May 26, 1936. H. F. GLUNZ 2,042,304

METHOD OF AND APPARATUS FOR APPLYING CLOSURES TO CONTAINERS

Filed Oct. 23, 1933 3 Sheets-Sheet 1

Fig. 1

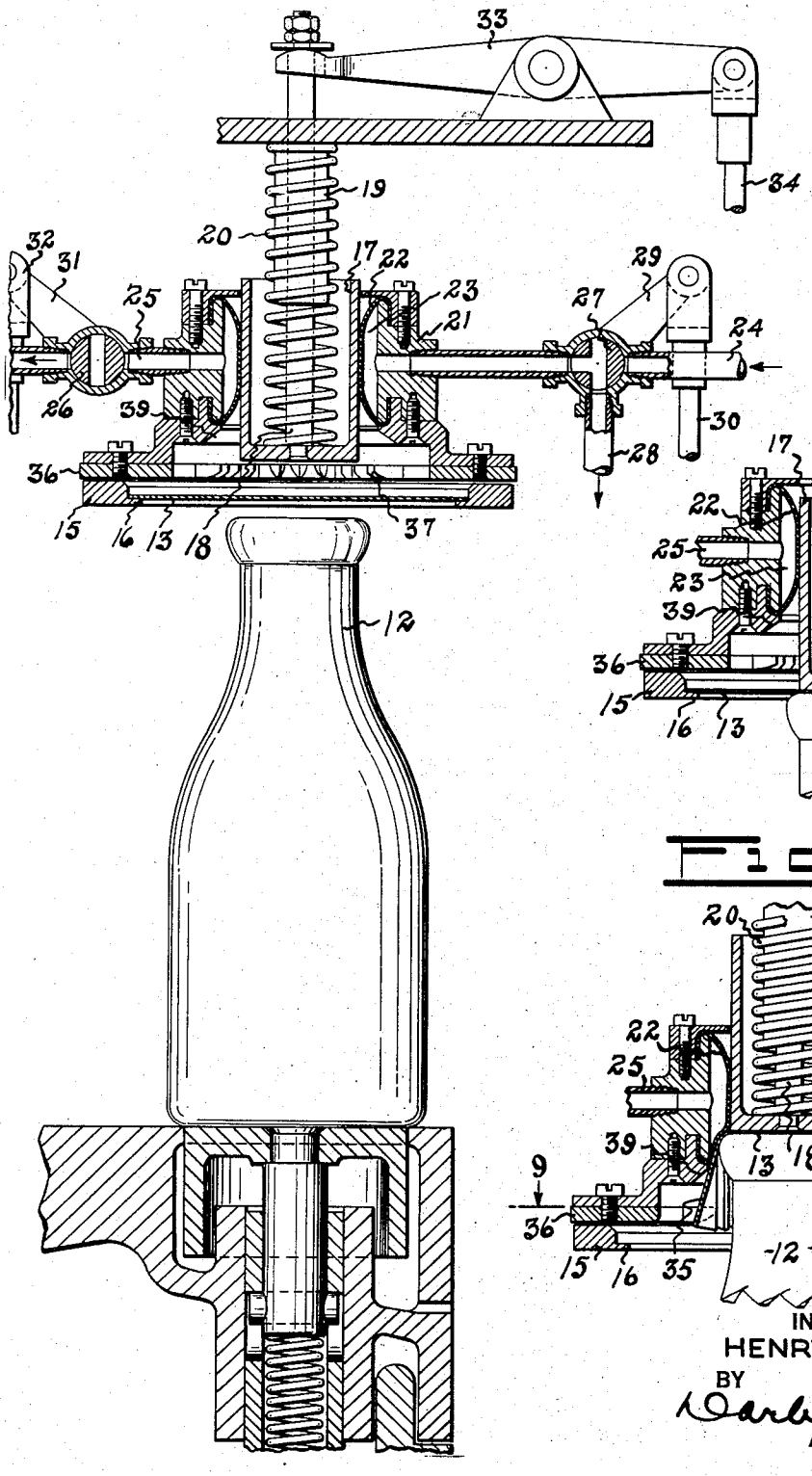



Fig. 2

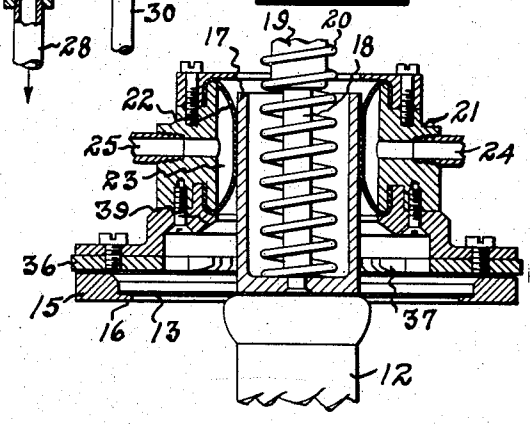



Fig. 3




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Filed Oct. 23, 1933 3 Sheets-Sheet 2

Fig. 4

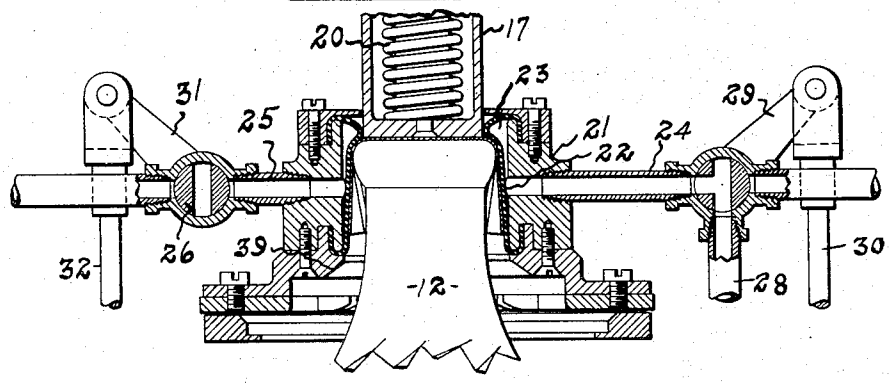



Fig. 5

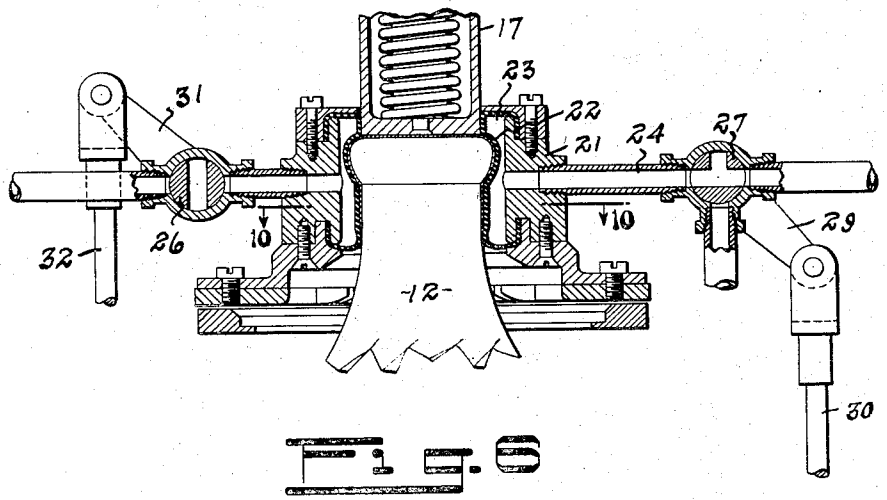
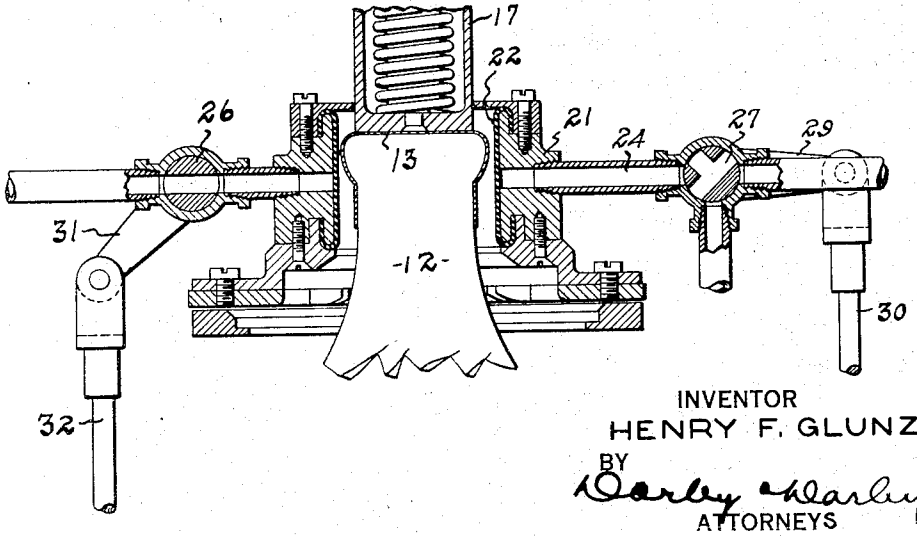



Fig. 6




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Filed Oct. 23, 1933 3 Sheets-Sheet 3

Fig. 7

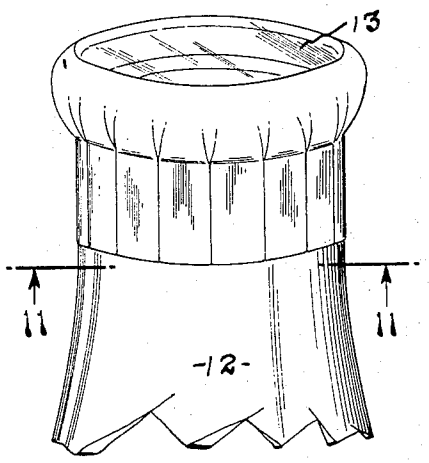



Fig. 8

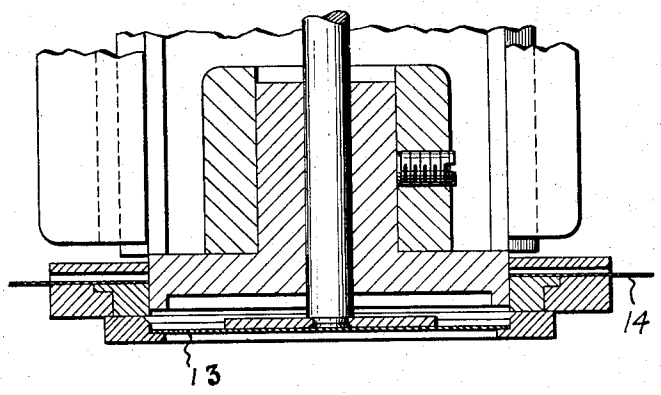



Fig. 9

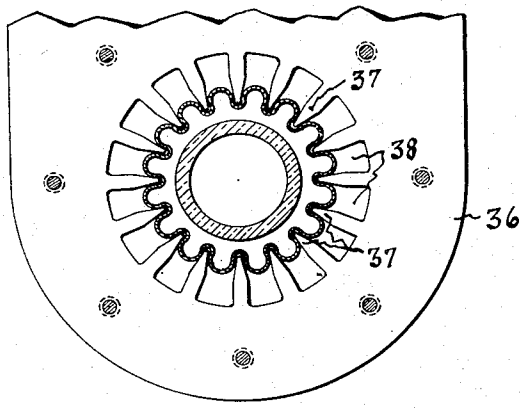



Fig. 11

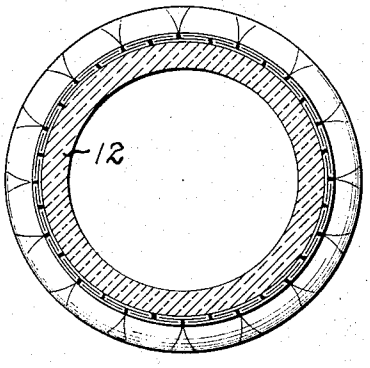
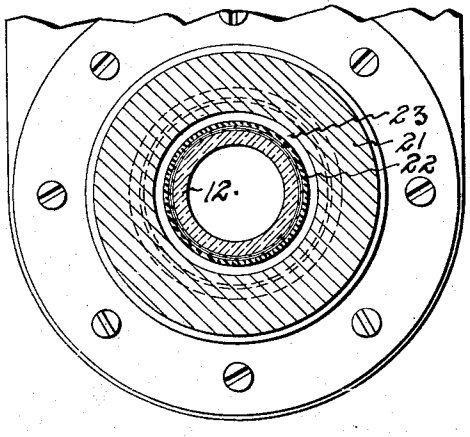



Fig. 10




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Patented May 26, 1936 2,042,304

# UNITED STATES PATENT OFFICE

2,042,304

## METHOD OF AND APPARATUS FOR APPLYING CLOSURES TO CONTAINERS

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Application October 23, 1933, Serial No. 694,708

6 Claims. (Cl. 226—83)

This invention relates to improvements in methods of and apparatus for applying caps or closures to containers.

The object of the invention is to provide a method of and apparatus for applying closures, such as sealing caps, to containers of various sorts, such as bottles for example, which is simple in operation and structure, easily carried out and operated, and efficient in effecting the application of the sealing cap or closure.

A further object of the invention is to provide a method of and apparatus for applying closures to containers, more particularly closures formed from cellulose acetate, "Cellophane", coated materials, such as waxed and paraffined paper and paper coated with cellulose acetate, and similar materials.

A further object of the invention is to provide a method and apparatus of the nature referred to wherein the sealing cap or closure, while being applied to a container, is drawn tightly and smoothly over the open end of the container to which the same is to be applied and maintained in tight application to the container after the application is completed.

A further object of the invention is to provide a method and apparatus of the nature referred to wherein the expansive force of the elastic gaseous medium is utilized in effecting the application of the sealing cap to a container.

A further object of the invention is to provide a method and apparatus of the nature referred to wherein wear and tear from friction in effecting the application of the sealing cap to a container is reduced to a minimum.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the steps, modes of operation, combination of elements, and details of arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

In the accompanying drawings I have shown an illustrative structure and apparatus embodying the principles of my invention and the manner of operating the same in carrying out my new and improved method and wherein—

Figure 1 is a broken view in vertical section of an apparatus adapted for carrying out my invention showing the container in the form of a bottle in position for application thereto or to the open end thereof of a sealing cap or cover;

Fig. 2 is a similar view showing the parts of the apparatus after the container has been partially lifted into position for its open end to contact with the material constituting the seal or cap;

Fig. 3 is a similar view showing the parts in their respective positions after the container has been extended further into the sealing cap applying devices;

Fig. 4 is a view similar to Fig. 1 showing the parts in their relative positions after the container has been advanced to its limit and before the completion of the application of the sealing cap;

Fig. 5 is a view similar to Fig. 4 showing the parts in their respective positions after the application of the sealing pressure to the partially applied cap;

Fig. 6 is a view similar to Figs. 4 and 5 showing the parts in their relative positions after the cap applying and sealing devices have completed their work and the container, with the cap applied thereto, is ready to be discharged from the apparatus;

Fig. 7 is a broken detail view showing a transparent sealing cap applied to the open mouth of the bottle;

Fig. 8 is a broken detail view in section illustrating a method of stamping out the sealing caps which are to be applied to the containers;

Fig. 9 is a broken view in section on the line 9—9 of Fig. 3 looking in the direction of the arrows;

Fig. 10 is a similar view on the line 10—10 of Fig. 5 looking in the direction of the arrows; and

Fig. 11 is a similar view on the line 11—11 of Fig. 7 looking in the direction of the arrows.

The same part is designated by the same reference numeral wherever it occurs throughout the several views.

The application of airtight and liquid tight caps or closures to containers, such as bottles or the like, has become an important and essential element in the packaging and sealing of various commodities. In order to be effective a cap or closure must be applied to the container so as to form an airtight or liquid tight seal, while at the same time the closure should be of such nature as to permit of its being readily ruptured or removed when access is desired to the contents of the container.

It is another of the desirable features of such closures in many instances that the same shall be transparent so as to enable the contents of the container to be examined.

Another characteristic is that the sealing closure be so applied that it cannot be readily or

easily slipped off from the neck, for example, of a bottle to which it has been applied. Ordinarily a bottle neck is formed with a rounded shoulder at its mouth or open end which affords an excellent anchorage for a sealing closure or cap, but to enable the rounded or enlarged bottle neck to serve that purpose efficiently it is essential that the cap be so applied that it will engage over, around, and underneath the overhanging portion of the enlarged rim and will be retained in such engaging relation.

Another essential feature is that the blank cover or cap, in its application to a container, such as the open end of a bottle, be made to conform to the exterior curvature of the bottle neck at the point of application of the cap without danger of injury to the cap and without leaving any unnecessary looseness in that portion of the cap which spans the open end of the bottle.

It is among the special purposes of my present invention to provide a method of application of a sealing closure or cap which will secure these and other various advantages, and to provide a simple and effective form of apparatus capable of carrying out such method.

In accordance with my invention I propose to support a sealing cap blank in position over the end surface of a bottle neck, for example, to impinge centrally thereagainst, and then to relatively displace the bottle and cap suspension while the cap is retained in contacting relation with the end surface of the bottle neck so as to form the disc, which is to constitute the sealing cap, into more or less cup shape inverted over the open end of the bottle while the parts are maintained in this relation with the central part of the cap held pressed against the end surface of the bottle neck and its rim portion bent into more or less enveloping relation with respect to the bottle neck; then to apply a flexible pressure to the enveloping portion of the cap so as to press the same into conformation with the shape and contour of the bottle neck and around and beneath the enlarged end portion of the bottle.

I have found that this operation of conforming the blank cap material to cup shape and to the conformation of the bottle neck can be accomplished efficiently, expeditiously, and satisfactorily by means of a resilient pressure applied to the exterior of the enveloping portion of the cap material. I have also found that it is advantageous, particularly where operating with cap material made of cellulose acetate or "Cellophane", to heat the cap material so as to soften the same and permit the cap to be formed or pressed into close hugging relation around the bottle neck without danger of cracking or otherwise injurying the cap material. I therefore prefer to employ hot air or steam as a resilient medium for effecting the application of the cap to the bottle neck. I have also found that the best results are attained when the pressure medium is not applied until after the cap material has been preliminarily applied, as above described, over the open end of the bottle. I have also found that it is advantageous to release the pressure medium before the bottle with the completely applied cap is removed. In this manner undue wear of the appliances employed is avoided.

By operating in the manner above described of preliminarily applying the blank cap material to the end of the bottle and preliminarily forming the applied blank into a cup in inverted relation over the end of the bottle, without displacing the contact of the end surface of the bottle with the cap material, and then applying a drawing friction to the skirt portions of the preliminarily applied cup shaped cap in a direction lengthwise of the bottle, not only is the cap material drawn and maintained tight across the open end of the bottle, but the skirt portions of the cap are sufficiently crimped and folded into uniform relation with respect to the bottle neck which it encloses and in conformity with the shape thereof.

In the accompanying drawings I have shown a simple form of apparatus which is suitable for carrying out my invention and in which 12 is a bottle neck, to the open end of which a sealing cap is to be applied. If desired, the sealing cap indicated at 13 (see Fig. 8) may be stamped out in the form of a circular disc from a sheet 14 of suitable material, such for example as cellulose acetate or regenerated cellulose (Cellophane). This stamped out disc is supported at its edges in position upon an inner ledge 16 by a suitable supporting ring 15.

As indicated in the drawings, the bottle neck is supported in position for its open end to present towards the central portion of the cap blank 13, and in opposed relation to a central cup 17 carried by a rod 18. The rod 18 works loosely in a sleeve 19 which may be actuated in any suitable manner in proper timed relation.

A spring 20 serves to permit the tubular member 17 to yield against the action of said spring for movement lengthwise with respect to the sleeve 19. The closed end of the sleeve member 17 cooperates with the end surface of the bottle neck to constitute, in effect, a clamp to clamp the cap blank 13 between them, as clearly indicated in Fig. 2. With the parts in these respective relations a relative endwise movement is imparted to the bottle neck and sleeve 19 so as to permit the bottle neck to protrude farther and farther into the surrounding ring member 21.

A ring 22 of resilient or flexible material, such for example as rubber, is mounted within the ring member 21 with its upper and lower edges rigidly anchored in the ring member 21. The flexible ring 22 should normally be of a diameter slightly smaller than that of the bottle neck and it should be, when clamped in position in the ring member 21, slightly wider than the inner surface of the ring member 21 so as to form a space 23 therebetween. Communicating with the space 23 is a pressure supply pipe 24 and an exhaust or vacuum pipe 25. The exhaust pipe 25 is controlled by a valve 26, while the supply pipe 24 is controlled by a three-way valve 27. The exhaust valve 26 when moved into one position opens the pipe 25 and the space 23 to exhaust to a vacuum source. This is the position as illustrated in Fig. 6.

In another position the exhaust valve 26 shuts off from exhaust the pipe 25 and space 23. This is the position shown in Figs. 4 and 5. The pressure supply valve 27 when occupying one position opens the pressure supply 24 to the space 23, as shown in Figs. 4 and 5. In another position the valve 27 opens the space 23 to exhaust to the atmosphere through pipe 28 to which reference will be made hereinafter. This position of the valve 27 is shown in Figs. 1 and 4.

I have indicated the mechanical connections 29, 30 for operating the pressure supply control valve 27 and similar connections 31, 32 for controlling the operation of the exhaust control valve 26. The actuation of the valve operated devices is effected automatically and in proper timed

relation with respect to the positioning of the bottle and the cap blank for application of the sealing cap to the bottle. Likewise the member 17 which serves to clamp the cap blank to the end of the bottle is caused to shift endwise the raising of the bottle against the tension of the spring 20 and in the opposite direction by suitable connections 33, 34 (see Fig. 1) so as to enable the operation of this feature of the apparatus to be effected in proper timed relation.

I have referred to the fact that when the bottle neck is moved into the head or ring 21 that portion of the cap blank which does not cover the end surface of the bottle is bent downwardly over the bottle end, as clearly indicated in Fig. 3, thus forming the cap material into more or less cup shape which is inverted over the end of the bottle. The depending portion 35 of the cap blank when thus folded downwardly becomes more or less gathered or shirred or, in other words, is formed into plaits, laps, or folds, inasmuch as it occupies a smaller space than the blank initially occupied before being formed into cup shape.

I have found it advantageous to provide means to prevent the shirring or folding action from injuring or cracking the cap blank material while being formed into the laps or folds referred to. To accomplish this result I provide a head or ring member 21 with a plate or ring 36 which is applied to the open end of said head 21. This ring member 36 on its inner edge is formed with a series of radial fingers 37 which are separated apart from each other by radial spaces 38 (see particularly Figs. 1, 2, 3 and 9). When the cap blank is clamped between the open end of the bottle and the member 17, and the bottle is raised so as to enter the bore of the head member 21 the fingers 37 serve to form creases in the cap material, while the open spaces 38 receive the portions of the cup material which are to be lapped or folded together or upon each other.

Thus, preliminarily, the cap material is not only formed into cup shape but the surplus of the skirt portion of the cup is directed into laps or folds of uniform character. As the bottle advances further into the bore of the head ring 21, the inclined surface 39 will engage the folded portions of the cup skirt and press the same into folded position, as clearly indicated in Figs. 7 and 11. The surface 39 also guides the bottle into the head 21, if the bottle is not in perfect alignment.

I have found that it is advantageous to heat the cap blank material to a greater or less degree while the bottle is rising in the head 21. This not only serves to prevent cracking and injuring of the cap but also facilitates the lapping and folding of the fullness of the skirt portion of the cap. After a bottle has been removed, the rubber ring 22 retains sufficient heat to heat the cap for the next bottle to a sufficient degree while the bottle is being raised.

In operation, a cap blank 13 is cut or stamped from a strip of material 14, as shown in Fig. 8, and moved in movable ring 15 into position under the head 21. This may be accomplished in the manner shown in my copending application Serial No. 675,557, filed June 13, 1933, or in any other suitable manner.

The cap blank 13 is supported in the ring member 15 with its edges resting upon the shoulder 16 of the ring member. The bottle is then brought into position under the cap to be applied to its end. The vacuum valve 26 is closed and pressure valve 27 is positioned to cut off the pressure supply and connect pipe 28 to the space 23 thereby opening the space 23 to the atmosphere.

By a relative movement of the sleeve 17, due to operation of the lever 33, and of the bottle, the cap blank is clamped between the end surface of the bottle neck and the member 17. This is the relative position of the parts as seen in Fig. 2. The further movement of the bottle neck into the bore of the head 21 is against the pressure of spring 19, and consequently without release of the clamping action of the member 17. The central portion of the cap blank is moved into the bore of the head 21, while the skirt portion 35 of the blank is formed into loose folds or laps, the folded portions depending around the open end of the bottle in a more or less loose condition. This is the relation of the parts shown in Fig. 3. Lever 33 may be raised to the position shown in Fig. 1 at any time after the bottle has risen to its uppermost position. There will still be pressure of the head of sleeve 17 against the bottle as the lever 33 rises a shorter distance than the bottle has risen. This pressure helps to eject the bottle after the seal has been completed.

The progression of the end of the bottle through the bore of the head 21 causes the inner surface of the flexible fabric or member 22 to frictionally engage the cap material and force the same downwardly by a more or less frictional rubbing contact therewith and bending the same over the rounded contour of the bottle neck, while at the same time drawing the cap material, or the portion thereof which covers the open mouth of the bottle taut. This is the position of the parts as indicated in Fig. 4.

At this point in the operation pressure medium is admitted to the space 23 by opening the pressure control valve 27 (Fig. 5). Where hot air or steam is employed as the pressure medium the material composing the bottle cap is desirably heated or softened sufficiently to permit its being forced into conforming relation with respect to the exterior surface of the bottle neck without danger of injury. If the pressure medium is admitted to the space 23 the flexible member 22 becomes distended so as to force the skirt portions of the cap into close contact with the bottle neck and into conforming relation with respect to the shape of the bottle neck, thereby accomplishing the efficient application of the cap to the bottle. This is indicated in Fig. 5 of the drawings.

At the end of this operation the supply of pressure medium is cut off by suitably operating the pressure supply valve 27 to permit the pressure medium which has been utilized to extend the member 22 to be exhausted to atmosphere through pipe 28, thereby releasing the flexible member 22 from contact with the cap or bottle or other surface and permitting the bottle with the cap applied to it to be withdrawn from the head 21. If found desirable, and to insure the removal of the flexible member 22 from liability of contacting with any surface while the bottle is being withdrawn, instead of relying on the exhaust of the pressure medium to atmosphere through pipe 28 the space 23 may be connected through the connection 25 with the vacuum source (Fig. 6) by opening valve 26 thereby quickly relieving the space 23 of all pressure tending to distend the member 22.

My device may be operated with pressure media other than steam or hot air. For example, hot water or other hot liquid may be used. This

may be particularly advantageous if the sealing cap is of paraffined or waxed paper, as a lower temperature is sufficient for satisfactory operation in such a case.

A property of the materials used in the preferred form of my device that makes it particularly efficient in operation is that cellulose acetate, "Cellophane," and similar materials will not adhere to rubber under any circumstances. The bottle is, therefore, always easily released from the head 21.

The head of sleeve 17 is provided with a vent (not shown). Without such a vent, if there should be some moisture on top of the cap it would turn into steam and blush the cap. With the vent the steam escapes and the cap is not blushed.

From the foregoing description it will be seen that I provide an exceedingly simple and efficient method of application of a sealing cap or top to receptacles and I have also provided an exceedingly simple and efficient form of apparatus capalble of use in carrying out my invention. While I have described a specific form of apparatus for carrying out the process, and while I have shown the application of the principles of my invention to the capping of bottles, it is to be understood that I do not limit or confine myself to the use of any particular type or structure of mechanism for carrying out my process, nor to any specific detail of mechanical structure, except as hereinafter set forth in the claims. It is equally obvious that the principles of my invention are suitable for use in the application of other types of structures of caps or closures and to other structures of receptacles or containers.

I claim:

1. The method which consists in clamping the center portion of a sealing cap blank of cellulose acetate material over the open end of a container to be sealed, and preliminarily bending the unclamped portions of the cap blank over the container, and then subjecting the partially applied cap blank to a heated elastic medium to reduce the material of the bent portion to a molding state and to conform the same to the shape of the container and to apply the same into sealing relation with respect thereto.

2. The method of capping a receptacle with cellulose acetate material or the like which consists in raising the receptacle so that the mouth thereof contacts with a blank of said material, applying said blank of material to the receptacle, subjecting the outer peripherial zone of the blank to heat and a resilient pressure by a resilient pressure means to warm said zone to a molding temperature and to seal the same to the receptacle, then withdrawing the pressure and creating a vacuum behind said resilient pressure means, and then lowering the receptacle.

3. The method of making and sealing caps on receptacles which consists in forming blanks of thin sheets of transparent cellulose material, then centering the same over the mouth of a receptacle to be capped and sealed, then raising the receptacle up against the blank so that the outer skirt of the blank is preliminarily folded over the crown of the receptacle, then supplying the blank with radial creases in its outer skirt, then subjecting the folded creased portion of the blank to a resilient heated pressure by a resilient pressure means to reduce the creased portion to a plastic condition and to seal it to the receptacle, then withdrawing the pressure and creating a vacuum behind the resilient pressure means and then lowering the receptacle.

4. The method of making and sealing caps on receptacles which consists in forming blanks of thin sheets of transparent cellulose acetate material, then centering the same over the mouth of the receptacle, then raising the receptacle so as to contact with said blank and so that the outer skirt of the blank will be preliminarily folded over the mouth of the receptacle, then supplying the outer skirt of the blank with radial folds, then supplying said folded portion of the blank with heat to reduce it to a molding state and at the same time subjecting it to a gradually increasing resilient pressure to seal it to the receptacle.

5. In an apparatus for capping and sealing receptacles, means for cutting cap forming blanks from thin sheets of cellulose acetate material, means for conveying said blanks and suspending the same above the mouth of a receptacle to be capped and sealed, means for raising said receptacle to engage the blank, a head adapted to accommodate the neck of the receptacle, a ring of resilient material secured to said head, and adapted to preliminarily engage with the skirt of said blank and to fold it against the neck of the bottle as said bottle is raised to engage the blank, means for permitting steam to enter said ring to soften the material of said skirt to a molding state and to apply pressure against said ring to mold said skirt portion of the blanks to the neck of the bottle, and means for applying a vacuum behind said ring after it has operated to mold said skirt portion of the cap forming blanks to the neck of the bottle.

6. In an apparatus for capping and sealing receptacles, means for cutting cap forming blanks from the sheets of cellulose acetate material, means for conveying said blanks and suspending the same above the mouth of a receptacle to be capped and sealed, means for raising said receptacle to engage the blank, means to accommodate the neck of the receptacle as it is raised, said means having a ring of resilient material secured thereto and positioned so as to engage the outer skirt of said blank with the neck of the receptacle, means for permitting heated gas under pressure to enter said ring so as to cause the same to frictionally engage the outer skirt of said blank to preliminarily press and fold the same against the receptacle under a heated pressure and to soften the material of said skirt to a plastic state, and at the same time to apply a sufficient pressure against the same to mold and seal it to the neck of the receptacle, means for releasing said pressure, and means for exhausting said ring after the skirt of said blank has been sealed to the receptacle.

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