Jan. 11, 1944. J. W. THOMAS 2,339,119

CLOSURE REFORMING METHOD AND APPARATUS

Filed March 18, 1941 2 Sheets-Sheet 1

Fig. 1.

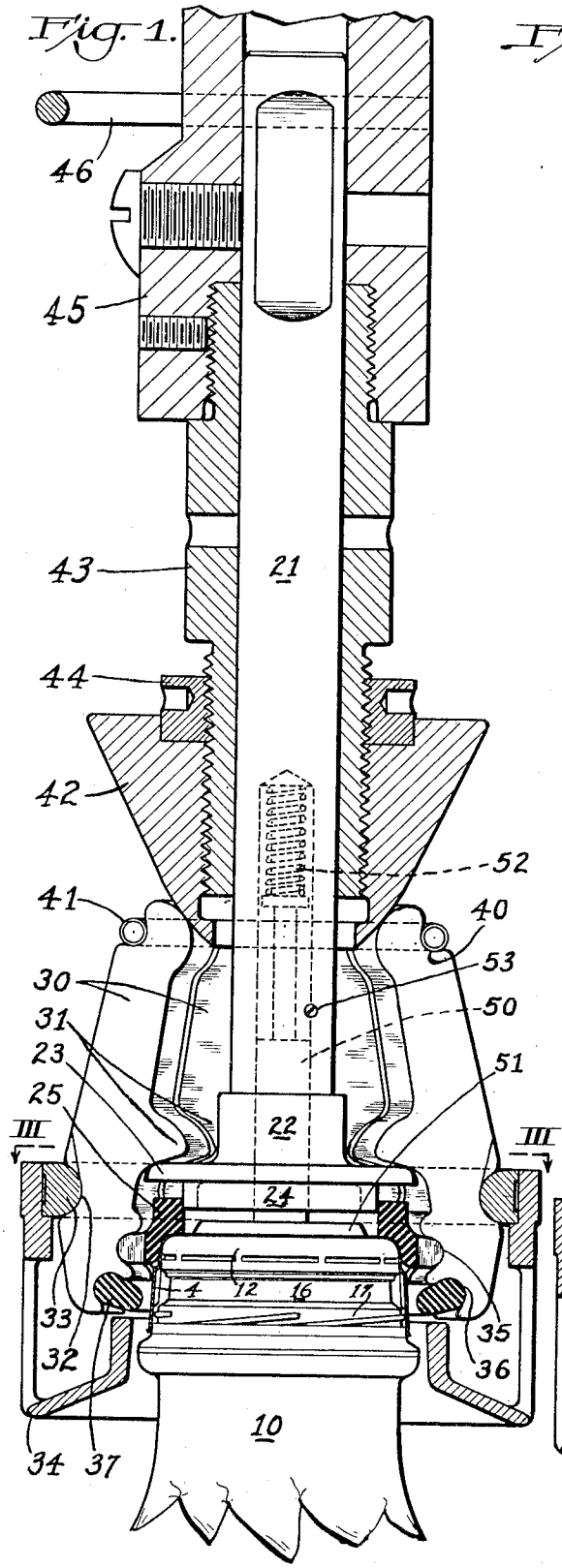
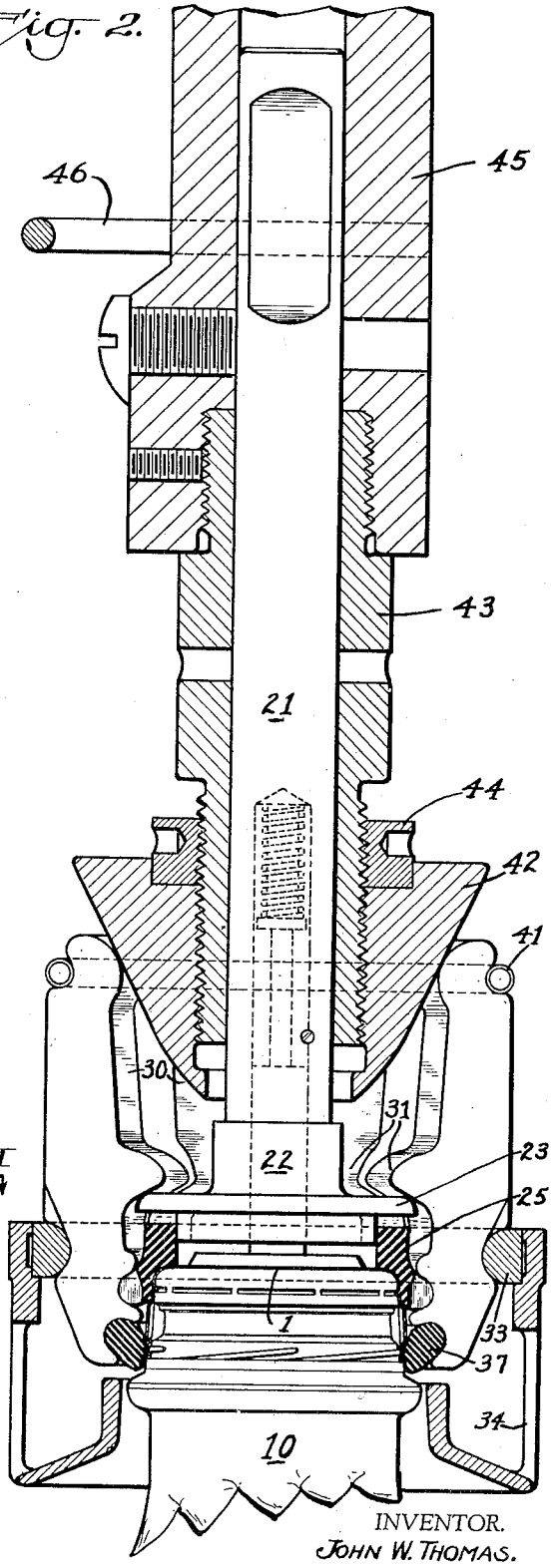


Fig. 2.



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Filed March 18, 1941 2 Sheets-Sheet 2

Fig. 3.

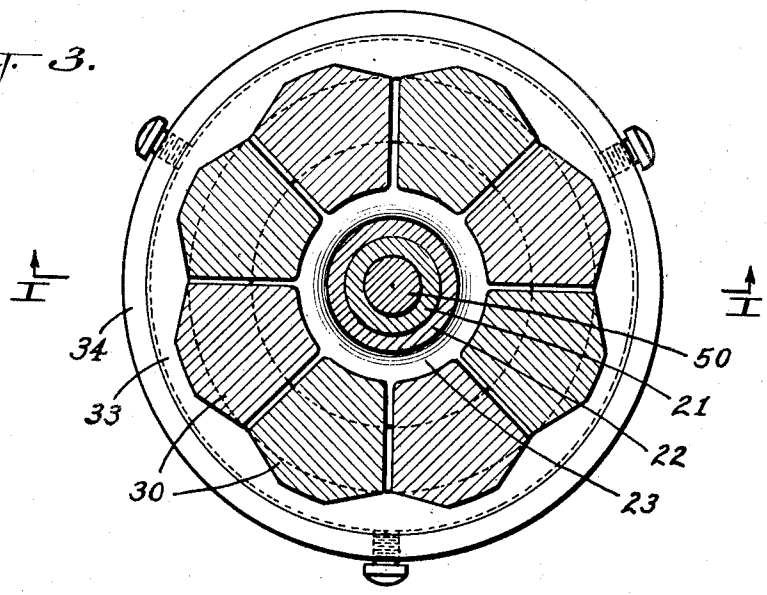


Fig. 4.

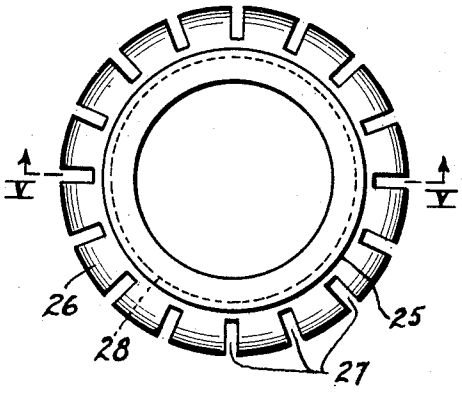


Fig. 6.

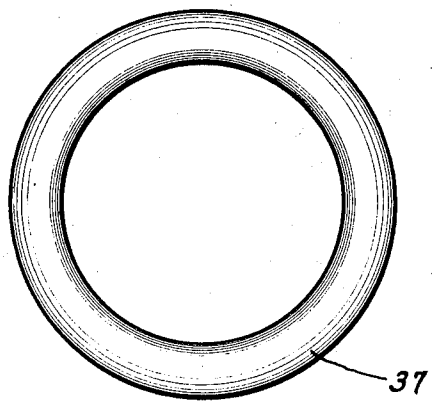


Fig. 5.

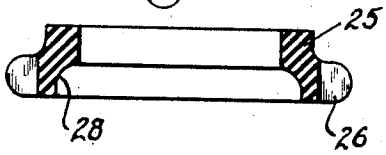
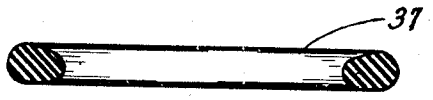


Fig. 7.



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CLOSURE REFORMING METHOD AND APPARATUS

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Application March 18, 1941, Serial No. 383,936

11 Claims. (Cl. 226—85)

This invention relates to a closure reforming method and apparatus, particularly to a method and apparatus for reforming the skirts of pliable closures on closure engaging surfaces of receptacles or containers, such as milk bottles.

The invention is an improvement upon the invention disclosed in the patent to Hogg No. 2,112,842, entitled "Capping machine," and issued April 5, 1938. That patent discloses a capping machine for reforming the usual cup-like, pliable metal closure on a container of usual form. The machine there shown comprises a single resilient reforming member actuated by a plurality of reforming segments, lever-operated by a segment spreading cam.

The method and machine disclosed in the above-mentioned patent finds a wide field of usefulness in the reforming of pliable metal closures on milk bottles and the like. However, there has been recently developed a number of peculiar types of bottle finishes requiring special closures and special methods of and apparatus for reforming closures thereon. Among these, I have chosen, to illustrate the applicability of the invention, a container having upper and lower closure engaging surfaces separated by a wide groove. Such a container makes it necessary to provide a closure reforming method and apparatus which will satisfactorily reform the closure at the upper and lower surfaces without injuring the closure at the portion of its skirt opposite the groove in the container finish. Other container finishes may present similar problems.

I have also chosen, to illustrate the applicability of the invention, a closure for such a container having upper and lower closure engaging skirt portions joined by a reinforcibly shaped mid-section. Such a closure, and the combination of the same with a container of the above character are described and claimed in my application for "Pliable metal closure," Serial No. 383,935, filed concurrently with this application, and which issued on October 13, 1942, as Patent No. 2,298,777.

An object of this invention generally is to provide a simple, reliable method and apparatus for reforming upper and lower portions of the skirt of a closure onto a container. A particular object is the provision of such method and apparatus for use in reforming closures on containers having sealing surfaces separated by a wide groove or the like.

The invention also contemplates the desirability of providing a closure reforming method and apparatus suited to working the peripheral panel and upper skirt portions of a closure progressively downwardly and inwardly while the closure is held firmly seated upon the top of the container. It is a particular object to provide for full sealing of the closure without mutilating, bending, tearing, or distorting a section of the closure opposite a groove or other relieved portion in the container finish.

Various additional objects and advantages of the invention will be in part obvious and in part found specifically discussed in the following detailed description referring to the drawings.

In the drawings:

Fig. 1 is a vertical section of closure reforming apparatus conforming to the invention, with the parts shown in the position they occupy preparatory to the reformation of the closure, the section being taken on the line I—I of Fig. 3;

Fig. 2 is a vertical section of the apparatus shown in Fig. 1, with the parts shown in the position which they occupy after reformation of the closure;

Fig. 3 is a horizontal section of the apparatus taken on the line III—III of Fig. 1;

Fig. 4 is a plan view of the upper resilient reforming member;

Fig. 5 is a section of the upper resilient member taken on the line V—V of Fig. 4;

Fig. 6 is a plan view of the lower resilient reforming member; and

Fig. 7 is a vertical section of the lower resilient member.

In order that the method of the invention be adequately described, the apparatus chosen to illustrate the invention will first be discussed. Preliminarily, however, it is noted that the invention is particularly adapted to the reforming of a closure 1 on a container 10 (Figs. 1 and 2) provided with an upper closure engaging surface 12 and a lower closure engaging surface 17 separated by a wide groove 16. The closure 1 is preferably a cup-like, pliable, metal closure having upper and lower skirt portions separated by a knurled mid-portion 4.

In the description of the apparatus like reference numerals designate like parts throughout the several figures. In Figs. 1 and 2 the spindle 21 forms the central element about which the apparatus is assembled. A flange generally designated by the reference numeral 22 is attached to the lower end of the spindle in any fashion that will provide a strong joint, as by the shrink fitted collar shown. The flange 22 has a horizontal web 23 and an annular flange 24, disposed perpendicularly to the web and therebe-

neath, which forms a seat for the upper resilient reforming member 25 seated thereover. The attachment of the upper resilient member 25 to the spindle 21 is optional, however, since the upper resilient member may be retained in assembled relationship by the reforming segments to be described below.

The top surface of the web 23 serves as a support and bearing surface for projections on a plurality of reforming segments 30. These segments extend in axial planes of the spindle 21 and enclose its lower portion and the upper resilient member 25. Each segment is an unbalanced lever having a projection 31. Each projection 31 is rounded so that a free point of oscillation may be established between the projection 31 and the web 23, the web 23 serving both as a support and as a bearing surface. On the outer side of each segment opposite the projection 31, there is an external arcuate recess 32 that receives a narrow radially unyielding segment retaining ring 33. For guiding the containers 10 into sealing position, a suitable guide bell 34 may be attached to the segment retaining ring 33 by screws, such as are shown in Fig. 3.

The lower ends of the segments 30 have, on the inner surfaces thereof, upper internal recesses 35 that receive the upper resilient member 25 and tend to direct the application of pressure by the upper resilient member to a closure. These same recesses may of course be used to retain the upper resilient member even though the annular flange 24 is not provided upon the web 23. Below the upper internal recesses 35, there are also provided lower internal recesses 36, on the inner surfaces of each of the segments 30. The lower internal recesses 36 are adapted to receive the lower resilient reforming member 37, being suited to retain and support the lower resilient member 37.

At the upper ends of the segments 30 there are, on the outer surfaces thereof, spring recesses 40 that accommodates a small spiral spring 41 which serves as a segment return spring.

Disposed about the spindle 21 and in contact with the upper ends of the segments 30, there is provided a segment spreading cam 42 of inverted conical form. The cam is mounted on a cam support 43 slidable on the spindle 21, the cam being secured to the cam support by suitable threads and locked in position by a lock nut 44. The cam support 43 is threadedly secured to a suitable adapter 45 which may be connected with the operating plunger of either a single or a multiple unit reforming apparatus, or which may be provided with a handle or rigidly mounted for operation of the apparatus by vertical movement of the container. These alternatives will be further discussed hereinafter. The spindle 21 is slidable with reference to the assembly made up of the cam 42, support 43, and adapter 45. The spindle 21 is retained against complete removal from the adapter by means of a removable wishbone pin 46, the pin permitting the necessary amount of upward and downward travel of the spindle 21 relative to the adapter 45.

Disposed within the lower end of the spindle 21 is a closure centering plunger 50 bearing at its lower end, within the closure reforming throat defined by upper and lower resilient members 25 and 37, a pressure plate 51. Plunger 50 is spring pressed downwardly by the coiled spring 52 mounted between the end of the plunger and the bottom of a suitable drilled or formed recess in the spindle 21. A pin 53 serves to slidingly retain and prevent the spring 52 from pressing the centering plunger 50 downwardly to an undesirable extent.

In Fig. 3 the parts described appear more fully, it being noted that eight segments 30 have been found to be an adequate, efficient, and preferable number of operating levers for actuating the resilient reforming members, as will be further described.

In Figs. 4 and 5 the upper resilient member 25 is shown in detail. This member should be constructed of resilient material such as vulcanized rubber. The lower portion of the member is provided with a bulbous annular portion 26 within which the closure receiving recess 28 is disposed. A plurality of radial slits 27 are cut in the bulbous annular portion 26 to facilitate the compression and downward distortion of the member 25 necessary to the reforming operation.

In Figs. 6 and 7 the lower resilient member 37 is shown. This sealing member is a ring of substantially oval cross section, the ring being made of vulcanized rubber preferably.

One way of operating the apparatus contemplates that a closure 1 be loosely applied to a container 10 to assume the condition shown in Fig. 1. Thereupon, the adapter 45 is lowered until the upper resilient member 25 rests on the closure 1. In lowering the apparatus to this position, the pressure plate 51 will have centered and pressed the closure 1 into proper position on the container 10. In this condition the apparatus is ready to perform the closure reforming operation.

The completed closure reforming operation is shown in Fig. 2. It is performed by further lowering the adapter 45, thus driving the segment spreading cam 42 downwardly against the upper ends of the segments 30. The cam 42 spreads the upper ends of the segments 30 so that they assume a more nearly vertical or outwardly flaring position. The spreading of the segments 30 causes them to oscillate about their projections 31 which rotate and slide slightly on the horizontal web 23. Likewise, the segments 30 rotate around the segment retaining ring 33, which lowers slightly. The combined motion of the segments 30 about the two points of support at 31 and 33 causes the lower ends of the segments 30 to be lowered an appreciable amount and to be moved radially inward toward the closure skirt and container finish.

The movement and pressure of the adapter 45, in conjunction with the movement of the segments 30, causes the following movements to be imparted to the two resilient members. The upper resilient member 25 is pressed firmly in the downward direction on the peripheral panel portion of the closure 1, on the fillet portion of the closure 1 connecting the top panel to the skirt, and progressively on the upper skirt portion of the closure. At the same time the member 25 will have its bulbous annular portion wrapped or rolled downwardly so as to progressively apply radially compressing forces to the upper skirt portion of the closure and thereby reform the same into conformity with the upper closure engaging surface 12 of the container 10. It is noticed particularly that the movement of the upper resilient sealing member 25 imparts a progressive downward wiping and inward pressure on the upper portion of the closure skirt.

Since the lower resilient sealing member 37 is spaced somewhat from the closure prior to the

reforming operation, it does not come into reforming action until a period somewhat delayed after the start of the pressure applying step of the upper resilient member. It is pointed out, then, that after reforming has been started on the upper portion of the closure skirt, the lower resilient member **37** is radially compressed into contact with the lower skirt portion of the closure. Because of the continued inward and downward movement of the lower ends of the segments **30**, the lower resilient member **37** likewise wipes downwardly on the skirt of the closure a slight amount as it is radially contracted to apply closure reforming pressure. Its pressure, of course, reforms the lower portion of the skirt into conformity with the lower closure engaging surface **17** of the container. It will be noted further that the upper and lower resilient members **25** and **37**, respectively, are at all times separated from each other, this separation being assured by the separation of their arcuate supporting recesses **35** and **36**. Thus no direct pressure is applied to the knurled mid-portion **4** of the closure skirt.

Upon completion of the reforming operation above described, the adapter **45** is merely lifted, subsequently lifting the spindle **21** directly; and the segment return spring **41**, in conjunction with the expanding pressure of the resilient members **25** and **37**, causes the parts of the apparatus to again assume the relative position shown in Fig. 1.

Another method of operation contemplates only that the adapter **45** be held stationary and that suitable means be provided for moving the container **10** upwardly and downwardly to effect the same relative movement of the parts as was previously described.

From the foregoing description of the apparatus and its operation, the value and novelty of the closure reforming method of the invention are readily recognizable. The essentials of the method of reforming a closure of the character described on a container of the character described may be briefly described as follows. A cup-like, pliable metal closure **1** is first disposed in assembled relationship with a container **10**. Thereupon downward pressure relative to the container is applied to the closure over three separately definable surfaces or areas. These are the peripheral panel portion of the closure, the fillet of the closure connecting the panel to the skirt, and the upper portion of the skirt which is to serve as one of the closure retaining skirt portions. Conjunctive with the downward pressure, a progressive radial pressure is applied to the upper portion of the skirt. This pressure is progressively applied first at the uppermost part and progressively throughout succeedingly lower parts of the upper skirt portion. This results in a securely reformed closure-container combination in which the closure is wrapped or wiped downwardly onto and into engagement with the upper closure engaging surface of the container. After starting the application of pressure as above described, the lowermost portion of the skirt of the closure may likewise be pressed in two directions. The lower skirt portion receives downward pressure culminating in simultaneous downward and radially inward pressure. These two pressures serve to wipe the lower skirt portion downwardly and inwardly onto the lower closure engaging surface of the container, and result in a second reformation of the closure on the container.

In cases where it is desirable, it is obvious that the reforming action at the upper closure engaging surface of the container may be separate from the closure reforming action at the lower closure engaging surface of the container. The foregoing methods of applying a closure to a container are necessary to, and peculiarly adapted to, the reforming of closures of the character described on containers of the character described.

Modifications in the method and apparatus herein described may be made without departing from the scope of the appended claims.

What is claimed is:

1. The method of reforming a cup-like, pliable closure on a container comprising pressing the peripheral panel, connecting fillet and upper skirt portions of the closure downwardly relative to the container, substantially simultaneously pressing the upper skirt portion radially into conformity with an upper side surface of the container, and, after beginning said steps, pressing the lower skirt portion of the closure radially into conformity with a lower side surface of the container separated from the upper side surface thereof and maintaining the mid-skirt portion of the closure in self-supporting bridging relationship between the upper and lower side surfaces of the container.

2. The method of reforming a cup-like, pliable closure on a container comprising pressing the peripheral panel, connecting fillet and upper skirt portions of the closure downwardly relative to the container, substantially simultaneously but in a downwardly progressing manner pressing the upper skirt portion over a confined area radially into conformity with an upper side surface of the container, and, delayingly after beginning said steps, pressing the lower skirt portion of the closure over a second confined area radially into conformity with a lower side surface separated from the upper side surface of the container and maintaining the mid-skirt portion that is between the confined areas of the closure in self-supporting bridging relationship between the upper and lower side surfaces of the container.

3. A method of reforming a cup-like, pliable closure having a stepped, medially-reinforced skirt onto a container having a pair of separated closure securing surfaces, which method comprises resiliently squeezing the upper skirt portion of the closure into conformity with the upper closure securing surface of the container while wiping the skirt downwardly relative to the container, and, delayingly after beginning said squeezing step, resiliently squeezing the lower skirt portion into conformity with the lower closure securing surface, and disposing and maintaining the medially-reinforced portion in self-supporting connecting relationship between the upper and lower skirt portions and opposite the portion of the container separating the upper and lower closure securing surfaces.

4. In an apparatus for reforming a closure on a container, a resilient means for downwardly pressing against the peripheral panel portion, connecting fillet portion and upper skirt portion of a closure and for radially reforming the upper skirt portion, means for actuating said resilient means, a second resilient means for downwardly pressing and radially reforming the lower skirt portion of the closure, and means for actuating said second mentioned resilient means delayingly

after actuation of said first mentioned resilient means.

5. In an apparatus for reforming a closure on a container, a resilient means for downwardly pressing against the peripheral panel portion, connecting fillet portion and upper skirt portion of a closure and for radially reforming the upper skirt portion in a downwardly progressing manner, a second resilient means for downwardly pressing and radially reforming the lower skirt portion of the closure, and common means for actuating both of said resilient means affording delayed actuation of said second mentioned resilient means.

6. In an apparatus for reforming a closure on a container, an upper resilient reforming member adapted to engage the peripheral panel portion, connecting fillet portion and upper skirt portion of a closure, said upper resilient member being provided with a bulbous portion adapted to be annularly disposed about the upper skirt portion of a closure, a lower resilient reforming member adapted to be annularly disposed about the lower skirt portion of a closure and spaced from said upper resilient member, common means supporting said resilient members for downwardly pressing and radially contracting the same, and means for supporting and actuating said common means with said resilient members in operative relationship to a closure on a container.

7. An apparatus for reforming closures on containers comprising an upper resilient reforming member, a plurality of reforming segments adapted to contract said upper resilient member and positioned circumferentially thereabout, a lower resilient reforming member carried by said reforming segments below said upper resilient member, said reforming segments having oscillatably supported inwardly directing projections, means carried by said reforming segments exteriorly thereof adapted to retain the same for oscillatory movement, and means for oscillating said reforming segments.

8. An apparatus for reforming closures on containers comprising a central spindle having a substantially horizontal web at its lower end, an upper resilient reforming member carried beneath said web, a plurality of reforming segments adapted to contract said upper resilient member and positioned circumferentially about said spindle and said upper resilient member, a lower resilient reforming member carried by said reforming segments below said upper resilient member, said reforming segments having inwardly directing projections supported upon said web, means carried by said reforming segments exteriorly thereof adapted to retain the same upon said web, and means coaxial with said spindle adapted to actuate said reforming segments.

9. In an apparatus for reforming closures on containers comprising a central spindle, oscillatable means supported by said spindle, a skirted resilient reforming member located immediately beneath said spindle and in contact with said oscillatable means, and means coaxial with said spindle and contacting said oscillatable means, the improvement which consists in a second resilient reforming member located beneath said skirted resilient member but spaced therefrom and in contact with said oscillatable means, whereby relative movement between said spindle and said means coaxial therewith actuates said oscillatable means and transmits pressure therethrough to said reforming members both vertically and radially thereof.

10. The method of reforming a cup-like, pliable closure on a container having several separated closure securing surfaces comprising loosely assembling the closure and the container, pressing the peripheral panel, connecting fillet, and upper skirt portions of the closure progressively downwardly relative to the container, and concurrently pressing the upper skirt portion radially against the upper closure securing surface with a peripheral wrapping and squeezing motion, and delayingly after beginning the aforesaid pressing step but while continuing reforming pressure on the upper closure portions aforesaid, pressing a lower portion of said closure skirt separated from the upper portion thereof downwardly relative to the container, and concurrently pressing the same radially against a lower closure securing surface of said container with a peripheral lowering and squeezing motion.

11. The method of reforming a cup-like, pliable closure on a container comprising loosely assembling the closure and the container, pressing with an upper resilient means progressively downwardly relative to the container against the peripheral panel, connecting fillet, and upper skirt portion of the closure and radially against an area defined by the upper skirt portion, and delayingly after beginning the aforesaid pressing step, pressing with a lower resilient means spaced below the upper resilient means progressively downwardly relative to the container and radially against an area defined by the lower skirt portion of the closure separated from the upper skirt portion by a mid-skirt portion, thus concurrently lowering and squeezing each of the upper and lower skirt portions about the container.

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