribs 266, 267 are adapted to engage the lower end of ribbon 19, just above the blade of the cut-off knife, so as to support the lower end of the mandrel 250 from movement away from the knife during the cutting operation.

Referring to Fig. 23, a modified form of the lower portion of a mandrel is shown.

Screwthreadedly secured to the lower end of any one of the described mandrel forms is a cap 275 with a downwardly opening recess 276 formed therein to receive the top of the bottle. The lower end of the mandrel shank 277 is reduced in diameter as at 278 to form a downwardly directed annular shoulder 279. Circumferentially surrounding the reduced diameter portion 278 of the mandrel shank 277 is a ring 286 of rubber or like material which is adapted to provide a yieldable support for the circular, rigid backing ring against which the circular knife cuts the tubular material.

During the cutting operation the cut-off blades may tend to impart a slight eccentric motion to the lower portion of the mandrel, thus by providing a yieldable, or floating backing support for said mandrel this eccentric motion is absorbed by the yieldability of the rubber backing ring 280. This provides a more uniform incision of the knife blade and reduces the likelihood of any tearing in the ribbon 19 when the ribbon gripping means are returned to their upper position.

The exact embodiments of the preferred forms of the invention hereinbefore described are not to be taken as restrictive of the invention as variations in design to suit different conditions and articles will be obvious to persons skilled in the art.

We claim:

1. The method of longitudinally feeding an elongated tubular member to which internal access is prevented by an obstruction within said member, comprising the steps of: gripping a portion of the wall of said member between inner and outer surfaces on opposite sides of said sidewall by exerting opposed inwardly and outwardly directed forces on said surfaces, and translating said surfaces in the direction of feed while maintaining said gripping forces thereon.

2. The method of longitudinally feeding an elongated tubular member to which internal access is prevented by an obstruction within said member, comprising the steps of: gripping a portion of the wall of said member between inner and outer surfaces on opposite sides of said sidewall by exerting opposed inwardly and outwardly directed forces on said surfaces, and translating said surfaces in the direction of feed while maintaining said gripping forces thereon, releasing said forces and returning said surfaces to the original position thereof and thereafter gripping another portion and translating said surfaces in said direction.

3. Means for longitudinally feeding an elongated tubular member to which internal access is prevented by an obstruction within said member comprising: a pair of inner and outer gripping elements respectively positioned on opposite inner and outer sides of a portion of the sidewall of said member, means supporting said elements for movement longitudinally of said member, means for urging one of said elements toward the other for gripping said portion therebetween, and means for translating said elements in unison longitudinally of said member while said portion is so gripped.

4. Means for longitudinally feeding an elongated tubular member to which internal access is prevented by an obstruction within said member comprising: a pair of inner and outer gripping elements respectively positioned on opposite inner and outer sides of a portion of the side wall of said member, means supporting said elements for movement longitudinally of said member, means for urging one of said elements toward the other for gripping said portion therebetween, and means for translating said elements in unison longitudinally of said

member while said portion is so gripped, and means for releasing said elements from gripping relationship and for returning said elements to their original positions.

5. A device for longitudinally feeding an elongated flexible walled tubular member to which internal access is prevented by an obstruction within said member at one end thereof comprising: an inner gripping element within said member, means including said obstruction supporting said element for longitudinal movement toward said one end, an outer gripping element, means supporting the latter for longitudinal movement toward said one end, means for urging said outer element toward said inner element for gripping a portion of the wall of said member therebetween and means for translating said elements toward said one end in unison while said elements are in gripping relation for so feeding said member.

6. A device for longitudinally feeding an elongated flexible walled tubular member to which internal access is prevented by an obstruction within said member at one end thereof comprising: an inner gripping element within said member, means including said obstruction supporting said element for longitudinal movement toward said one end, an outer gripping element, means supporting the latter for longitudinal movement toward said one end, means for urging said outer element toward said inner element for gripping a portion of the wall of said member therebetween and means for translating said elements toward said one end in unison while said elements are in gripping relation for so feeding said member and means for moving said outer element away from said inner element for releasing said portion, and means for returning said elements to their original positions.

7. A device for longitudinally feeding an elongated flexible walled tubular member onto the neck of a vertically disposed bottle comprising: an elongated vertical mandrel adapted to be supported at its bottom on the top of said bottle with said member surrounding said mandrel, an inner gripping element slidably supported on said mandrel for movement relative to said mandrel from a first point toward said top to a second point, an outer gripping element, means for urging said outer element toward said inner element at said first point for gripping a portion of the wall of said member therebetween, means for translating said elements from said first point to said second point while said portion is so gripped, means for releasing said outer element from said wall and means for returning said elements to said first point.

8. A device for longitudinally feeding an elongated flexible walled tubular member onto the neck of a vertically disposed bottle comprising: an elongated vertical mandrel adapted to be supported at its bottom on the top of said bottle with said member surrounding said mandrel, an inner gripping element slidably supported on said mandrel for movement relative to said mandrel from a first point toward said top to a second point, an outer gripping element, means for urging said outer element toward said inner element at said first point for gripping a portion of the wall of said member therebetween, means for translating said elements from said first point to said second point while said portion is so gripped, means for releasing said outer element from said wall and means for returning said elements to said first point, the means for returning said inner element comprising a spring carried by said mandrel.

9. A device for longitudinally feeding an elongated flexible walled tubular member onto the neck of a vertically disposed bottle comprising: an elongated vertical mandrel adapted to be supported at its bottom on the top of said bottle with said member surrounding said mandrel, an inner gripping element slidably supported on said mandrel for movement relative to said mandrel from a first point toward said top to a second point, an outer gripping element, means for urging said outer element toward said inner element at said first point for gripping

13

a portion of the wall of said member therebetween, means for translating said elements from said first point to said second point while said portion is so gripped, means for releasing said outer element from said wall and means for returning said elements to said first point, a cutting element provided with a circular cutting edge surrounding the top of said bottle, and means for oscillating said cutting element in a rotary motion around said bottom of the mandrel and into cutting engagement therewith for severing said member.

10. Means for transversely cutting a band of tubular material surrounding the neck of a bottle or the like comprising: an inner circular support received within said band, a cutter provided with a circular radially inwardly directed cutting edge surrounding said support and said band, a housing for said cutter, rotary means cooperating with said housing and rotating about an axis spaced outwardly of said cutting edge for revolving said cutter about said band with said cutting edge revolving about a closed locus eccentric to the center of said support for progressively engaging the length of said cutting edge with the periphery of said support for cutting said band therebetween.

11. A banding device for applying a band of tubular material to the neck of a vertically disposed bottle or the like comprising: an elongated vertical mandrel having a bottom adapted to be supported on the top of said bottle with a ribbon of said material surrounding said mandrel, an inner gripping element slidably supported on said mandrel for longitudinal movement relative thereto, an outer gripping element supported for movement toward said inner element for gripping a portion of the wall of said band therebetween, means for translating said gripping elements toward said top while in said gripping relationship for feeding a length of said material constituting such band onto said neck, a cutter having a circular inwardly directed cutting edge surrounding said mandrel adjacent said bottom, and means actuating said cutter for progressively engaging the length of said cutting edge with said mandrel for severing the material therebetween.

12. Means for longitudinally feeding a tubular length of banding material onto the neck of a bottle comprising: a head surrounding said material and provided with a radially inwardly directed apertured surface adapted to engage the outer side of said material, means for applying a vacuum to the apertures on said surface for drawing the adjacent portion of said material to said surface

14

and holding the same in frictional engagement therewith, and means for translating said surface in the direction of feed of said material while the latter is in frictional engagement with said surface.

13. Means for longitudinally feeding a tubular length of banding material onto the neck of a bottle comprising: a head surrounding said material and provided with a radially inwardly directed apertured surface adapted to engage the outer side of said material, means for applying a vacuum to the apertures on said surface for drawing the adjacent portion of said material to said surface and holding the same in frictional engagement therewith, and means for translating said surface in the direction of feed of said material while the latter is in frictional engagement with said surface, and means for automatically breaking said vacuum to permit return of said surface to its original position after such translation.

14. Means for transversely cutting a band of tubular material surrounding the neck of a bottle or the like comprising: an inner circular support received within said band, a cutter provided with a circular radially inwardly directed cutting edge surrounding said support and said band, a housing for said cutter, a pair of supports for said housing, means for imparting an orbital movement to said supports for revolving said cutter about said band with said cutting edge revolving about a closed locus eccentric to the center of said support for progressively engaging the length of said cutting edge with the periphery of said support for cutting said band therebetween.

15. Means for transversely cutting a plurality of parallel bands of tubular material or the like comprising: a housing provided with a plurality of cutters having circular cutting edges surrounding said bands, means supporting said housing at a pair of points for orbital movement for revolving said cutters about said bands with said cutting edges respectively revolving about closed loci eccentric to the central axes of said bands for progressively engaging the length of said cutting edge with the periphery of said band.

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