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Babineau

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[54] **APPARATUS FOR APPLYING TUBULAR NECKBANDS TO CONTAINERS**

[75] Inventor: **Joseph G. Babineau,** Arnprior, Canada

[73] Assignee: **Pfizer Inc.,** New York, N.Y.

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[52] **U.S. Cl.** **53/291;** 53/389; 156/423; 156/516

[51] **Int. Cl.²** **B67B 5/00;** B65B 41/04

[58] **Field of Search** ..... 53/291, 292, 295, 296, 53/389, 180 M, 361; 156/423, 516, 86, 521

[56] **References Cited**

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Primary Examiner—Travis S. McGehee
Assistant Examiner—Horace M. Culver
Attorney, Agent, or Firm—Connolly and Hutz

[57] **ABSTRACT**

Tubular plastic band stock material is pushed down over an antifriction-surfaced mandrel, onto the capped neck of a container, by a feeding sleeve having inverted U-cup packing rings at each end and a tubular diaphragm between the U-cups which is pneumatically compressed about the tubular band stock material and mandrel in the down stroke of the sleeve to firmly push the band stock down over the mandrel.

11 Claims, 5 Drawing Figures

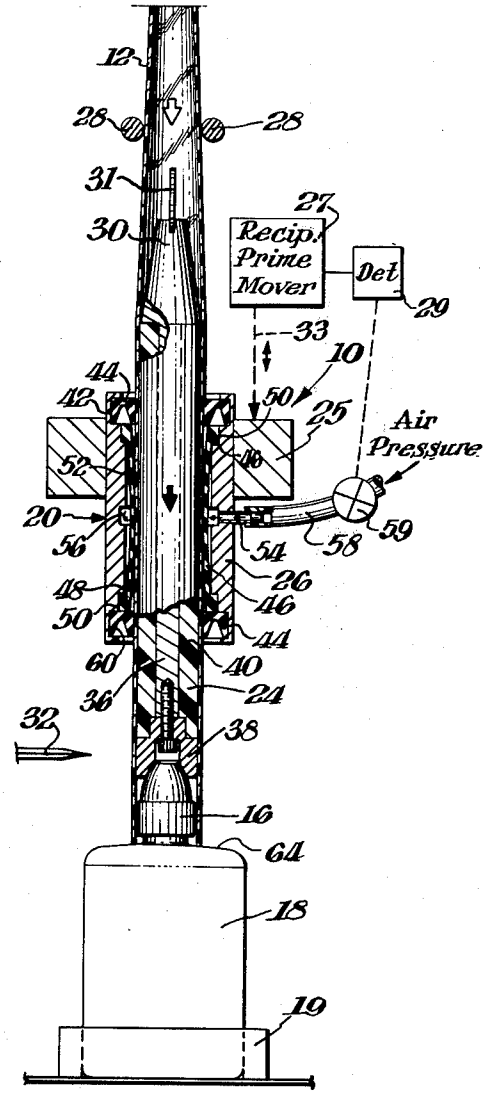
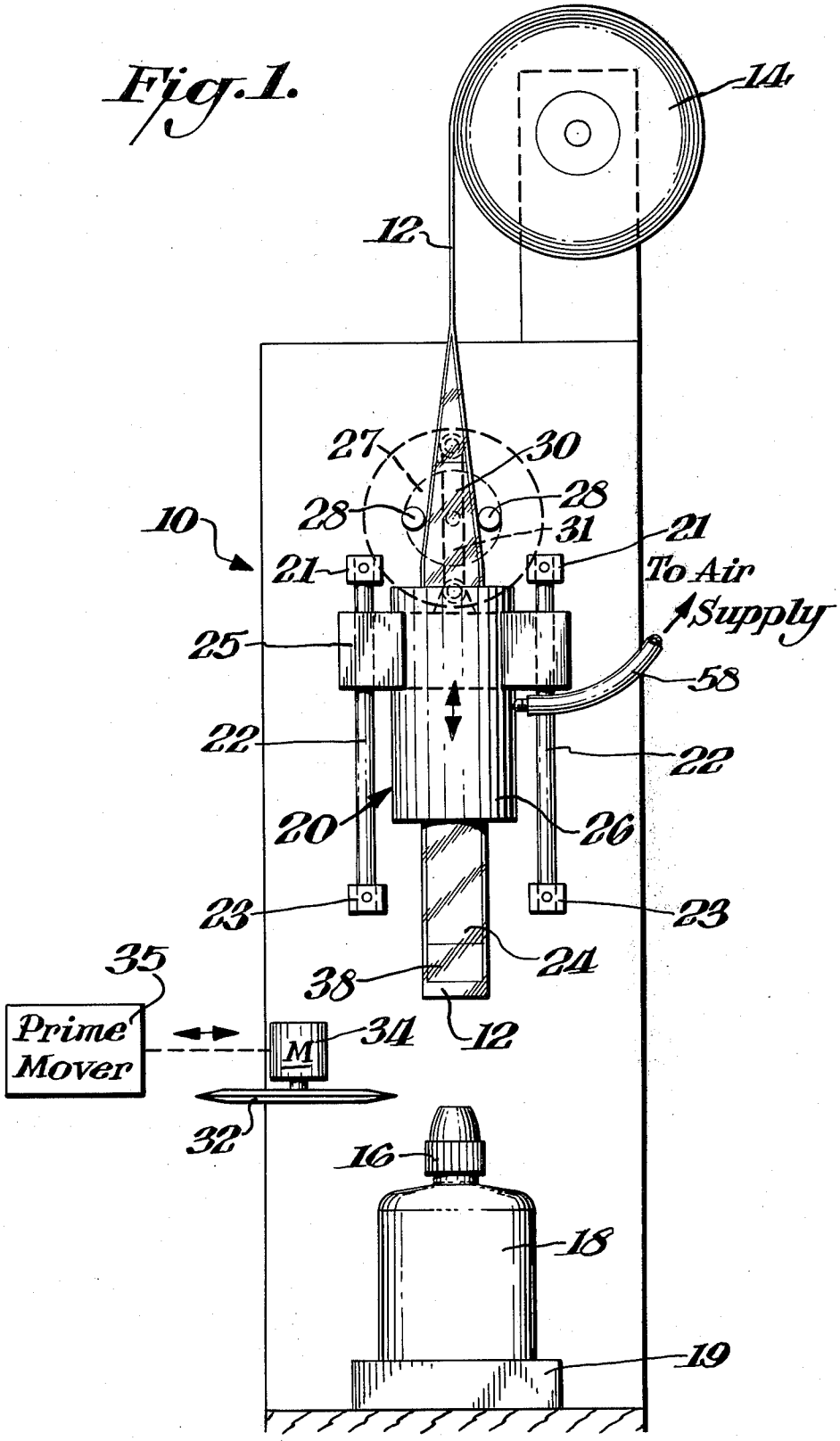
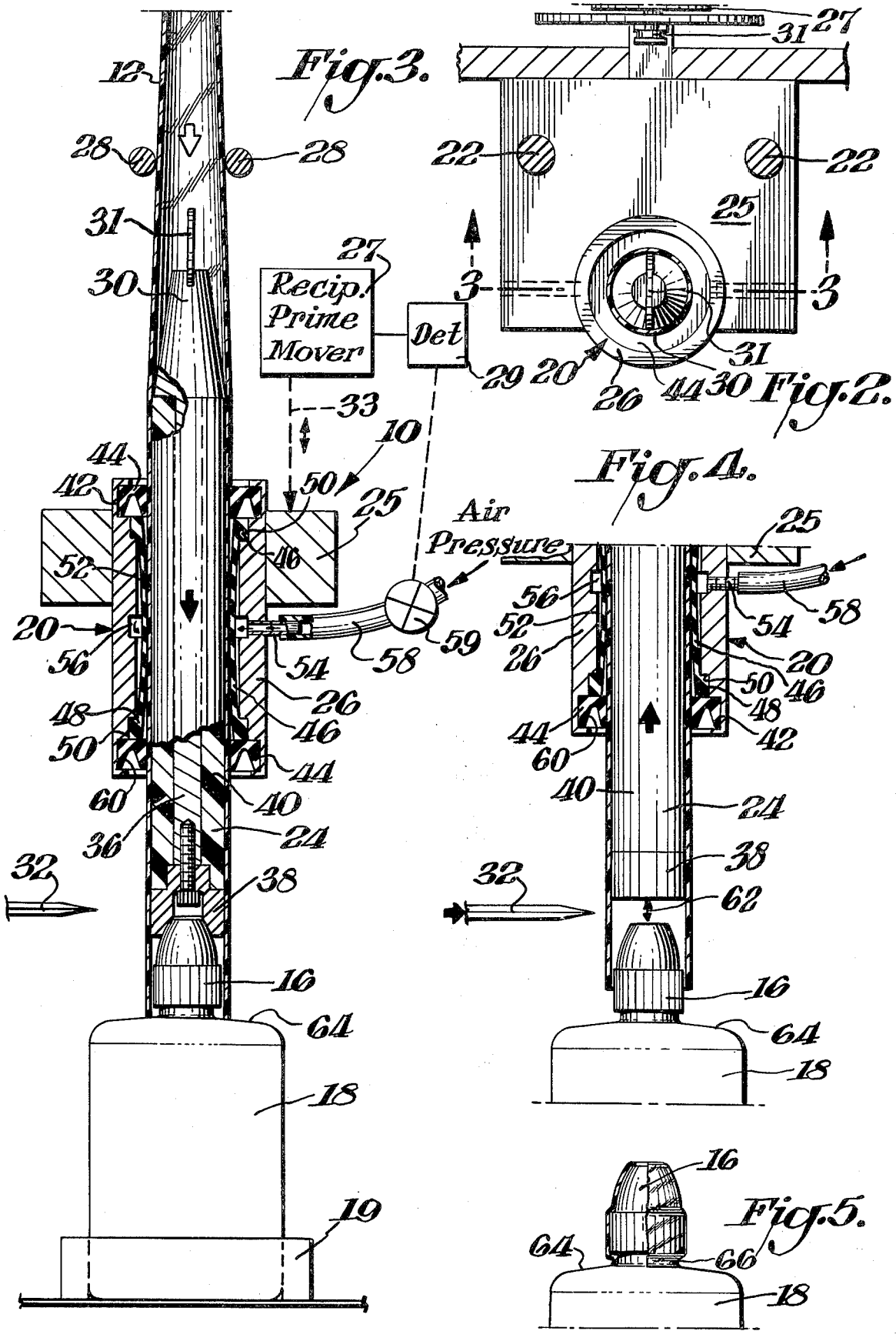


Fig. 1.


14
12
27
30
28
28
10
28
31
21
21
To Air
Supply
25
58
22
22
20
26
23
23
24
35
38
Prime
Mover
M
34
12
32
16
18
19


Fig.3.
Recip. Prime Mover
Det
Air Pressure
Fig.2.
Fig.4.
Fig.5.

APPARATUS FOR APPLYING TUBULAR NECKBANDS TO CONTAINERS

BACKGROUND OF THE INVENTION

An existing apparatus for applying plastic bands to the capped necks of containers, such as apothecary bottles, is described in *Food & Drug Packaging, Vol.* 25, Number 3, Aug. 5, 1971. It feeds shrinkable plastic tubing over a floating mandrel between the inner lips of a pair of inverted U-cup packing rings mounted within a feeding sleeve. The lips of the packing rings are, however, liable to slip when they become coated with dust or wear. Another existing apparatus described in U.S. Pat. No. 3,523,052 intermittently applies a troublesome vacuum to gripping jaws. An object of this invention is to provide a simple dependable apparatus for feeding tubular band stock over the necks of containers, which is not prone to slip because of wear, dust accumulations or for any other reason.

SUMMARY

In accordance with this invention a tubular diaphragm is secured inside the feeding sleeve between the inverted U-cup packing rings. Fluid pressure is admitted between the sleeve and the diaphragm in the down stroke of the sleeve to make the diaphragm positively grip the tubular band stock against the mandrel, which is provided with an antifriction surface, to facilitate feeding of the band stock material down over the capped necks of the containers.

BRIEF DESCRIPTION OF THE DRAWINGS

Novel features and advantages of the present invention will become apparent to one skilled in the art from a reading of the following description in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts and in which;

FIG. **1** is a side view in elevation of an apparatus for applying tubular band stock over the capped necks of containers, which apparatus incorporates one embodiment of this invention;

FIG. **2** is a top plan view of the sleeve and mandrel assembly of the apparatus shown in FIG. **1**

FIG. **3** is a cross-sectional view taken through FIG. **2** along the line **3—3** with the feeding mandrel and tubular band stock pushed downwardly over the capped neck of a container;

FIG. **4** is a cross-sectional view similar to the bottom portion of FIG. **3** with the mandrel and feeding sleeve moved upwardly away from the capped neck of the container; and

FIG. **5** is a front view in elevation partly broken away of the top portion of the container shown in FIGS. **1**, 3 and **4** with the neck band shrunk about its capped neck.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. **1** is shown an apparatus **10** for feeding shrinkable tubular plastic stock **12** wound on reel **14** onto the capped neck **16** of container **18** resting on platen **19**. Stock **12** may be a plastic, such as PVC (polyvinylchloride) or if cellulose may be retained in a water-preservative solution (not shown) to keep it moist. Containers **18** may be laterally advanced on a conveyor (not shown) in an automatic form of this invention similar to the conveyor described in U.S. Pat. No. 3,523,052, which utilizes vacuum gripping jaws to feed band stock material. Tubing **12** is advanced over capped neck **16** by a mandrel and sleeve assembly **20**, which continuously reciprocates down and up on guide rods **22** through yoke **25** between upper supports **21** and lower supports **23** in response to the reciprocating movement of prime mover **27** connected to yoke **25**. Reciprocating prime mover **27** is, for example, a reciprocating linkage **33** driven by an electric motor.

Mandrel and sleeve assembly **20** includes a central mandrel **24** and a rigid outer sleeve **26** which grip tubular band stock **12** between them. Stop pins **28** arrest the upward movement of mandrel **24** by engaging its tapered nose **30**. FIG. **1** also shows cut-off saw **32**, such as a jeweler's saw, rotated by a prime mover **34** (such as an electric motor). Saw **34** is inserted into and out of cutting position by prime mover **35** (such as an air cylinder) to cut tubing stock **12** about capped neck **16** after it is fed into place, as later illustrated and described.

Details of sleeve and floating mandrel assembly **20** are shown in FIG. **3**. Mandrel **24** has stainless steel axial core **36** with tapered nose **30** mounted above and inverted cup **38** mounted below it. Nose **30** and tapered cup **38** are also both made, for example, of stainless steel. A slippery antifriction polytetrafluoroethylene or polytrifluorochloro-ethylene sheath **40** is mounted about core **36** between nose **30** and inverted cup **38** to facilitate slipping of band stock material **12** over it. Inverted cup **38** has a tapered recess which abuts capped neck **16** to arrest the downward movement of mandrel **24**.

Feeding sleeve **26** is mounted about mandrel **24**. It includes terminal recesses **42** within its upper and lower ends, which receive inverted U-cup packing rings **44**. A resilient insert, such as tubular elastic diaphragm **46**, is longitudinally mounted within sleeve **26**, between rings **44**, and it is made of a resilient material, such as urethane rubber, having a hardness for example of **60** Shore. U-cup packing rings **44** are also made of rubber, such as Buna-N. Tubular diaphragm **46** has enlarged flanges **48** at its upper and lower ends, which are secured in annular grooves **50** within sleeve **26** next to outer recesses **42** which receive U-cup packing rings **44**. Flanges **48** are sealed within recesses **50**, for example, by a cement such as an epoxy, cyano acrylate or anaerobic polyester to provide a sealed annular space **52** between diaphragm **46** and the inner wall of mandrel sleeve **26**.

Tube **54** is inserted through the wall of mandrel sleeve **26** into communication with annular chamber **52** through distributing ring **56** to provide a fluid pressure thereto from conduit **58** such as compressed air of about four p.s.i. The compressed air forces tubular diaphragm **46** into firm contact about tubular plastic stock **12** which is in turn forced against sheath **40** of mandrel **24**. This in conjunction with the grasping action of inner lips **60** of U-cup packing rings **44** feeds band stock **12** down over mandrel **24** with its lower cup **38**, as shown in FIG. **3**, over capped neck **16** of container **18** onto which the band stock **12** is applied. Downward feeding of the tubular band stock over the capped necks is accomplished after bottom end **38** of mandrel **24** strikes capped neck **16**. Sleeve **26** thereafter continues moving downwardly until reciprocating linkages **33** is fully extended (shown in FIG. **1**). This overtravel of sleeve **26** pulls band stock **12** down and extends it past

mandrel 24 over the capped neck 16 of container 18.

FIG. 4 shows mandrel 24 and its lower cup 38 moved upwardly a slight distance away from capped neck 16, with pressure still expanding diaphragm 46 against sheath 40 to provide a slight clearance 62 between the bottom of mandrel 24 and the top of capped neck 16 above which cut-off saw 32 is actuated to sever the extended tubular band material slightly above cap neck 16. As sleeve 26 is moved upwardly after cutting off band stock 12, air pressure through tube 58 is terminated by detector 29 which actuates valve 59, this permits sleeve 26 to slip upwardly relative to band stock 12 after mandrel nose 30 strikes stops 28 and grasp a new length of stock for installation over the next capped neck 16. After extended tubular band stock 12 is severed, the containers 18 are transported to a shrinking heater, such as an infrared heat shrink tunnel, where heat is applied to dry and shrink the severed bands around cap necks 16. Prior to shrinkage the severed pieces of band stock 12 fall or are tamped down to abut against shoulders 64 of containers 18 to make sure that they cover the exposed neck portions 66 of capped necks 16 after shrinking as shown in FIG. 5. This final downward tamping of the severed portions of tubular band stock 12, if necessary, can be manually performed or automatically by any suitable automatic tamping means (not shown). Final drying of the shrunk bands may occur during storage.

When perforated stock is used with this apparatus, disc 31 in FIG. 3, serves as a plow to separate the perforations.

While mandrel and sleeve assembly 20 are moving upwardly, air pressure is exhausted from annular chamber 52 via control air valve 59 connected to line 58 and actuated by the prime mover 27 through detector 29. This release of pressure from the tubular diaphragm 46 allows sleeve 26 to overtravel when mandrel 24 strikes it's upper stops 28. The length of this overtravel determines the length of band stock 12 dispensed on cap 16.

At this upper travel point, air pressure is re-applied by detector 29 and control valve 59 to annular chamber 52 in back of tubular diaphragm 46 to maintain tubing 12 firmly gripped thereby to prevent any slippage between the tubular band stock 12 and the feeding sleeve 26, repeating the cycle. The air pressure is released by valve 59 actuated by detector 29 of a slight distance after the bottom of the down stroke of sleeve 26 and prime mover 27 (after band stock 12 has been severed). Diaphragm 46 is accordingly actuated to grasp on the down stroke and to release on the up stroke relative to band stock 12 and mandrel 24, after band stock 12 has been severed.

Although arrangements of this type without the tubular diaphragm start to slip because of dust deposits after a limited number of operating strokes, apparatus 10 has operated effectively for as much as about fifty thousand cycles before it was necessary to wipe dust accumulations off packing rings 44. Successful overall operation through many hundreds of thousands of operations has also been achieved.

For the larger diameters of tubing stock 12, axial core 36, FIG. 3, should be made for instance out of hollow aluminium tubing, thereby reducing the weight of mandrel 24. This weight reduction would prevent said mandrel from falling out of feeding sleeve 20, when air pressure is exhausted from diaphragm 46 on the upstroke.

I claim:

1. An improved apparatus for feeding shrinkable tubular band stock over the necks of containers comprising a reciprocating sleeve and floating internal mandrel gripping said tubular band stock between them and feeding it forward when the mandrel strikes the neck of a container characterized in that a resilient tubular insert having a substantial length is mounted within the sleeve and is disposable in forceful resilient pressure against the tubular band stock and the floating mandrel within it, the mandrel has an antifriction surface disposed opposite the pressure of the resilient tubular insert whereby downward movement of the sleeve and tubular band stock past the bottom end of the mandrel after it is arrested on the necks of the containers to extend the band stock around the necks of the containers is facilitated and length of upward and downward movement of the extended end of the tubular band stock is precisely controlled, said resiliant tubular insert comprising a tubular diaphragm having upper and lower ends, sealing means securing said upper and lower ends to upper and lower portions within said sleeve whereby an annular pressure-tight chamber is formed between the tubular insert and the inside of said sleeve, and a source of pressure is connected to said sleeve into communication with said chamber whereby said tubular diaphragm is firmly pressed against said tubular band stock and said mandrel within it to minimize slippage.

2. An apparatus as set forth in claim 1, wherein said resilient insert comprises an elastomeric insert.

3. An apparatus as set forth in claim 1, wherein said source of pressure comprises compressed air.

4. An apparatus as set forth in claim 3, wherein said tubular diaphragm comprises a tubular rubber diaphragm.

5. An apparatus as set forth in claim 4 wherein said tubular rubber diaphragm has enlarged upper and lower flanges and recesses are disposed when said upper and lower portion of said sleeve for receiving said flanges, and said sealing means comprises cement between said flanges and said recesses.

6. An apparatus as set forth in claim 1, wherein said antifriction surface comprises polytetrafluoroethylene or polytrifluorochloroethylene.

7. An apparatus as set forth in claim 6, wherein said polytetrafluoroethylene or polytrifluorochloroethylene comprises a substantial sheath extending substantially over the length of said mandrel.

8. An apparatus as set forth in claim 1, wherein inverted U-cup packing rings are supported within the top and bottom of said sleeve for helping grip said shrinkable tubular band stock.

9. An apparatus as set forth in claim 8, wherein said resilient insert comprises an elastomeric tubular diaphragm having upper and lower ends, sealing means securing said upper and lower ends to upper and lower portions within said sleeve whereby an annular pressure-tight chamber is formed between the tubular insert and the inside of said sleeve, and a source of pressure is connected to said sleeve into communication with said chamber whereby said tubular diaphragm is firmly pressed against said tubular band stock and said mandrel within it.

10. An apparatus as set forth in claim 1, wherein control means is connected to said source of pressure, detector means being included in said control means, and

said detector means being operatively associated with the upward and downward movement of said reciprocating sleeve whereby it actuates said control means to apply said source of pressure to said chamber on the down stroke of said reciprocating sleeve and to disconnect said source of pressure of said chamber during the up stroke of said reciprocating sleeve.

11. An apparatus as set forth in claim **10,** wherein cut off means is connected to said apparatus for severing said band stock after it is fed around the necks of the containers, and said detector means being constructed and arranged to maintain said source of pressure connected to said chamber a slight distance during said up stroke until after said severing means has severed said band stock just below the bottom end of the mandrel whereby a slight clearance is provided between the bottom of the mandrel and the top of the banded neck of the container for entry of said severing means.

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