

Aug. 10, 1937.

R. C. STROUT

2,089,769

BAND FORMING AND APPLYING MACHINE

Filed Dec. 11, 1934

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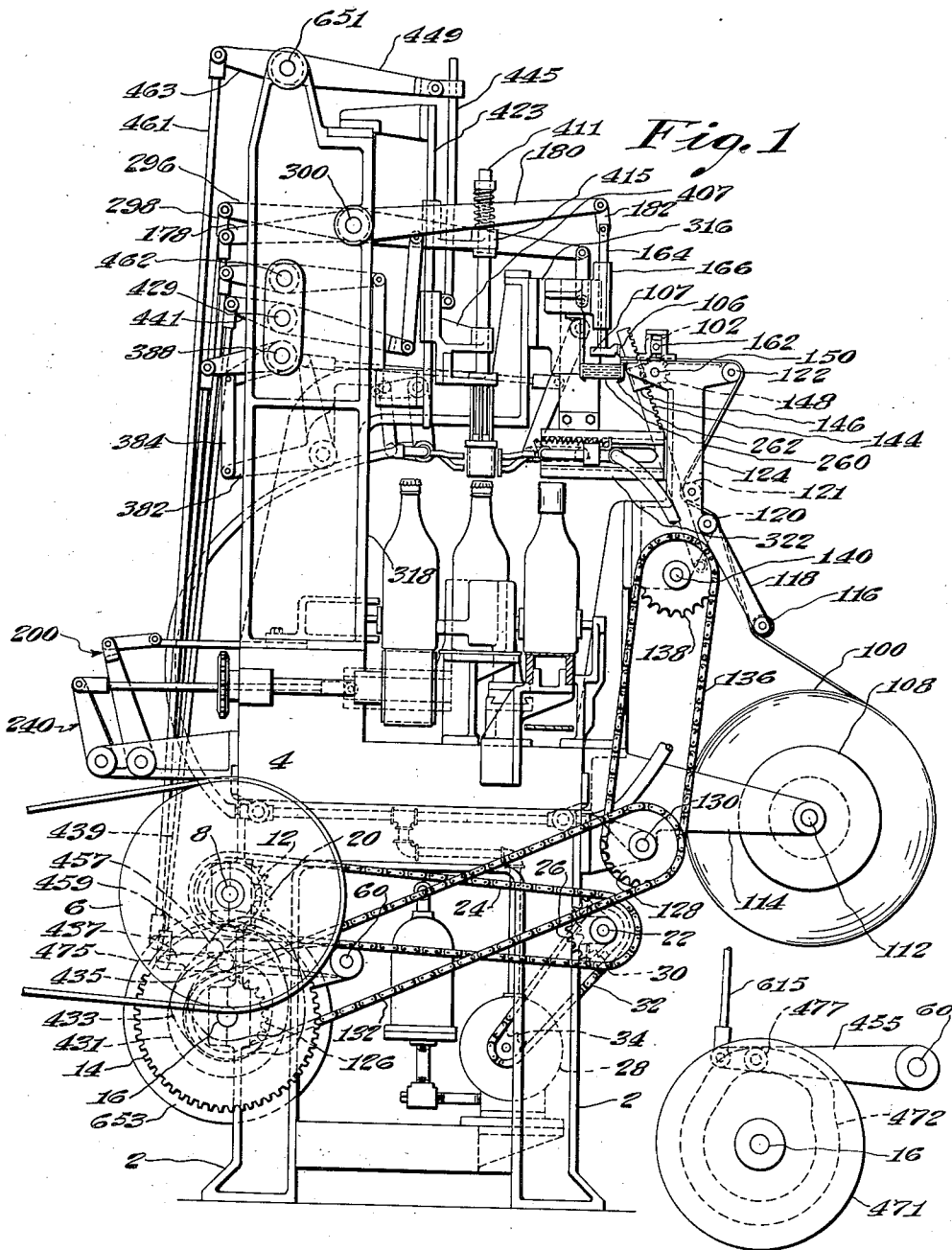


*Fig. 2*  
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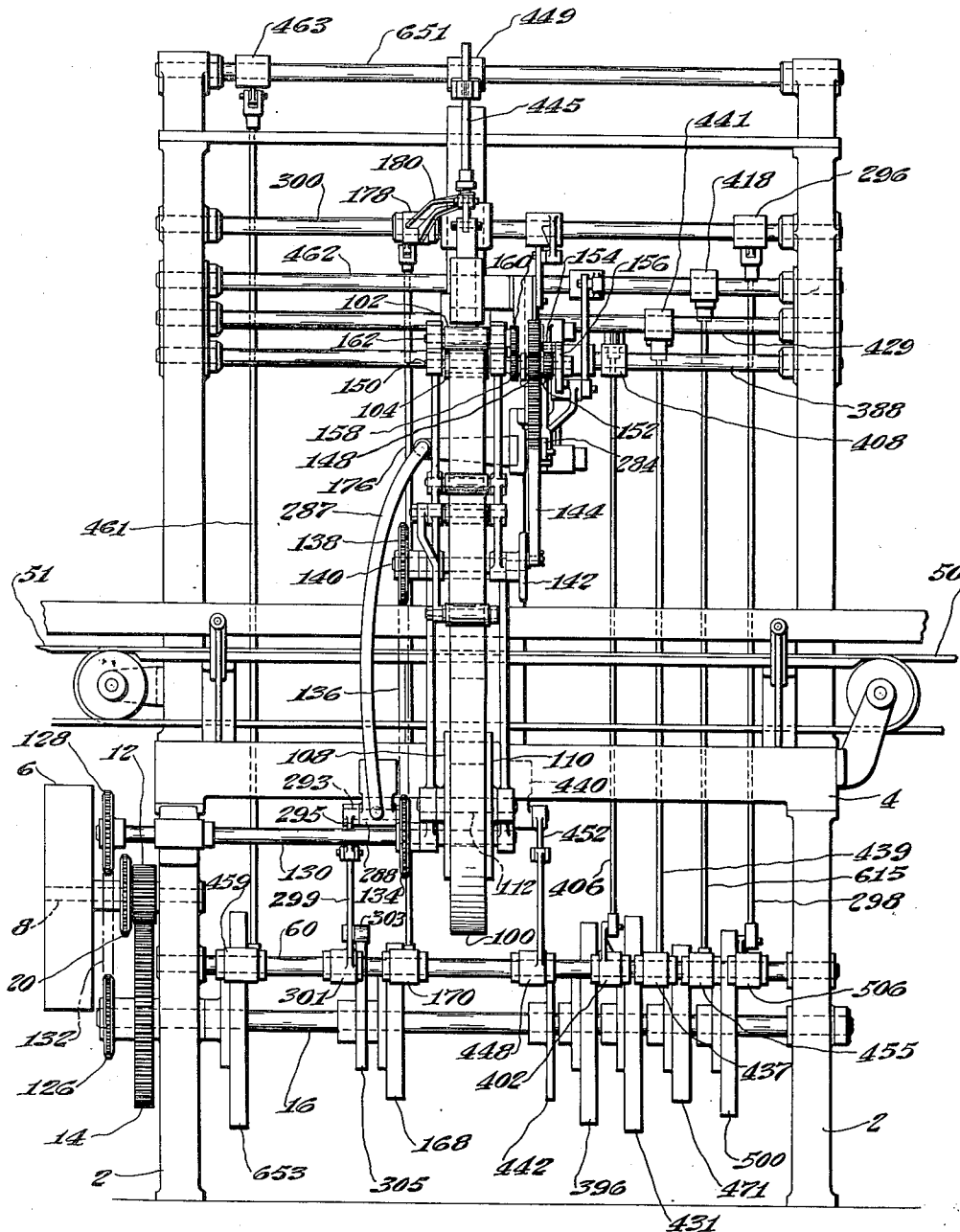
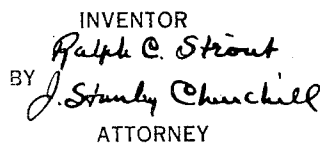


Fig. 3

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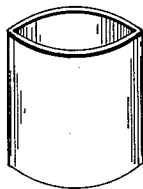


*Fig. 7*

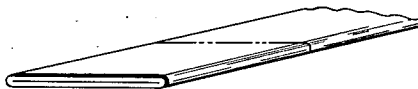


*Fig. 6*



*Fig. 8*



*Fig. 9*

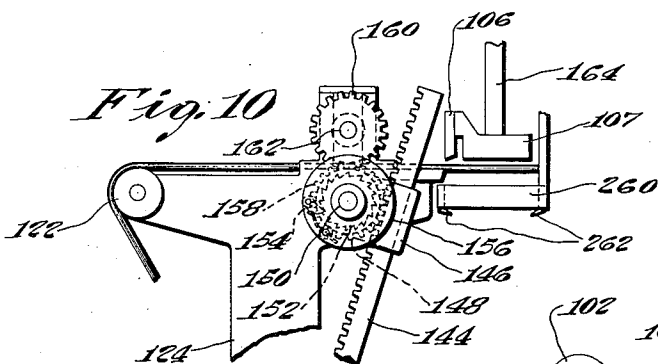


*Fig. 10*

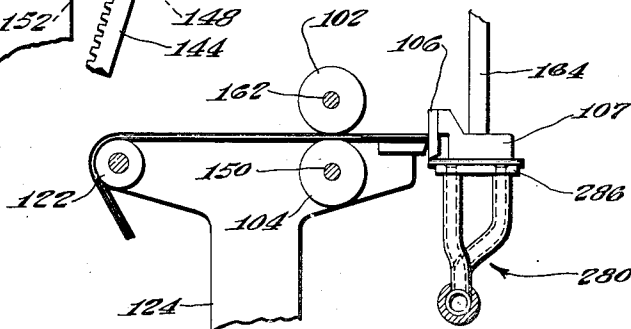


*Fig. 11*

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## UNITED STATES PATENT OFFICE

2,089,769

## BAND FORMING AND APPLYING MACHINE

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mesne assignments, to Pneumatic Scale Cor-  
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6 Claims. (Cl. 226—80)

This invention relates to a band forming and applying machine.

In general, the object of the invention is to provide a novel and efficient machine for forming successive bands from an elongated tubular member and for the automatic application of the bands thus formed to the neck portions of bottles in order to provide the bottles with sealing members. The machine is particularly useful in the formation and application of bands of wet regenerated cellulose to the necks of bottles in such manner as to cover at least a portion of the closure therefor, so that the sealing band may shrink in tightly fitting relation and form a seal that is required to be destroyed in order to open the bottle.

With this general object in view and such others as may hereinafter appear, the invention consists in the band forming and applying machine and in the various structures, arrangements and combinations of parts hereinafter described and particularly defined and claimed at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention, Fig. 1 is a side elevation of the machine; Fig. 2 is a detail of one of the operating cams to be referred to; Fig. 3 is a front elevation of the machine with some of the parts omitted; Fig. 4 is a vertical sectional view of the machine showing details of the band forming and band applying mechanism; Fig. 5 is a detail of two of the operating cams to be referred to; Fig. 6 is a detail in perspective illustrating a portion of the tubular member from which the present bands may be formed; Fig. 7 illustrates one of the bands in an open condition; Fig. 8 is a sectional detail illustrating the position preferably occupied by the band with relation to the neck and closure for the bottle after the application of the band and before the latter has shrunk; Fig. 9 is a side elevation illustrating the position occupied by the band after the latter has shrunk, forming a seal for the bottle; Fig. 10 is an enlarged detail of a portion of the band forming mechanism; and Fig. 11 is a similar view illustrating a modified form of band forming mechanism.

In general, the present invention contemplates the provision of an automatic machine for forming successive bands or sleeves from an elongated member constituting a supply and for automatically applying successive sleeves thus formed over the top and onto the neck of successive bottles. The machine is particularly useful in the formation and application of bands of wet regenerated

cellulose to the neck portions of the bottles in such manner that after application and after the applied band has been permitted to shrink, a tightly fitted seal is provided which must be destroyed in order to open the bottle. Provision is preferably made for withdrawing the elongated tubular member from a roll supply and for forming the bands therefrom in timed relation to the operation of the band applying mechanism, as will be described.

Referring now to the drawings, in the illustrated machine the filled and capped bottles are fed into the machine on an incoming conveyor from which the individual bottles are transferred into band applying position intermediate the incoming conveyor and a discharge conveyor. In the commercial form of the present machine a plurality of band applying mechanisms may and preferably will be embodied in the machine and provision made for transferring an individual bottle under each band applying mechanism and the band applying mechanisms are preferably disposed at spaced intervals along the incoming conveyor. For purposes of illustration, however, only one band applying mechanism and one band forming mechanism associated therewith have been herein illustrated. The elongated tubular material from which the successive individual bands are formed is preferably contained in a supply roll mounted upon the machine, and provision is made for feeding the tubular material to band forming mechanism arranged to form the bands and deposit them in superposed relation in an individual magazine, so that during the operation of the machine a bulk supply of formed bands is stored in such magazine from which they are automatically transferred to the band applying mechanism, as will be described. After the band has been applied to the bottle the banded bottle is transferred to the outgoing conveyor to be discharged from the machine, and when the bands are composed of wet regenerated cellulose, opportunity is afforded for the cellulose to dry and shrink to form a seal for the neck and cap of the bottle.

In the operation of the illustrated machine, a supply of filled and capped bottles is fed into the machine by an incoming conveyor 50 of any usual or preferred construction and is transferred from the conveyor 50 to a plate 62 immediately beneath the banding head either manually or by a pusher mechanism, generally indicated at 200. After a band has been applied, the bottle is transferred to an outgoing conveyor 51 either manually or by

a second pusher mechanism, generally indicated at 240, to be discharged from the machine.

Provision is made to form the bands to be applied from an elongated tubular strip of material and as herein shown, a roll of the tubular band material 100 is carried between discs 108 and 110 which are mounted on a stud 112 carried in a bracket 114 secured to the machine frame.

The elongated strip 100 is fed to a cut-off knife 106 by feed rolls 102, 104 being guided to said feed rolls over idler rolls 120, 121 and 122 which are journaled in a bracket 124 secured to the machine frame. A take-up lever 118 pivoted in the bracket 124 carries a roll 116 which bears against the banding material being guided to the feed rolls.

Means are provided for intermittently feeding a predetermined length of the banding material beyond the cutter 106 and to a position within a magazine 260 so that when the cutter 106 descends, as will be described, the tubular band is cut off and permitted to drop into the magazine in position to be withdrawn and applied to the neck of the bottle. The mechanism provided for causing the intermittent motion of the feed rolls includes a crank disc 142 on which a rack 144 is pivotally secured. The rack 144 is guided in a slide bracket 146 to mesh with a gear 148 loosely mounted on a shaft 150 on which the lower feed roll 104 is secured. A ratchet 152 formed as a part of the gear 148 is arranged to cooperate with a pawl 154 mounted on a pawl carrier 156 secured to the shaft 150.

During the operation of the machine the rack 144 is reciprocated so that during the downward stroke of the rack the spring pressed pawl 154 will engage with the teeth of the ratchet 152 and feed the banding material to be cut off. During the upward or idle stroke of the rack 144 the pawl 154 will slide over the ratchet teeth. The upper feed roll 102 is arranged to be driven through cooperating gears 158 and 160 on shafts 150 and 162 respectively.

The crank disc 142 is secured to a shaft 140 journaled in the bracket 124 and is arranged to be driven through a sprocket 138 secured to the end of the shaft 140, a chain 136, and a sprocket 134 secured to a shaft 130. The shaft 130 carries a second sprocket 128 at its outer end which is connected by a chain 132 to a sprocket 126 secured to a cam shaft 16. The cam shaft 16 is driven from the main driving element, such as an electric motor, not shown, belted to a pulley 6 secured to a main driving shaft 8. A pinion 12 mounted on the shaft 8 meshes with a gear 14 secured to the cam shaft 16. The shafts 8 and 16 are journaled in suitable bearings in the legs 2 of the machine frame. A platen 4 mounted upon the legs 2 supports the operating mechanisms for applying the band.

The cutter 106 is mounted on a vertical rod 164 which is arranged to be reciprocated in a slide bracket 166, secured to the machine frame, by a cam 168 mounted on the cam shaft 16. A cam lever 170 pivoted on a shaft 60 carries a cam roll 172 which cooperates with the path 174 of the cam 168. The outer end of the cam lever 170 is connected by a link 176 to a lever 178 loosely mounted on a rocker shaft 300. A second arm 180 of the lever 178 is connected by a link 182 to the vertically reciprocated rod 164.

The withdrawing and transferring mechanism generally indicated at 280 comprises a suction device including a suction plate 286, suction tubes 281 attached to a hollow sleeve 282 mounted in a

hub 283 formed in a horizontal slide member 284. The slide member is arranged to be reciprocated in a slide bracket 322 secured at the lower end of a vertical slide bar 310. Gibs 340 are provided to retain the slide member 284 in the bracket 322. The slide bar 310 is vertically reciprocated to raise the suction device 280 up to the magazine 260 to engage a collapsed band and to thereafter lower the suction unit to withdraw the lowermost band from the magazine. Lips 262 extending from the lower edges of the magazine are provided to retain the remaining bands within the magazine. A pad 107 formed at the lower end of the cutter reciprocating rod 164 serves as a presser to hold the bands down in the magazine when the suction pad comes in contact with the lowermost band.

Provision is made for supplying suction to the withdrawing unit 280 and as herein shown, see Fig. 1, a vacuum pump 28 of any usual or preferred construction is connected to the suction unit through connections including a pipe 285, flexible hose 287, a valve 288 and pipe connections 289. The vacuum pump 28 is driven from the main drive shaft 8 by sprocket and chain connections comprising a sprocket 20 fixed to the shaft 8 over which a chain 24 runs. The chain 24 also runs over a sprocket 26 fixed to a shaft 22. A second sprocket 30 fixed to the shaft 22 is connected to a sprocket 34 on the vacuum pump by a chain 32.

Provision is made for operating the valve 288 so the vacuum will be released at the proper time to withdraw a band and to cut off the vacuum during the idle portion of the cycle of operation of the withdrawing device. For this purpose a cam 305 secured to the cam shaft 16 is provided. A cam roll 303 mounted on the end of a lever 301 cooperates with the cam 305 and the roll is held in engagement with the cam by a spring 443. The lever 301 mounted on the shaft 60 is provided with a second arm 299 which is operatively connected to a valve lever 295 by a link 297. The lever 295 is secured to a valve shaft 293 which is provided with a part 294 through which the vacuum is released when the shaft 293 is rocked. The valve 288 is formed in a bracket 291 secured to the platen 4.

The vertical slide bar 310 which carries the suction unit 280 is arranged to be reciprocated by a cam 500 secured to the cam shaft 16. A cam path 502 in the cam 500 cooperates with a roller 504 in a lever 506 which is loosely mounted on the shaft 60. The outer end of the lever 506 is connected to a lever 296 by a link 298. The lever 296 is secured to the rock shaft 300 and a second lever 302 secured to the rock shaft is connected to the slide 310 by a link 304. The slide 310 is arranged to slide in a guide bracket 316 secured to a bracket 318 mounted on the platen 4. Gibs 309 are provided to retain the slide 310 in the bracket 316.

From the description thus far, it will be observed that the band material is cut off to form individual bands which are held in a magazine and one of said bands is withdrawn so that the withdrawing and transferring unit 280 is in a position corresponding to that shown in Fig. 4. Referring now to Fig. 11, a modified form of band withdrawing mechanism is shown wherein the magazine 260, as shown in Fig. 10, is dispensed with. In the modified form the cut off band is received directly on the suction plate 286 and thereafter transferred to band applying position in the usual manner, to be described.

Provision is now made to turn the unit 280 with the band to a position at right angles to that shown in Fig. 4, or to a position corresponding to that shown in Fig. 1, and at the same time to move the unit 280 to the left so that the band will be transferred to a position directly above the bottle to be banded. At this time a second suction unit, including tubes 430, 432, is caused to engage with the opposite side of the collapsed band and thereafter both suction units are drawn away from each other to open or expand the tubular band, so that spreading wires 401 may enter the opened band preparatory to applying it over the neck of the bottle.

The mechanism for moving the suction unit 280 horizontally in the slide bracket 322 comprises a cam 396 secured to the cam shaft 16. A cam lever 402 pivoted on the shaft 60 carries a roller 400 which cooperates with a cam path 398 in the cam 396. The outer end of the lever 402 is connected to a lever 408 by a link 406. The lever 408 is secured to a rocker shaft 388 and a second lever 386 also secured to the shaft 388 is connected to one arm 382 of a bell crank by a connecting rod 384. The connecting rod is pivotally secured to said lever arms by pins 390. The second arm 378 of the bell crank is connected to a depending lever 370 by a link 374 and pins 376, 380. The lever 370 is loosely mounted on a stud 372 which is secured to the slide 310. The lower end of the lever 370 is connected to the slide bracket 284 by a link 350 and a pin 352 secured to a hub 354 in the bracket 284. A slot 360 is provided in the bracket 322 to allow clearance for the hub 354.

During the operation of the machine, when the suction unit 280 is moved to the left as viewed in Fig. 4, it is caused to turn 90° by a stationary cam 410 secured to the bracket 322. A lever 414 secured to the hollow sleeve 282 carries a cam roll 412 which rides up the inclined surface of the stationary cam during the forward movement of the suction unit. A spring 411 serves to hold the roll 412 against the cam 410.

The second or rear suction unit comprising the suction tubes 430, 432 connected to a hollow sleeve 434 mounted in a swinging lever 436 is caused to advance and engage with the opposite side of the band and is caused to retract to open the band by mechanism including a cam 471 mounted on the cam shaft 16. A cam roll 477 carried by a lever 455 mounted on the shaft 60 cooperates with a cam path 472 in the cam 471. The outer end of the lever 455 is connected to a lever 418 by a link 615. The lever 418 is secured to a rock shaft 462 and a second lever 460 is connected to an arm 456 formed as part of the swinging lever 436 by a connecting rod 458 and pin 470. The lever 436 is pivoted on a stud 438 secured to the bracket 318. In order to provide a substantially parallel motion to the swinging lever 436 a linkage is provided comprising a lever 451, secured to the hollow sleeve 434, and connected to a link 453 which is pivoted on a pin 454 secured to the bracket 318.

Suction is supplied to the rear suction tubes 430, 432 through connections similar to those described for the withdrawing unit 280, and includes a flexible hose 638, a valve 440 and connecting pipes 841, 289 to the vacuum pump 28. The valve 440 similar in construction and operation to the valve 288 is opened and closed during the operation of the machine by a cam 442 fast on the shaft 16. One arm 446 of a bell crank loosely mounted on the shaft 60 carries

a cam roll 444 which is yieldingly urged against the cam by a spring 443. The other arm 448 of the bell crank is connected to a valve lever 452 by a connecting rod 450.

With the band in its open or tubular form 5 positioned above the bottle provision is made to hold the band in its tubular form and to lower the band over the neck of the bottle. As above stated, spreading wires 401 which are normally in an upraised and contracted position are caused 10 to be lowered and spread to hold the band. Thereafter a collar 409 which is provided with clearance holes through which the spreader wires pass is caused to descend and strip the band off the wires and onto the neck of the bottle. The 15 wires 401 secured in a hub 403 are arranged in a circle, and as above stated, are normally contracted so that their lower ends meet to form a point in which position the wires may readily be lowered into the opened band and there- 20 after caused to spread out to form a circle equal in diameter to the inside diameter of the band by the spreader 409, as will be described. The hub 403 is formed on an extended member 405 of a slide bracket 407 which is arranged to be 25 raised and lowered on a guide bar 423 by a cam 653 secured to the cam shaft 16, see Fig. 1. A cam lever 459 loosely mounted on the shaft 60 carries a cam roll 457 which cooperates with a cam path 475 in the cam 653. The outer end of 30 the lever 459 is connected to a lever 463 by a link 461. The lever 463 is secured to a rocker shaft 651 and a second lever 449 also secured to the rock shaft 651 is connected to the slide bracket 407 by a link 445 and a pin 447. 35

During the operation of the machine, the spreader wires 401 with the expanded band descends to a position where the lower ends of the wires and also the lower edge of the band are on a level with the top of the bottle. Thereafter 40 the collar 409 is caused to descend to the position illustrated in Fig. 4 where the band is completely stripped from the wires and applied to the bottle. The collar 409 attached to the lower end of a vertical rod 411 carried in a slide member 415 is caused to be raised and lowered on the slide bar 423 by a cam 431 secured to the cam shaft 16. A lever 437 loosely mounted on the shaft 60 carries a cam roll 435 which cooperates with a cam path 433 in the cam 431. The outer end of the lever 437 is connected to a lever 441 by a link 439. The 50 lever 441 is fast on a rocker shaft 429 and a second lever 427 also fast on the shaft 429 is connected to the slide member 415 by a link 425. The rod 411 is guided in a hub 413 in the bracket 407 and is yieldingly attached to the member 415 by a collar 417 on the underside of the member and a compression spring 419 coiled around the upper end of the rod 411. A collar 421 holds the spring against the member 415. The purpose 60 of this construction is so that during the operation of the machine, when the collar 409 is in its uppermost position in contact with the hub 403 to permit the wires 401 to contract, any discrepancy in the lowering of the slide members 65 415 and 407 will be taken up by the spring 419.

The bottle with the band applied is now transferred to the outgoing conveyor 51 to be discharged from the machine. While certain features of the invention are particularly designed 70 for use in the application of bands of wet regenerated cellulose to the necks of the bottles, nevertheless, it is not desired to limit the use of the invention thereto, as other bands may be applied to other forms of containers. 75

Having thus described the invention, what is claimed is:—

1. A band forming and applying machine having, in combination, bottle supporting means, band applying mechanism operative to apply a band upon the neck of a bottle, and mechanism for forming successive bands of uniform sectional dimension from a tubular supply thereof including means for transferring the bands into a position to be operated upon by the band applying mechanism, and operating means for effecting the operation of all of the aforesaid mechanism and means in timed relation.

2. A band forming and applying machine having, in combination, bottle supporting means, band applying mechanism operative to apply a band upon the neck of a bottle, means for withdrawing a tubular member from a supply roll thereof, means for forming successive bands of uniform sectional dimension from the tubular member thus withdrawn, and mechanism for transferring successive of the formed bands to a position to be operated upon by the band applying member, and operating means for effecting the operation of all of the aforesaid mechanism in timed relation.

3. A band forming and applying machine having, in combination, bottle supporting means, mechanism for forming successive bands of uniform sectional dimension from a tubular supply, and mechanism cooperating therewith for opening successive bands and applying them over the tops and upon the necks of successive bottles, and operating means for effecting the operation of all of the aforesaid mechanism in timed relation.

4. A band forming and applying machine having, in combination, bottle supporting means, means for withdrawing a tubular member from a

supply roll thereof, means for forming successive bands of uniform sectional dimension from the tubular member thus withdrawn, and mechanism for opening successive bands and applying them over the tops and upon the necks of successive bottles, and operating means for effecting the operation of all of the aforesaid mechanism and means in timed relation.

5. A band forming and applying machine having, in combination, means for supporting a supply roll of tubular band forming material, bottle supporting means, means for withdrawing the tubular band forming material from said supply roll thereof, a cutter operative to cut the tubular material to form individual bands of uniform sectional dimension, means for storing the bands as they are formed in superposed relation, band applying mechanism, and means for transferring the lowermost band in the pile to the band applying mechanism, and operating means for effecting the operation of all of the aforesaid mechanism and means in timed relation.

6. A band forming and applying machine having, in combination, means for supporting a supply roll of tubular band forming material, bottle supporting means, means for withdrawing the tubular band forming material from said supply roll thereof, a cutter operative to cut the tubular material to form bands of uniform sectional dimension, means for storing the bands as they are formed in superposed relation, band applying mechanism, and a suction device for withdrawing the lowermost band and presenting it to the band applying mechanism, and operating means for effecting the operation of all of the aforesaid mechanism and means in timed relation.

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