

April 9, 1929.

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1,708,828

APPARATUS FOR AND METHOD OF BOTTOMING PAPER BOTTLES AND THE LIKE

Original Filed March 14, 1924

Fig. 2.

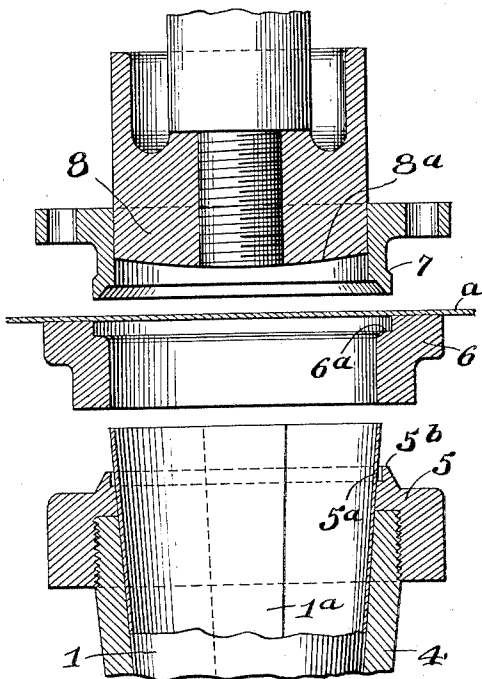


Fig. 3.

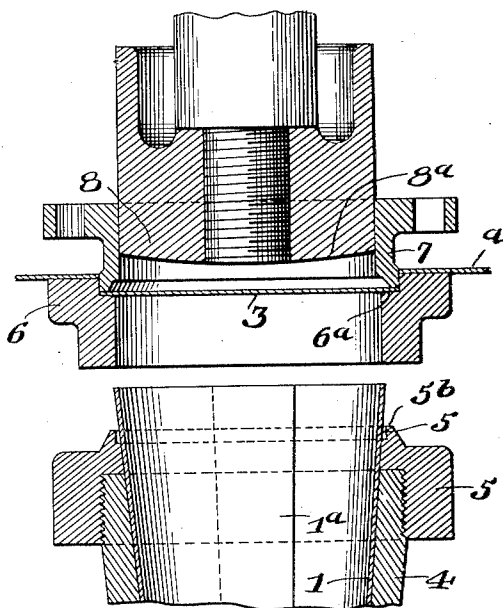


Fig. 4.

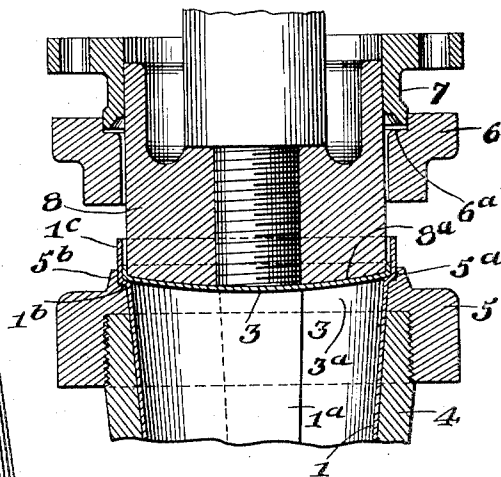
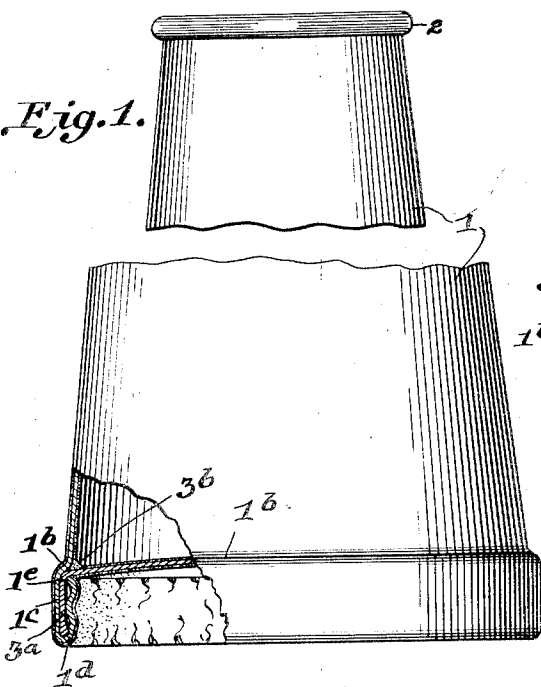


Fig. 1.



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APPARATUS FOR AND METHOD OF BOTTOMING PAPER BOTTLES AND THE LIKE.

Original application filed March 14, 1924, Serial No. 699,274, and in Canada December 9, 1925. Divided and this application filed June 6, 1928. Serial No. 283,399.

This invention relates more particularly to the formation of bottom closures for the tapered bodies or barrels of paper or other fibrous material bottles and apparatus for carrying out such method; and the objects and nature of the invention will be readily understood by those skilled in the art in the light of the following explanations of my novel method, and of the accompanying drawings that illustrate what I now believe to be the preferred mechanical expression or embodiment of my apparatus for carrying out such method, from among other forms, constructions and formations within the spirit and scope thereof; and this application is filed as a division and I hereby claim the date of filing of my parent application, Ser. No. 699,274, filed March 14, 1924, for tapered fibrous material bottles and the like.

An object of the invention is the production of a tapered or conical so-called paper bottle with an improved permanent comparatively rigid bottom closure.

With this and other objects in view, my invention consists in certain novel features of method and apparatus for carrying out the method as more fully and particularly explained and specified hereinafter.

Referring to the accompanying drawings forming a part hereof:

Fig. 1 is a sectional elevation showing, in part, a paper bottle or container produced by my instant method and apparatus.

Fig. 2, shows certain mechanism in vertical section, and a paper disk and a paper bottle body in cross section and in sectional elevation, respectively, all to illustrate a certain step in the method of forming paper bottles with permanent bottom closures, in accordance with my invention.

Figs. 3 and 4, are vertical sectional views illustrating additional steps in the method of bottoming paper bottles in accordance with my invention.

The paper container or bottle construction disclosed, is claimed by my parent application filed March 14, 1924, Ser. No. 699,274.

This paper bottle, which is here shown in the approximate form of truncated cone, or with a barrel that is longitudinally tapered from bottom of large diameter to its top or mouth of small diameter, is produced, in ac-

cordance with my invention, briefly, as follows:—

First—a single flat blank composed of preferably a single sheet of flexible suitable paper or so-called pulp board is cut of the required dimensions and of the required form to fold around a tapered mandrel to produce the longitudinally tapered bottle body or barrel 1, with over long ends and of uniform taper from one end to the other. This blank is thus bent, rolled or folded around the tapered mandrel so that the longitudinal edges of the blank overlap and these overlapping edges are cemented or otherwise secured together to form the tapered body with a permanent liquid tight joint or seam 1^a, that extends throughout the length of the body.

This tapered body as thus produced is open at both ends and is of greater length than is the body of the completed bottle.

Second—This body 1, is then provided with any suitable mouth portion, such as a metal neck or mouth ring 2, applied and permanently secured to the small-diameter upper end of the body, to form the top rim and exterior surrounding bulging annular bead or rim of the bottle head and an interior depressed seat within the bottle mouth to receive the usual paper sealing disks or so-called bottle caps:

Third—The tapered body 1, is then dropped, small end down, into a hollow tapered mandrel of such dimensions that the over long large end of the body projects upwardly beyond the upper open end of the mandrel and upwardly through and beyond an annular die-and-bottom-shoulder-forming enlargement at the upper end of the mandrel. The interior taper of the mandrel is of such dimensions that the outer tapered surface of the body 1, fits the same, and the body is thereby supported below said enlargement, against collapse or deformation, under the downward thrust and pressure of the hereinafter described bottoming operations.

While the body is thus supported, a plunger, whose axis is alined with the common longitudinal axes of the body and hollow mandrel, drives a transversely-arranged imperforate stiff sheet paper bottom disk 3, having annular upwardly directed flange 3^a,

into the projecting large end of the body and longitudinally thereof toward the small end of the body, until the further longitudinal inward progress of said disk is stopped by the bottom shoulder of the annular top enlargement or die of the mandrel. The bottom face of the plunger is over-large in diameter with respect to the interior diameter of the body where the bottom disk is to be seated, and the bottom disk covers the transverse bottom face of the plunger and is throughout its area backed by said plunger face, the upturned annular flange of the disk having been formed on and surrounding the lower end portion of the plunger and thus forming the working or paper body engaging operative face of the plunger. This flanged disk is thus of greater external diameter than the interior diameters of the upper end of the paper barrel arranged to internally receive the same. The driven descending plunger faced by the flanged bottom disk, thus radially and annularly expands, stretches and swages the upper end of the paper barrel 1, outwardly under great pressure against the restraining inner surfaces of the walls of the annular top die or enlargement of the mandrel and thus shapes the upper end of the paper body accordingly, thereby forming the expanded end of the barrel with an enlarged annular upwardly facing shoulder backed by the bottom die shoulder of the enlargement of the mandrel and against which the annular outer bottom portion of the bottom disk is seated and compressed by the plunger. The bottom disk 3, having thus been swaged into and seated in the body end expanded thereby the plunger is withdrawn from said bottom disk and the barrel.

This "third" step preferably includes flexing the bottom disk into centrally arched or convex form toward the interior of the body while the general plane of the body of the disk is at right angles to the direction of plunger movement and while the disk is backed throughout its area by the plunger end and while the disk is tightly stretched over and across the plunger, all while the plunger is driving the disk into the barrel end to its final seat tightly against and compressing the annular enlarged shoulder 1^b, formed thereby in the barrel. To accomplish the arching or dishing of the disk, the end face of the plunger is rounded or convexed, and the upward longitudinal pull or drag of the disk flange during the disk flanging operation and during the body expanding operation, causes the tight stretching of the disk and its conformation to the rounded form of the plunger end, under the natural tendency and elasticity of the stiff paper to return to its original flat form.

Fourth—The expanded upstanding end of the paper barrel and the upstanding flange

3^a of the bottom disk in the barrel, are then by a suitable descending crimping or spinning and pressure head, compressed downwardly and against the floor of the mandrel enlargement or die to form a permanent crimp compressed against the bottom disk and locking the same against the shoulder 1^b of the body and permanently securing the same in and to the body, and also providing the paper bottle with an annular depending as well as projecting surrounding body stiffening and protecting rim.

Fifth—The paper body as thus far completed, is then preferably subjected to waterproofing and sealing treatment, which, in part at least, consists in introducing therein a suitable waterproofing agent in liquid form, such as paraffin melted by heat, and then pouring the surplus liquid sealing agent therefrom. The liquid paraffin quickly seeks and hardens in the annular angular joint or seam between the top surface of the bottom disk and the tapered surrounding portion of the barrel, thereby forming an annular fillet or ring in and sealing said joint or seam and adhering to the paper surfaces. This distribution of the melted paraffin to quickly seek and form said sealing fillet, is facilitated where the bottom disk is centrally arched upwardly as hereinafter described.

The apparatus of my invention, from among other structures, for carrying out my method, includes the upwardly enlarging tapered hollow mandrel 4, the upper end of which provides a normally-fixed ring die 5, surrounding the upper end of the mandrel bore, and in effect forming an annular radial enlargement 5^a, of the upper end of the mandrel bore open at the top, and providing a bottom approximately flat upwardly facing radially enlarged stop shoulder or step constituting the floor of the enlargement. This enlargement is surrounded by vertical preferably cylindrical wall 5^b, rising from the horizontal floor or stop shoulder.

A reciprocating punch die 7, is provided for cutting flat large diameter disks 3, from a web of stiff yet somewhat flexible paper *a*, fed across ring die 6, and delivering each flat disk in the die 6, onto the internal upwardly facing shoulder 6^a, within said die 6, see Fig. 3, and to thereon hold the flat disk pending a disk flanging operation. While the flat disk is thus held on the flange forming shoulder 6^a, a disk flanging plunger 8 descends through the hollow or ring punch die 7, and enters the die 6 and engages the central portion of flat disk 3 and draws or forces said disk 3 through the contracted bore of die 6 and thereby forms the disk 3 with annular flange or skirt 3^a of the dimensions required. The mandrel 4 during this operation is held longitudinally and accurately aligned with said die 6 and the

plunger and spaced therefrom with the large projecting open end of the tapered barrel 1 opposite the discharge end of the ring die 6. The parts are so arranged and proportioned, that the plunger 8 will carry the flanged disk directly from die 6 into the large projecting end of the paper body, and will drive said flanged disk into the body and utilize the flanged disk as a die in expanding, swaging, and shaping the body end into and to conform to the enlargement 5^a and the annular lip 5^b, see Fig. 4. The end face 8^a, is convexed to produce the desired inward bulge of the disk 3, when within the bottle body, under the upward pull of the disk flange while pressed by the punch 7, and under the tight frictional engagement of the disk flange with ring die 6, and with the inner surface of paper barrel 1.

The diameter of the working end of the plunger 8, is less than the contracted bore of flanging die 6 and the internal diameter of the cylindrical end 1^c, of the bottle body, and hence the flanged disk fits on the working end of said plunger with its flange exteriorly surrounding said end and is thus forced into the enlarged end of the paper barrel until the shoulder formed by enlargement 5^a, and the paper shoulder 1^b, thereon, arrests further inward movement of the flanged disk and plunger within the barrel end. The oversize flanged disk thus swages the paper body into the enlargement 5^a and against the annular lip 5^b and the disk is thereby rigidly compressed against the shoulder 1^b and the wall 1^c and the meeting paper surfaces are approximately amalgamated together by the high pressure.

The plunger 8 is withdrawn when the bottom disk is driven to its seat in the expanded body, and the mandrel and its bottle body containing the disk are brought into position for crimping. Any suitable means, such as a rotary crimping head, then acts on the projecting cylindrical end of the paper body to lock the flanged disk in the body by the formation of a locking crimp. During this crimping operation pressure is applied to the crimp longitudinally of the paper body and toward the small end thereof, and this pressure is sustained by the shoulder formed by enlargement 5^a, and hence the position of the flanged disk within the body is not changed. It is hence possible to apply the desired heavy pressure during the crimping operation without forcing the flanged disk into the paper body beyond the position predetermined and necessary in a bottle of the desired rated capacity.

The body 1, of the bottle or container is composed of a blank of stiff yet flexible paper material, and the bottom disk 3, is also composed of stiff strong sheet paper material.

The paper container is of a certain rated predetermined capacity and the bottom 3 is so driven and fixed in the body as to avoid sagging or upward movement thereof, in other words, to avoid changing the capacity of the container.

The bottom disk, as hereinbefore described, is driven into the body end while the disk is held in convexed or dished form without destroying the elasticity of the paper and its tendency to return to the original flat form, and the disk is thus fixed in the body while dished and thus held under tension so that the disk exerts outward radial tension or pressure against the surrounding restraining wall of the body to maintain the tight seal or contact of the disk with the body particularly under the weight of the contents on the upwardly arched disk, although I do not wish to so limit all steps and features of the invention.

The annular joint within the bottom end of the container and sealed by fillet 3^b, is protected against seam-opening or fillet-breaking indentation or distortion of the container body, by the heavy stiff rim forming crimp 1^d, between the lower end of the body and the bottom disk flange, forming the lower end of the body with the exteriorly surrounding preferably cylindrical enlarged diameter wall 1^c, of the annular depending crimp embodying said wall 1^c, the upset flange 3^a, and the upturned portion of the body wall end terminating at 1^c, against the bottom surface of disk 3.

What I claim is:

1. The improved method of bottoming paper receptacles of tapering form which consists in driving a bottom closure disk, while maintained in a position transverse to the longitudinal axis of the receptacle, by pressure uniformly applied throughout the area of the outer side of the disk, longitudinally of the receptacle into the large end thereof to radially stretch and enlarge said receptacle end and form an annular shoulder, all while supporting the receptacle below said disk against distortion; and crimping the projecting enlarged end of the receptacle to fix the disk in the receptacle end against said shoulder.

2. In the method of bottoming tapered sheet paper material receptacles, those steps which include supporting the tapered body of the receptacle below its large end against distortion in a hollow mandrel, with said large end projecting up through a hollow die of enlarged diameter having an annular floor; driving a paper material bottom closure disk of enlarged diameter while held in a transverse position downwardly into said large end of the paper body, while said disk is backed against tilting and buckling outwardly, to stretch and expand said body end within said

die and down against said floor by the contact of the disk with the inner surface of said body end; and crimping the outer end of the body to cooperate in fixing the disk and forming a liquid tight bottom closure.

3. In the method of producing a paper bottle, those steps which consist in arranging a longitudinally tapered paper barrel in a hollow mandrel having an annular die at its upper end with the paper barrel projecting upwardly through and beyond said die; then driving an over-size paper bottom disk longitudinally into the paper barrel held by the mandrel while said disk is held to convex form under tension to return to flat form and thereby swaging the disk into the barrel and expanding the barrel within said die and against an annular shoulder formed by such expansion of the barrel against the die; and thereafter crimping the barrel end against the disk while said shoulder is backed by the die.

4. In the method of providing the paper material body of a bottle and the like with a permanent liquid tight bottom closure, those steps which consist in driving and forcing an oversize flanged paper material disk longitudinally into the open end of said body and by contact with surfaces of said disk swaging said body radially outwardly to conform to the internal shape of a die providing said body with an annular internal shoulder against which said disk seats and an enlargement receiving said disk and then crimping the projecting end of the body around the disk flange to permanently lock the disk and body together against relative longitudinal movement of the disk.

5. In the manufacture of a paper material bottle and the like, with a permanent liquid tight bottom closure, those steps which consist in holding the paper material body against longitudinal movement with its open large end projecting through and beyond a ring die having its bore abruptly enlarged at its upper end, and then expanding the portion of the body surrounded by said enlargement to conform to the shape thereof, by forcing a flanged oversize paper material disk longitudinally into said body through the large open end thereof, and then permanently securing said disk therein under radial tension and thereby maintaining the expanded and shouldered formation of the body end portion that encloses said disk.

6. In the manufacture of paper containers, those steps which include, shaping a flat sheet paper material blank to provide a container body of truncated cone form with the longitudinal edges of the blank secured together to form the body with a longitudinal seam; and bottoming said body by driving a stiff elastic bottom disk of enlarged diameter into an end of said body

while said disk is backed and held transversely of the longitudinal axis of the body, and thereby expanding the body end to form therein an intermediate annular shoulder against which the disk is forced under pressure, and then crimping the expanded outer end of the body to the outer surface of the disk to permanently lock the disk and body together.

7. In the manufacture of paper containers, those steps that include providing a stiff container barrel of sheet paper material; and driving a stiff flanged paper bottom disk of enlarged diameter, while on the end of a plunger, into an end of said barrel to expand and enlarge the barrel end and form a shoulder against which said disk is driven, the flange of said disk being formed on and surrounding said plunger which has a convex end face on which the disk is held under tension in dished form by the drag of the disk flange in contact with and while expanding the container end.

8. In apparatus for the manufacture of paper containers having dished bottom closures; a mandrel for supporting a paper container body with its end projecting upwardly, and a plunger having a convex end face adapted to receive a flanged stiff paper bottom disk of enlarged diameter with respect to said body end with the disk flange surrounding the plunger, said plunger adapted to forcibly drive said disk into said barrel end to expand and enlarge the same by the contact of the disk flange with the inner surface of the barrel end and to form a shoulder in the barrel against which the disk is driven, whereby the drag of the disk flange in contact with the inner face of the barrel stretches the disk to convex form tightly over and backed by the convex end of the plunger.

9. Mechanism for bottoming paper material bodies, comprising a hollow mandrel having an end ring die the upper end of the bore of which is abruptly enlarged to provide an outwardly facing annular shoulder and a surrounding upstanding annular edge wall of enlarged diameter, in combination with a reciprocating driven plunger formed to fit in and carry a flanged paper material disk of oversize and drive the same longitudinally into the large open end of a conical paper material body in said mandrel and projecting through said die, and to thereby expand and shape the portion of the body surrounded by said enlargement to conform thereto by direct swaging contact between the surfaces of the disk face and flange and the inner surface of the body.

In testimony whereof I have hereunto set my hand at Fulton, N. Y. this 4 day of June, 1928.

WILLIAM H. BREMMERMAN.