Aug. 3, 1937. O. J. BRUUN 2,088,635

HYDRAULIC CAPSULING MACHINE

Filed June 30, 1933

Fig. 1.

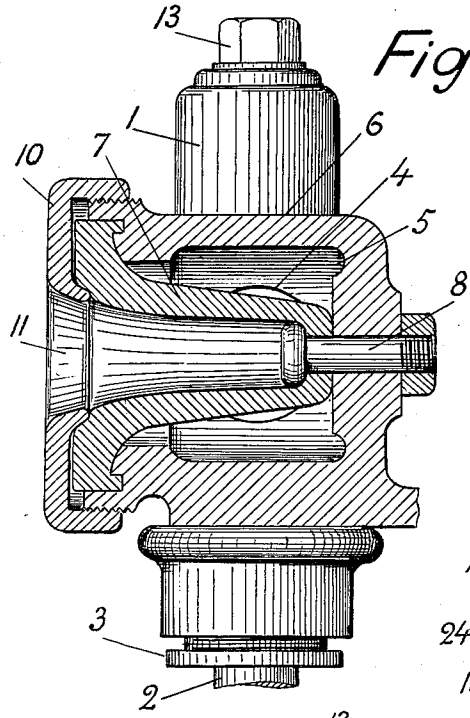


Fig. 2.

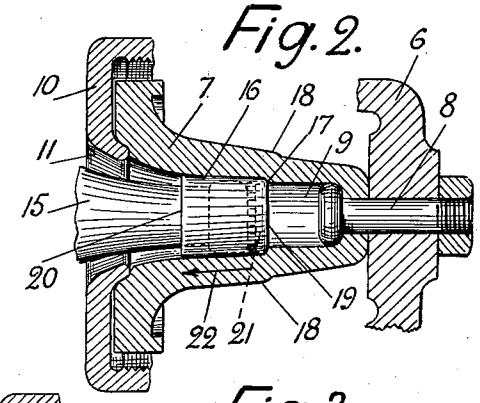


Fig. 3.

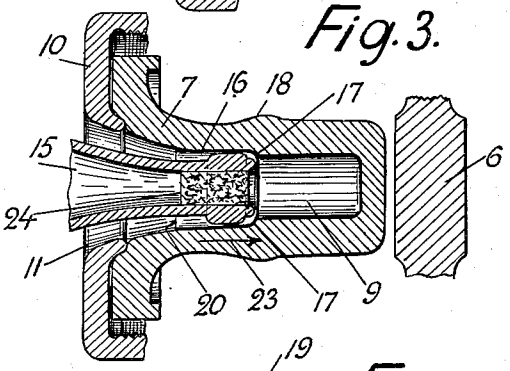


Fig. 4.

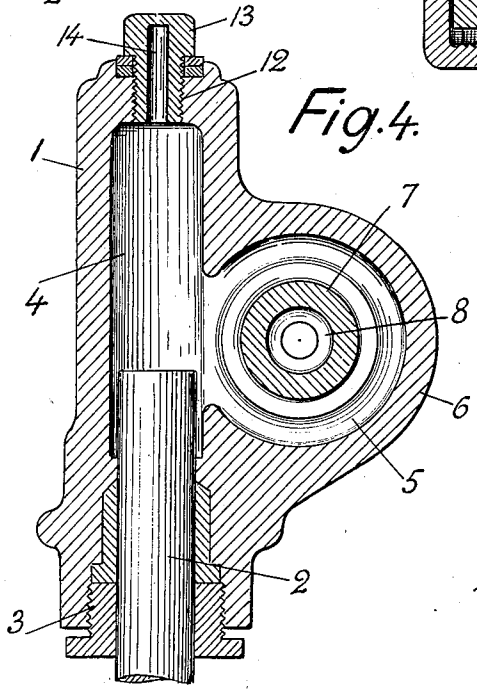


Fig. 5.

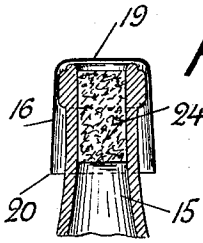


Fig. 7.

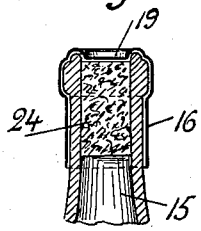
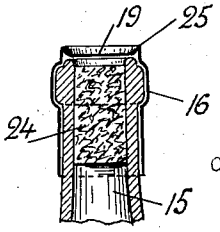


Fig. 6.



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HYDRAULIC CAPSULING MACHINE

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Application June 30, 1933, Serial No. 678,443
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12 Claims. (Cl. 226—85)

This invention relates to improvements in hydraulic capsuling machines of the kind having an elastic sleeve encircled by a liquid chamber, in which the liquid pressure on the sleeve is controlled by a piston, adapted to be moved inwards and outwards in said liquid chamber. Such machines are used in capsuling bottles with the so-called tin-foil capsules.

The invention relates more specially to elastic sleeves for such hydraulic capsuling machines and has for its object to improve the working of such devices, mainly so as to make it possible to perform a perfect capsuling, using capsules of very thin tin-foil.

The above mentioned sort of capsuling machines are commonly used for applying the known cup-shaped tin-foil capsules, but are not suitable for attachment of the kind of capsules that are made from thin soft metal foil with fluted sides. In order to enable capsules of this nature to be affixed tightly and smoothly to the bottle neck, it is for instance necessary for the capsuling machine to be fitted with a device, by means of which the capsule is stretched tightly over the mouth of the bottle and maintained in position there, until the actual squeezing into position is effected.

It is known to effect this stretching of the capsule, before the actual squeezing into position is effected, in such a manner that a capsuling member consisting of a rubber sleeve, the inside diameter of which is somewhat larger than the bottle neck, and which sleeve by an increase in the liquid pressure on the outside thereof is compressed so far, before the introduction of the bottle neck, that the diameter of the clear opening in the sleeve will thereby become smaller than the diameter of the bottle neck. After the final squeezing into position has taken place, the pressure is then removed so that the rubber sleeve will again expand, and the diameter of the clear opening will be larger than the diameter of the bottle neck, and will thereby allow the capsuled bottle neck to be freely removed. This process has proved unsuitable in practice, partly because the machine parts causing the diameter of the rubber sleeve to be reduced must be adjusted separately for each individual neck diameter of the bottles to be capsuled, and partly because bottle necks of one and the same batch of bottles are mutually of highly varying diameters, in such a manner that some capsules, for a certain definite adjustment of the squeezing member, during the insertion into the partly compressed sleeve will meet a friction that is just suitable for producing the desired stretching, while other capsules applied to bottle necks having a smaller diameter will not be stretched sufficiently, and still other capsules applied to bottle necks with a larger diameter will be stretched so much, during the insertion into the sleeve, that they will be torn. This will happen with still greater certainty as soon as the bottle neck is only a little too large, as the heretofore known squeezing members have no yielding power, and because the rubber sleeve itself, which is held in position by the squeezing members, for instance the uncompressible liquid maintained under pressure around the sleeve, is not in itself sufficiently yielding to be able to adjust itself to the varying diameter of bottles.

The present invention relates for instance to an arrangement by which it becomes possible to effect the requisite stretching of capsules over the bottle aperture, and to maintain the capsules in the stretched state during the actual squeezing into position on bottles of various diameters, without the necessity of effecting any adjustment of the parts of the device, and without the above mentioned drawbacks appearing.

This advantage is attained, according to the invention, in that the elastic sleeve itself, without any previous reduction of the diameter, is fitted with a throat, the clear diameter of which is smaller than the diameter of the smallest bottle neck with capsule loosely applied, and in that the liquid chamber encircling the sleeve is given a yielding wall allowing, without any appreciable increase in the liquid pressure, the escape of the quantity of liquid that is displaced by the insertion of the bottle neck with loosely applied capsule into the narrow part of the sleeve, which is hereby expanded. In this manner the friction adjusts itself automatically against the sides of the capsule, whether the diameter of the bottle neck inserted be somewhat larger or smaller, and secures for all the capsules a uniform stretching, without any risk of the capsule being torn to pieces on bottles happening to have a larger diameter than the normal one.

It is of especial advantage for this purpose to provide, at some point or other of the liquid chamber, an air cushion sufficiently large to take up the quantity of liquid displaced by the largest bottle neck, may be fitted with an external bottle stopper, for instance a Crown-Cork which may occur among the bottles to be capsuled, without the pressure rising appreciably, and hereby the advantage is attained that the friction against the sides of the capsule, during the insertion into

the sleeve, will be of about the same magnitude, whether the neck diameter be larger or smaller.

When after the squeezing into position of the capsule the pressure against the outside sleeve is removed, and the sleeve has again returned to its natural shape, in which the clear diameter is smaller than the bottle neck with its capsule applied, the sleeve will continue to exert a pressure against the bottle neck and the capsule thereon. However, as the diameter of the bottle neck with the capsule pressed on to the same will now be smaller than during the insertion, when the capsule was loosely applied, and as the capsule furthermore has now assumed the shape of the bottle neck and, consequently, is fixed in position, it will now be possible to remove the bottle neck from the sleeve, without tearing the capsule, although the sleeve according to the invention is fitted with a throat, which also after the capsule is squeezed into position will exert a pressure against the bottle neck.

After the capsule has been squeezed into position a reduced pressure may also be created in the liquid surrounding the sleeve, in such a manner that the latter will expand and the diameter of the clear opening in the same will be larger in the position of repose of the sleeve, and in such a manner that it will be possible to withdraw, without any friction, the bottle with the capsule attached thereto.

In order to attain a perfectly smooth squeezing into position of the capsule, the latter will have to be smoothed at the same time as it is pressed into position, and the squeezing into position must be effected in such a manner that the air between the loosely applied capsule and the bottle neck can escape. This cannot be done, unless the squeezing into position be effected gradually, which result according to the invention can be attained by giving the sleeve wall a varying thickness.

When the bottle neck is introduced into the throat of the sleeve, which according to the invention is smaller than the diameter of the bottle neck with the capsule loosely applied, there will hereby be formed in the bottom of the sleeve an air-tight cavity, in which the air enclosed will be compressed when the walls of the sleeve are pressed inward. The compressed air formed in this manner will press the top of the capsule firmly against the bottle seal with a soft elastic pressure on the entire surface, without any embossment pressed into the top of the capsule being thereby injured.

The squeezing into position of the top of the capsule against the bottle stopper has heretofore been attained by pressing the mouth of the bottle, with the capsule loosely applied thereto, against a fixed stop provided in the sleeve, the result being that the capsule did not fit smoothly at the top, while at the same time any embossment impressed into the top of the capsule would be destroyed by being pressed against the fixed stop.

The resistance from the compressed air in the cavity has the further effect that the sleeve will be supported during squeezing operation at the points where it does not rest against the bottle and the capsule applied thereto, in such a manner that these parts of the sleeve will not be unduly stressed and for this reason will be very durable.

The following drawing is illustrative of the invention, in which:—

Fig. 1 represents an axial section of the sleeve and the adjoining parts of the machine,

Fig. 2 represents an axial section of a sleeve with a bottle inserted with the capsule loosely applied and covering a Crown-Cork stopper,

Fig. 3 represents a corresponding section of a differently constructed sleeve holding a bottle with a deeply seated stopper,

Fig. 4 represents a cross-section of the sleeve and the adjoining machine parts,

Fig. 5 represents a bottle neck with its capsule loosely applied,

Fig. 6 represents an axial section of a bottle neck with an improperly applied capsule, which has not been stretched over the bottle mouth before being squeezed into position, and

Fig. 7 represents a bottle neck with a capsule properly applied and stretched over the bottle mouth before the squeezing into position.

The device consists of a cylinder **1**, in which a piston **2** in manner known per se can be moved back and forth through a stuffing box **3**. The inner cavity **4** of the cylinder communicates with the inner cavity **5** of a casing **6**, in which an elastic sleeve **7** is inserted. According to the invention the diameter of the clear width of the sleeve decreases in inward direction, which decrease in the constructions shown is produced by the sleeve having the shape of a solid of revolution the curved generatrix of which is turning its convexity towards the axis. The bottom of the sleeve in the machine shown on Figs. 1 and 2 is pressed tightly against the casing **6** by means of a bolt **8**. In the machine shown in Fig. 3 the bottom of the sleeve is solid. The sleeve **7** is held firmly along its outer edge by means of a screw-cover **10**, which is screwed firmly on to the casing **6**, and which is fitted with an opening **11**, by way of which the bottle can be introduced into the sleeve **7**.

The cylinder **1** is fitted at the top with a filling aperture **12** closed by a screw-plug **13**, which according to the invention is hollow, the screw-plug **13** being provided with an inner cavity **14** forming an air cushion communicating with the cavity **4** in the cylinder **1**.

The device operates in the following manner:

When the capsuling machine is to be made ready for use the piston **2** is moved out to the position it has to occupy when the sleeve is in its position of repose. After this the chambers **4** and **5** are filled with liquid, preferably glycerine, and the screw-plug **13** is then screwed into position. The parts occupy now the position shown in Fig. 4, in which the liquid in the chambers **4** and **5** are exposed to atmospheric pressure, while the surface of the liquid is just at the same level as the bottom side of the screw-plug **13**.

If now a bottle **15** with loosely applied capsule **16** is inserted through the opening **11**, it will only be feasible to push the same freely so far forward that the edge **17** on the bottle mouth, or the bottle stopper attached above the same, will be in contact with the inner wall of the sleeve. When the bottle is moved further forward while overcoming the friction between the sleeve and capsule, the latter will be stretched down over the bottle mouth, and will be held in position by a certain pressure along the edge **17**. At the same time the sleeve **7** is expanded by the bottle and capsule isserted, so that a bulb **18** will be produced on the outside of the sleeve. Owing to the liquid chamber **5** having a yielding support on the air cushion **14** in the cavity **4**, such an expansion of the sleeve can freely take place, without the liquid pressure in the chamber **5** being increased appreciably. The stretching of the capsule top and the fixing of the stretched cap-

sule thus attained will be independent of the diameter of the bottle or the bottle stopper, when only the said diameter is large enough to cover the clear opening in the sleeve.

Then the piston 2 is moved inward. At the start the liquid is hereby pressed into the cavity 14, until the pressure in the same becomes sufficient to overcome the resistance from the sleeve 7, after which the latter is compressed firmly about the bottle neck and squeezes the stretched and fixed capsule firmly about the bottle neck, in such a manner that the capsule 16 will be conformed smoothly and firmly, as shown in Fig. 7, and will closely take the shape of the bottle neck.

As the walls of the sleeve will yield first to the liquid pressure at the points where the latter are thinnest, the squeezing into position, by making the thickness of the sleeve wall varying, will propagate itself gradually along the sides of the capsule, either from the top 19 of the capsule to the foot 20 of the same or vice versa, all depending on the thickness of the walls of the sleeve decreasing gradually in one or the other direction. Hereby, simultaneously with the squeezing into position of the capsule, a smoothing of the capsule and a removal of the air contained in the capsule will be effected.

In the construction shown in Fig. 2 the sleeve has a decreasing wall thickness running from the inlet opening 11 and towards the bottom. The sleeve will therefore first be pressed inward around the cavity 9 formed in the sleeve and limited by the bottle and the bottom of the said sleeve, and then around the edge 17. By compression of the air in the cavity 9 the top 19 of the capsule will be pressed firmly around the edge 17 and against the bottle stopper 21, which in Fig. 2 is shown as a Crown-Cork stopper encircling the mouth of the bottle. Subsequently the capsule is pressed against the lower part of the bottle neck, in such a manner that the capsule simultaneously with the squeezing into position will be smoothed out in the direction indicated by the arrow 22 in Fig. 2, while at the same time the air enclosed between the capsule and the bottle neck will be expelled or pressed out.

After this the piston 2 is again moved outward, whereby the liquid pressure in the chambers 4 and 5 will again sink down to the atmospheric pressure, and the sleeve will then again assume the shape shown in Fig. 2. After this the bottle with the capsule applied thereto can be withdrawn, without any danger of tearing. In order to make certain that the bottle can easily be withdrawn, without the capsule being torn off, a vacuum may also be produced in the chamber 5 by moving the piston 2 farther outward than to the position corresponding to atmospheric pressure in the said chamber. The sleeve will thus be expanded beyond the position of repose, and will thereby be removed entirely from the capsule, which is now squeezed into position and smoothed out.

In the construction shown in Fig. 3 the wall thickness of the sleeve is increasing from the inlet opening 11 towards the bottom of the sleeve.

When here the pressure in the chamber 5 is increased, after the bottle with the loosely applied capsule has been inserted and has formed the bulb 18 on the sleeve, whereby at the same time the capsule has been stretched down over the mouth of the bottle, the sleeve will first be pressed inward against the bottle with the end 20 facing the aperture 11. The capsule will therefore first be squeezed into position along its lower edge, and will be smoothed up towards the edge 17 gradually as the squeezing inward of the sleeve is extended, and some of the capsule material will be pressed past the said edge, in the direction of the arrow 23, in such a manner, that when the sleeve at the top end also commences to bend inward owing to the constantly increasing pressure in the chamber 5, there will be accumulated at this point a surplus of material at the top 19 of the capsule, which will be necessary if the stopper 24, by means of which the bottle is closed as shown in Fig. 3, has been pressed farther into the bottle mouth than the edge of the latter, or the bottle stopper contains parts projecting beyond the edge of the bottle neck.

Owing to this surplus material it will be feasible in such cases to cause the capsule that has been squeezed into position to fit smoothly around the bottle neck and to rest against the bottle stopper as shown in Fig. 7.

A feature common to both of the constructions shown in Figs. 2 and 3 is that the squeezing into position and the smoothing of the capsule are effected gradually, which result is attained by giving the sleeve a varying wall thickness.

If it were attempted to apply a capsule without taking care that the same should be stretched down about the bottle mouth and be held in position thereon while stretched, the capsule 16 would fit poorly as shown in Fig. 6, in which a sharp annular edge 25 at the top near the bottle mouth will be formed by the surplus material produced by the compression.

The arrangement may be modified in various manners without transgressing the boundaries of the invention, and it should be pointed out especially that the sleeve 7 may have other forms than shown, as for instance the clear width does not have to be decreasing throughout the entire length, but may increase again after the minimum cross-section desired for the work has been passed.

Further, the sleeve does not have to be shaped like a solid of revolution, but may be of oval cross-section, which will be suitable if the bottles to be capsuled are fitted with a stopper fitted with an opening device disposed on the side, or in the case of bottles fitted with a drop-spout or the like.

On the other hand, if the work is to be done with capsules made from thin metal foil with previously impressed corrugations, the inside of the sleeve must necessarily be smooth, without any incisions, folds or the like.

I claim:

1. A process for applying capsules having top and skirt portions to bottles, which comprises the steps, initially applying an unrestrained pressure over the entire skirt portion of a capsule to stretch the capsule over the mouth of a bottle, maintaining said capsule in its stretched position, and thereafter compressing the capsule into close conformity with the bottle.

2. A process for applying capsules having top and skirt portions to bottles, which comprises the steps, initially applying an unrestrained elastic pressure progressively downwardly over the entire skirt portion of a capsule to stretch and fix the capsule over the mouth of a bottle, maintaining said capsule in its stretched position, and thereafter compressing the capsule into close conformity with the bottle.

3. A process for applying capsules to bottles, which comprises the steps, introducing a bottle having a loosely applied capsule thereon within

an elastic member initially having a clear diameter less than that of the bottle in contact with the capsule whereby an elastic pressure is applied to stretch the capsule over the mouth of the bottle, maintaining said capsule in stretched position, and thereafter applying pressure on said elastic member to compress the capsule into close conformity with the bottle.

4. A process for applying capsules to bottles, which comprises the steps, applying an unrestrained elastic pressure against a capsule to stretch the same into contact with a bottle adjacent its mouth, maintaining said capsule in stretched position, and thereafter applying a fluid pressure to compress the complete capsule into close conformity with the bottle.

5. A process for applying capsules to bottles, which comprises the steps, loosely positioning a capsule upon a bottle mouth, initially applying an unrestrained pressure upon the capsule to smooth and stretch the same over the bottle mouth, maintaining said unrestrained pressure to hold the entire capsule in fixed position relative to the bottle adjacent thereto, and thereafter compressing the capsule from its fixed position into close conformity with the bottle.

6. A capsule-applying machine for applying capsules to bottles, comprising an elastic sleeve member having a normal clear diameter less than the bottle diameter adjacent the capsule supported thereon, a fluid chamber surrounding said elastic sleeve member, a piston member adapted to exert a pressure on said elastic member, and an air cavity associated with said fluid chamber whereby fluid within the chamber may be displaced to permit unrestrained adjustment of the elastic sleeve member to varying sizes of bottles.

7. A capsule-applying mechanism for applying capsules to bottles, comprising an elastic sleeve member adapted to receive a bottle loosely supporting a capsule thereon, said sleeve member having a normal clear diameter less than that of the bottle adjacent its capsule, and a fluid chamber surrounding said elastic sleeve member having a piston reciprocally mounted therein, said elastic member being adapted to exert and maintain an elastic stretching pressure upon the capsule adjacent the top of the bottle, and said piston being adapted to compress said capsule into close conformity with the bottle.

8. In a capsule-applying machine, an elastic sleeve member having a normal clear diameter less than that of a bottle having a capsule loosely supported thereon, said sleeve member being adapted to initially stretch the capsule over the bottle adjacent its mouth, a fluid chamber surrounding said elastic sleeve member, a piston cooperating with said fluid chamber and adapted to exert a pressure upon said elastic sleeve member to compress the capsule into close conformity with the bottle, said elastic sleeve member being provided with a wall of graduated thickness whereby the compression pressure adjusts itself along the depth of said capsule.

9. In a capsule-applying mechanism, an elastic sleeve member having a normal clear diameter less than that of a bottle having a capsule loosely supported thereon, a fluid chamber surrounding said elastic sleeve and equipped with a piston for exerting a pressure on said elastic sleeve member, an air cavity associated with said fluid chamber to permit displacement of said elastic sleeve to accommodate varying sizes of bottles without exerting any initial fluid pressure thereon, said elastic sleeve being adapted to initially stretch the capsule over the bottle adjacent its mouth, and said piston being adapted to compress the capsule into close conformity with the bottle.

10. A process for applying capsules having top and skirt portions to bottles, which comprises the steps, loosely supporting a capsule upon a bottle mouth, initially applying an unrestrained pressure progressively downwardly over the entire depth of said capsule skirt, whereby the capsule is stretched over the mouth of a bottle, maintaining said capsule in stretched position, and thereafter applying additional pressure to compress the capsule into close conformity with the bottle.

11. A process for applying capsules having top and skirt portions to bottles, which comprises the steps, loosely supporting a capsule upon a bottle mouth, inserting said bottle with its loosely supported capsule within an unrestrained elastic member initially having a clear diameter less than that of the bottle in contact with the capsule, whereby the elastic member contacts the skirt portion only of the capsule to stretch the capsule over the mouth of a bottle and provides entrapped air within a space between the elastic member and the top portion of the capsule, maintaining said capsule in stretched position, and thereafter applying pressure to said elastic member and entrapped air to compress the capsule into close conformity with the bottle.

12. A process for applying capsules having top and skirt portions to bottles, which comprises the steps, loosely positioning a capsule upon a bottle mouth, initially applying an unrestrained pressure progressively downwardly over the entire depth of said capsule skirt to smoothly stretch the capsule over the bottle mouth, maintaining said capsule in stretched position, and thereafter applying additional pressure to compress the capsule into close conformity with the bottle while simultaneously expelling air from between the capsule and its supporting bottle.

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