

June 19, 1962

A. PANCRAZI

3,039,250

BOTTLE NECK FOILING DEVICE

Filed May 4, 1961

3 Sheets-Sheet 1

FIG. 1

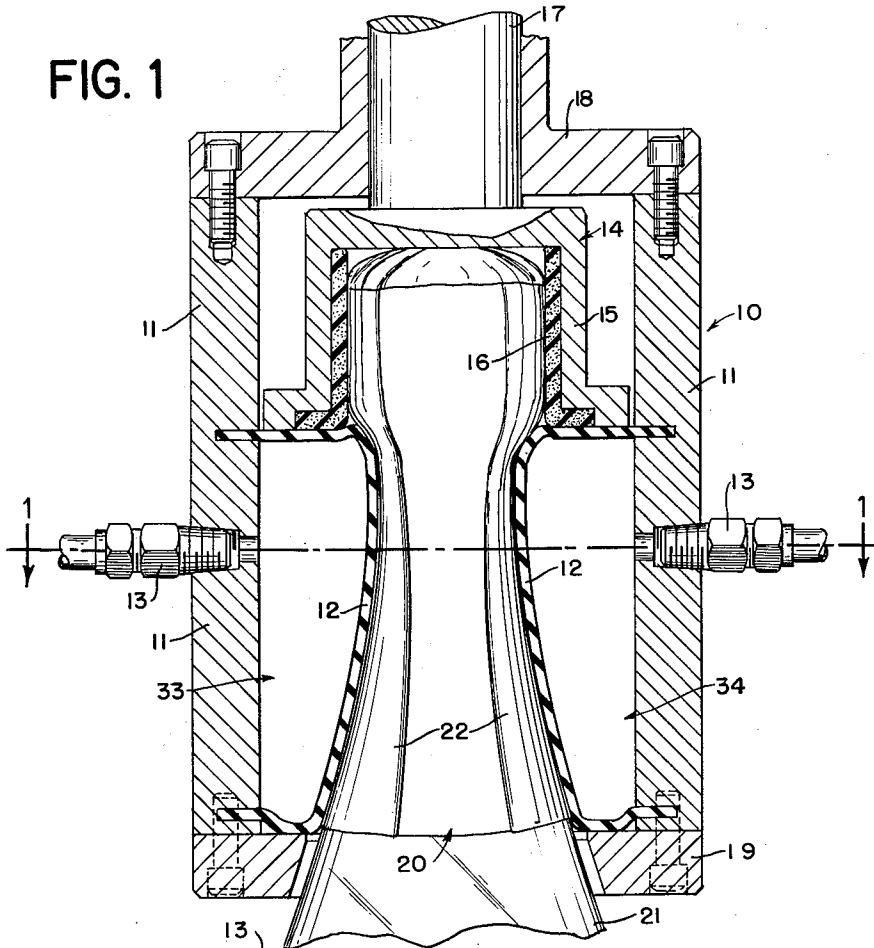
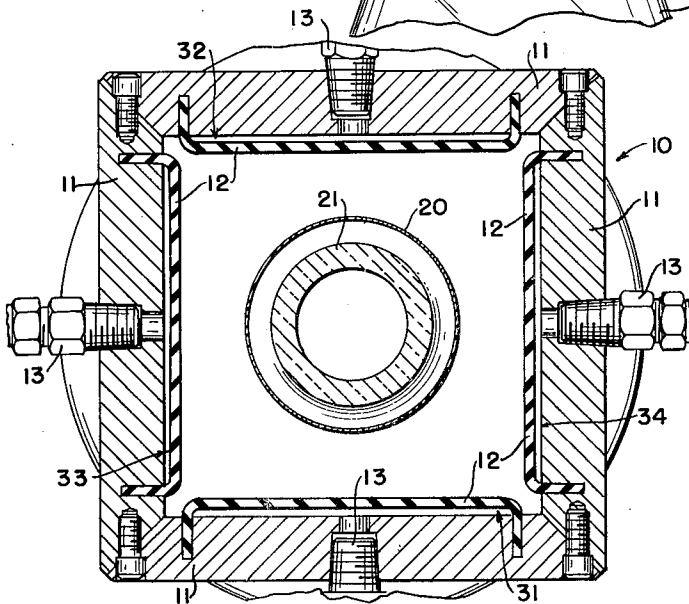


FIG. 2



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FIG. 3

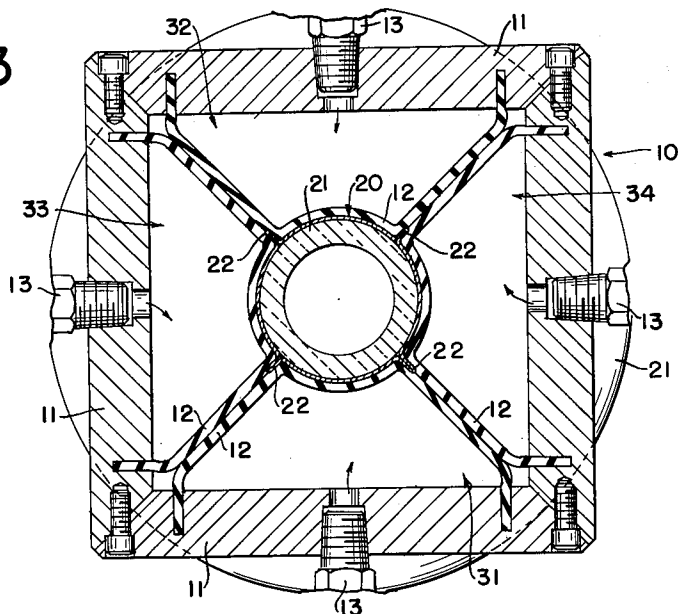
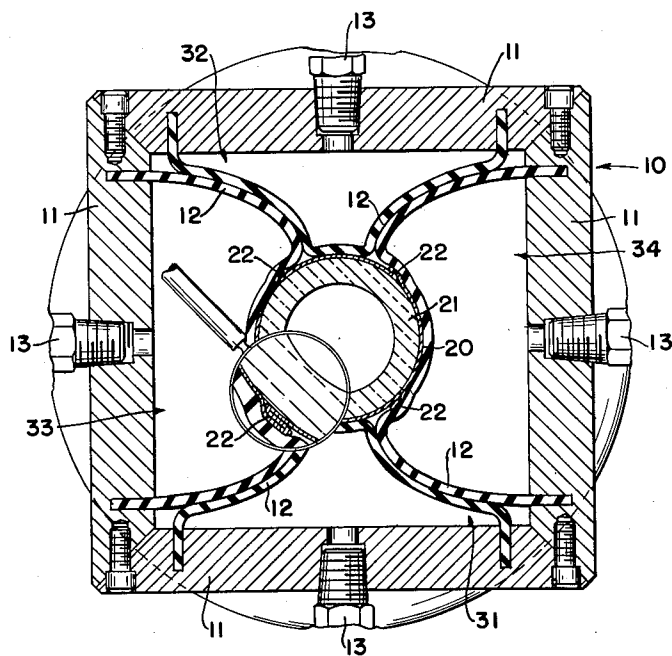


FIG. 4



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FIG. 5

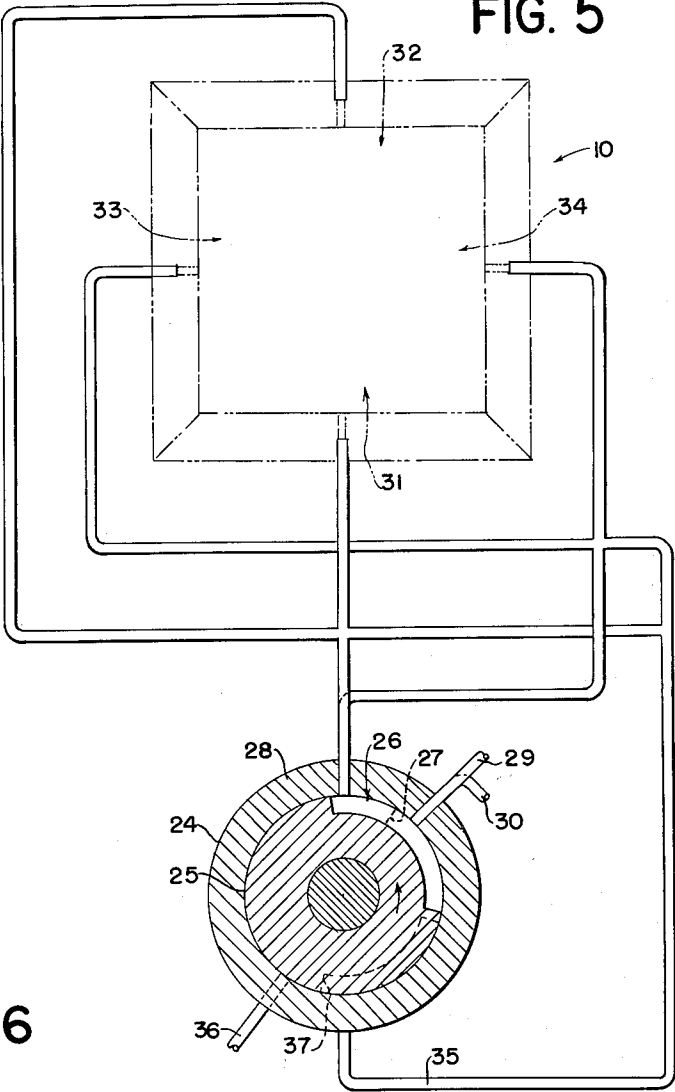
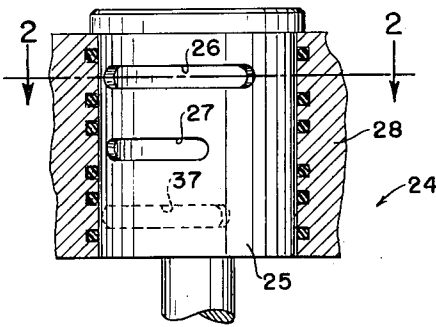


FIG. 6



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BOTTLE NECK FOILING DEVICE

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10 Claims. (Cl. 53—329)

My invention relates to packaging and more particularly to machinery for wrapping foil around the necks of bottle-shaped containers.

The tops of champagne bottles have been traditionally wrapped in metallic foil. Though the purpose of the foil is primarily aesthetic, it also serves to enclose the sealing wire which holds the cork in place. Enclosing the sealing wire in this manner protects it from inadvertent snagging and accidental opening. It also permits easy handling of the bottle around its top. Foils may serve another purpose in that some wineries label them with their distinctive marks.

Foiling the tops of these bottles presents a problem due to the shape of the surface to be foiled. The difficulty stems from the double curvature of the neck, namely that it is curved (usually circular) in a plane through the neck and also curved (usually hyperbolic) along the surface of the neck. Because of this double curvature it is impossible to shape a perfectly conforming surface from a flat piece of foil. Due to the geometry of the surfaces there must be some surplus foil when it is wrapped around the neck of the bottle. This surplus foil makes it difficult to obtain a tight, yet unwrinkled, foil surface.

The foil wrap is usually fabricated from a flat sheet of foil by first cutting a suitable pattern and then folding and gluing it to form a conic section to fit around the neck of the bottle. The bottom edge of the wrap is usually sized to rest on the neck. The top is then capped by folding over the excess foil and gluing it together or the top is made by gluing on a small circular piece of foil. Foils may be preprinted with the winery's label as a part of the fabrication step, either when the foil is flat, or after it has been shaped to form a conical surface.

This pre-shaped foil is positioned around the neck and top of the bottle and then pressed tightly against its surface. It is to this pressing operation that my invention is directed. The problem is to develop a machine which tightly seals the foil to the bottle in such a way as to present a smooth and attractive foil surface. Various machines, which have been developed to accomplish this, either fail to achieve the desired surface or yield a partly smooth surface only at the expense of complex and slow multistep pressing operations. The desirability of an attractive foil surface in current machines must be compromised with the high costs of installing and operating the necessary equipment.

My invention provides an effective and inexpensive machine for producing the desired surface. My device uses fluid pressure in a series of expansible diaphragms to seal the foil to the bottle. These diaphragms also gather the surplus foil into a series of fine pleats, which are then lapped over and sealed by differential pressure produced between adjacent expanded diaphragms.

In addition to achieving a tight, smooth foil surface, my machine also pleats and positions the surplus foil so as to consistently furnish a most satisfactory surface for a label preprinted on the foil. My machine is simple and fast, making it inexpensive to install, operate and maintain.

It is an object of my invention to provide a simple and inexpensive machine for foiling the necks of champagne bottles, which uses fluid pressure to uniformly seal the foil against the bottle, pleating and lapping over the surplus foil to present an attractive foil surface.

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It is another object of my invention to provide a new and inexpensive method for wrapping other types of doubly curved containers with various kinds of pliable foil which uses fluid pressure to seal the foil to the container and gather the surplus foil into a series of pleats, which pleats are then smoothly lapped over and pressed against the container to present an attractive foil wrap.

It is a further object of my invention to provide a bottle neck foiling machine which consistently positions a foil surface, uniformly smooth and large enough so as to permit the effective use of foils preprinted with the producer's label.

It is still another object of my invention to provide a device for foiling double curve-shaped containers at a low unit cost, employing machinery which has a minimum of moving parts making installation, operation and maintenance costs minimal.

Other objects and features of my invention will be apparent when the following description is considered in connection with the annexed drawings, in which:

FIGURE 1 is a vertical cross-sectional view of a foiling device in accordance with my invention, illustrated in its initial pressing stage. The bottle and foil are also shown in position in the foiling head for effecting the above-mentioned pressing operations;

FIGURE 2 is a horizontal cross-sectional view of the foiling device of FIGURE 1, illustrated just prior to the commencing of the pressing operation, the view being taken on the plane of the line 1—1;

FIGURE 3 is a horizontal cross-sectional view similar to FIGURE 2, illustrating the device when it has just completed the initial pressing and pleating stages;

FIGURE 4 is a horizontal cross-sectional view similar to FIGURE 2, illustrating the device when it has just completed the lapping and final sealing stage. An enlarged section of the sealed lap is included to better illustrate this final foiling step;

FIGURE 5 is a schematic diagram of a control arrangement for my foiling machine, including a cross-sectional view of the main control valve being taken on a plane through the upper annular groove of the control valve, designated line 2—2 in FIGURE 6; and

FIGURE 6 is an elevational view of the rotating element of the control valve of FIGURE 5, shown in a fragmentary cross-section of the valve housing.

Referring now to the drawings and particularly to FIGURES 1 and 2, the principal element of the foiling head 10 is an array of four matching pressure chambers which are fastened together by suitable means, such as the illustrated screws, to form a rectangular box, each chamber having an outside metal plate element 11 into which is sealed an expansible diaphragm element 12 fabricated from an elastic material such as soft rubber. The diaphragm 12 of each chamber is disposed toward the center of the array and may be inflated or deflated by fluid pressure, such as air or oil, admitted through the port 13 built into each of chamber plate elements 11.

The foiling head 10 also contains a safety plunger device 14 which comprises a cylindrical cup-shaped element 15, which is internally lined with an elastic material 16, such as rubber, connected to the lower end of a plunger 17. The plunger 17 moves up and down freely in a boss through a sleeve integral with the upper plate 18 of the foiling head. When the foiling head is in its raised position away from the bottle the plunger 14 rests on the lower plate 19 of the head. When the head lowers to its foiling position the plunger 14 rises to the position illustrated in FIGURE 1.

After the bottle has been filled and corked a cup-shaped foil wrap is placed around the neck of the bottle. As discussed earlier, since the conic-shaped foil 20 cannot

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conform to the doubly curved bottle neck 21, the foil necessarily fits loosely around the top and neck of the bottle (FIGURE 2). With the foil so placed the bottle is positioned under the foiling head.

The foiling head 10 is then lowered so as to seat the foil 20 around the neck of the bottle 21. As the head lowers, the internally lined cup-shaped element 15 centers the foil around the bottle 21 and rises with it relative to the head 10 until it seats against the upper plate 18. At this point the cup-shaped element 15 is forced around the top of the bottle by the continued lowering of the head 10, thereby squeezing the top part of the foil wrap around the bottle's lip and cork.

Referring particularly to FIGURE 2, with the foiling head in this lowered position the foil 20 fits loosely around the neck of the bottle 21. Each of the pressure chambers is then equally pressured through its port 13 which causes its expansible diaphragm 12 to inflate and push inward toward the foil 20. The diaphragms 12 continue to expand, pressing the foil 20 against the neck of the bottle 21. As the diaphragms expand, pressing around the neck of the bottle, they conform the foil 20 to the neck's shape.

Referring to FIGURE 3, in forcing the foil 20 to conform to the bottle neck's shape 21, the diaphragm element's leading edges push the surplus foil so as to collect it into a series of fine pleats 22, four in this particular arrangement, which form between adjacent fully expanded diaphragms, leaving the rest of the foil surface 20 smoothly sealed to the neck of the bottle 21.

Referring to FIGURE 4, a pressure differential between adjacent diaphragms is then produced by either raising or lowering the pressure in the non-adjacent pressure chambers, which causes the higher pressured diaphragms to expand further around the bottle and thereby lap the pleats of surplus foil over, sealing the pleats 22 smoothly against the bottle neck. Then the pressure is released from all of the pressure chambers, so as to free the foiling head 10 and diaphragms 12 of any contact with the foiled bottle 21. The head is then raised and the bottle removed from the wrapping station.

The device as illustrated has been operated very satisfactorily, using air pressure up to 50 p.s.i. The foiling operation at this pressure requires approximately five seconds. It is apparent that the speed of this device and the tightness of its seal can be increased by increasing the air pressure to the expansible diaphragms. Alternatively, tightness can be increased by merely using longer sealing time. Tightness and speed can therefore be varied to meet the particular requirement of each foiling operation.

An illustrative example of a means for controlling this foiling device is schematically illustrated in FIGURE 5. The device for controlling the pressure differential step of the foiling operation consists essentially of an air valve 24 which comprises a rotating central shaft 25, having two annular recesses 26 and 27 of graduated arc lengths (elevation in FIG. 6). The cylindrical valve housing 28 into which the rotating member fits, has a pair of inlet and outlet air ports for depressuring the two sets of non-adjacent inflatable chambers. The annular recesses are so positioned that when the rotating central shaft revolves counterclockwise to the point shown, annular recess 26 permits free communication of air chambers 31 and 32 through the valve housing port 29 to the air exhaust line. Pressure is maintained on chambers 33 and 34 until the shaft's rotation reaches the annular recess 27, at which point these chambers exhaust through port 30, permitting unencumbered removal of the foiled bottle.

The pressuring line 35 may also be controlled by the same rotating valve assembly. Air under pressure enters the housing 28 through port 36, passing through the annular recess 37 to air supply line 35 leading to all four chambers and maintaining equal pressure on each of the four pressure chambers until the shaft rotation reaches the edge of the annular recess 37.

The plunger 14 which was described above on centering

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and sealing the top part of the foil, is also a safety device for protecting against accidental rupture of the expansible diaphragms 12. When the foiling steps are completed and the head is raised from the bottle the plunger 14 drops down until it rests on the bottom plate 19 of the foiling head 10. When the plunger is in this position, should the pressure chambers be accidentally charged, the diaphragms cannot overexpand and rupture, since their expansion is limited by the presence of the plunger shaft 17 in the middle of the foiling head 10.

Although this description has been limited to foiling the tops of bottles, it is apparent that my invention could also be used in wrapping other types of double curved-shaped containers. It should also be clear that my invention is not limited to wrapping metal foil but rather can be used to wrap other types of pliable foil also. It should also be evident that the control arrangement described is illustrative only, and that other means are apparent to those skilled in the art. For example, the various steps listed in my method could be automatically synchronized with each other and with a bottle conveyor system.

Therefore, while I have described a preferred embodiment of my invention, it is to be understood that other various modifications may be made within the scope thereof. I wish, consequently, not to be limited by the foregoing description which was given solely for the purposes of illustration, but rather to be limited only by the claims granted to me.

What is claimed is:

1. An apparatus for tightly pressing a foil onto a doubly curved surface comprising, in combination, a plurality of pressure chambers provided with expansible diaphragm elements so disposed as to permit expansion of said diaphragms against a foil positioned on the surface to be foiled, means for pressuring said pressure chambers so as to expand said diaphragms against said foil and surface and to press said foil against said surface initially at a limited area of contact between said diaphragm and surface and then progressively across said surface thereby pressing foil against said surface and forcing surplus foil to advance with said diaphragm's expanding fronts to form a pleat between adjacent expanded diaphragms, means for causing a pressure differential between adjacent expanded diaphragms so as to lap over the pleat of surplus foil toward the lower pressured diaphragm of said adjacent diaphragms and to press said lapped pleat against said surface, and means for depressuring said pressure chambers so as to permit unencumbered removal of the foiled surface.

2. An apparatus for tightly pressing a foil around a doubly curved container comprising, in combination, a plurality of pressure chambers provided with expansible diaphragm elements, said pressure chambers being mounted in an array positioned around said container with said diaphragms disposed so as to be expansible against foil positioned around said container surface, means for pressuring said pressure chambers so as to expand said diaphragms against said foil and surface and to press said foil against said surface initially at a limited area of contact between said diaphragm and surface and then progressively across said surface thereby pressing foil against said surface and forcing surplus foil to advance with said diaphragm's expanding fronts to form a pleat between adjacent expanded diaphragms, means for causing a pressure differential between adjacent expanded diaphragms so as to lap over the pleat of surplus foil toward the lower pressured diaphragm of said adjacent diaphragms and to press said lapped pleat against said surface, and means for depressuring said pressure chambers so as to permit unencumbered removal of the foiled container.

3. An apparatus for tightly pressing a foil around the neck of a bottle-shaped container comprising, in combination, a plurality of pressure chambers provided with expansible diaphragm elements, said pressure chambers being mounted in an array positioned around said neck of

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a bottle-shaped container with said diaphragms disposed so as to be expansible against foil positioned around said container surface, means for pressuring said pressure chambers so as to expand said diaphragms against said foil and surface and to press said foil against said surface initially at a limited area of contact between said diaphragm and surface and then progressively across said surface thereby pressing foil against said surface and forcing surplus foil to advance with said diaphragm's expanding fronts to form a pleat between adjacent expanded diaphragms, means for causing a pressure differential between adjacent expanded diaphragms so as to lap over the pleat of surplus foil toward the lower pressured diaphragm of said adjacent diaphragms and to press said lapped pleat against said surface, and means for depressuring said pressure chambers so as to permit unencumbered removal of the foiled container.

4. An apparatus for tightly pressing a foil around the neck of a bottle comprising, in combination, an array of four pressure chambers provided with expansible diaphragm elements, said pressure chambers being mounted in a foiling head capable of being positioned around the neck of said bottle with said diaphragms disposed so as to be expansible against said foil positioned around said neck, means for so positioning said head around said neck, means for pressuring said pressure chambers so as to expand said diaphragms against said foil and surface and to press said foil against said surface initially at a limited area of contact between said diaphragm and surface and then progressively across said surface thereby pressing foil against said surface and forcing surplus foil to advance with said diaphragm's expanding fronts to form four pleats between the adjacent expanded diaphragms, means for causing a pressure differential between adjacent expanded diaphragms so as to lap over the pleat of surplus foil toward the lower pressured diaphragm of said adjacent diaphragms and to press said lapped pleat against said surface, and means for depressuring said pressure

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chambers so as to permit unencumbered removal of the foiled surface.

5. An apparatus as in claim 4, in which said means for pressuring said pressure chambers is air pressure.

5 6. An apparatus as in claim 4, in which said means for pressuring said pressure chambers is air pressure variable in an approximate range between 15 to 50 p.s.i.

7. An apparatus as in claim 4, in which said means for pressuring said chambers is hydraulic pressure.

10 8. An apparatus as in claim 4, in which said means for pressuring said pressure chambers is hydraulic pressure variable in an approximate range between 15 to 50 p.s.i.

9. An apparatus as in claim 4 in which said means for pressuring said pressure chambers and said means for causing said pressure differential between adjacent expanded diaphragms are synchronized with each other and with the said head positioning means so as to automatically perform the head positioning, foil pressing and lapping steps in proper sequence.

20 10. An apparatus as in claim 4, in which is provided a plunger element comprising a plunger which is loosely sleeved through a plate attached to the top of the foiling head and a lower cylindrical element internally lined with elastic material, said cylindrical element being sized to force fit around the top of the bottle to be foiled, said plunger being so mounted that when the foiling head is positioned around the neck of the bottle said lined cylindrical element fits tightly around the top of the bottle pressing said foil against said bottle surface, said plunger also being so mounted that when the foiling head is removed from around the bottle said plunger lowers to rest on a plate attached at the bottom of the foiling head thereby limiting said diaphragm's freedom of expansion to prevent rupture from accidental charging of said diaphragms with no bottle in place between said diaphragms.

No references cited.