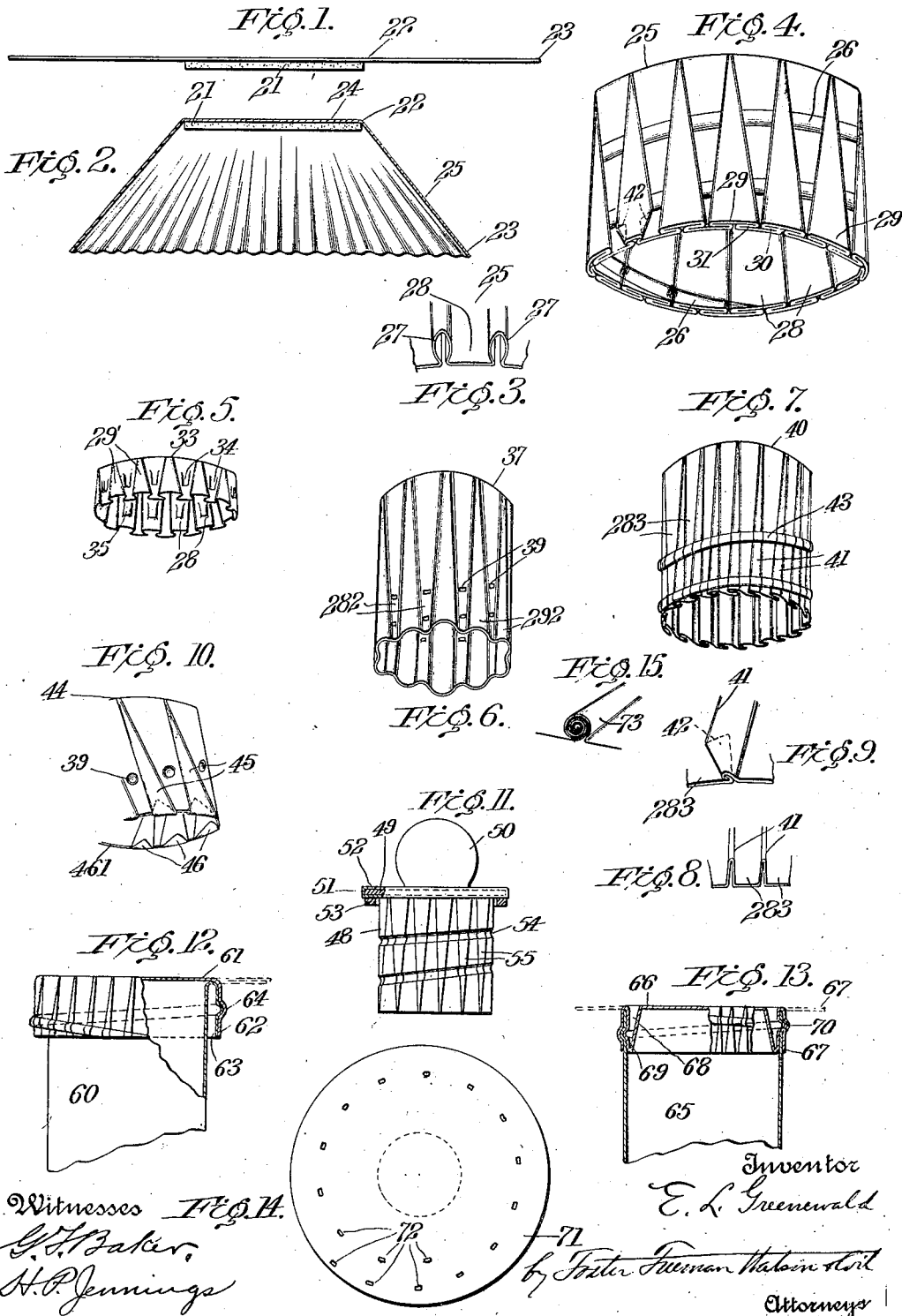


E. L. GREENEWALD.
CLOSURE.
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Witnesses *FIG. 14.*
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CLOSURE.

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To all whom it may concern:

Be it known that I, EUGENE L. GREENEWALD, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Closures, of which the following is a specification.

My invention relates to closures and more particularly to bottle and jar closures and the methods of making the same.

The primary object of the invention is to provide a bottle cap which is made from a single substantially flat piece of material by corrugating down the peripheral edge portion of the piece. This construction has the advantage that it produces a closure which is substantially undrawn, hence any decoration or coating placed on the blank will not be distorted or disfigured in the cap-forming operation and the material of the finished cap will be of substantially uniform thickness throughout.

The above and other objects and the novel features of the invention will be apparent from the following description taken in connection with the drawing in which:—

Figure 1 represents an edge view of a disk or blank from which the cap is made;

Figure 2 represents the cap partially formed;

Figure 3 is a perspective view of a portion of the cap before it is finished;

Figure 4 is a perspective view of a finished cap embodying my invention;

Figures 5, 6 and 7 are perspective views of caps embodying my invention;

Figures 8 and 9 are detail views of a portion of the cap shown in Fig. 7;

Figures 10 and 11 are views showing other forms of closures;

Figures 12 and 13 are perspective views, partly in section illustrating closures applied to receptacles;

Figure 14 is a plan view of a blank which may be used instead of the blank shown in Figure 1, and

Figure 15 is a detail view of a portion of another cap embodying my invention.

Referring to Figures 1 to 4, the cap is formed from a substantially flat and preferably circular blank 20 of suitable material such as metal or paper. The blank 20 is preferably of metal and of uniform thickness throughout and may have a depressed central portion if desired. A gasket 21 of

suitable material such as cork or composition may be attached to the blank at its center or if preferred the gasket 21 may be inserted into the finished cap.

In making the cap cup-shaped to fit the mouth of a bottle or container, I form radial corrugations in the flat portion of the disk 20 which lies between the edge of the gasket 21 and the outer edge of the disk 20. In other words, the annular flat rim portion lying between the circle 22 and the edge 23 is radially corrugated so as to reduce the outer diameter of the disk. The part which lies within the circle 22 forms the top or shell 24 of the cap and the part between the circle 22 and the edge 23 is radially corrugated and simultaneously bent down to form a corrugated skirt or flange 25 to engage the outer surface of the container. This operation avoids drawing any portion of the cap in cupping it.

Referring to Figures 3 and 4, the flange 25 is bent to a vertical position against the threaded neck of a bottle or on a threaded die so as to provide the screw-thread 26 on the inside of the flange 25 corresponding to the thread on the container to which the cap is coupled. The screw-thread 26 extends spirally upwardly from the bottom edge of the flange 25, the threads being slightly broken where they cross the corrugations 27. In the incomplete cap the corrugations 27 are loop-shaped and closed, and between them the portions 28 are curved to correspond to the shape of the body of the container.

To complete the cap the corrugations are flattened out as shown in Figure 4, the flat top portions 29 forming a part of the outside surface of the cap. The folds 30 and 31 formed by this flattening step lie flat against the inner side of the top portions 29 and against the outer surfaces of the portions 28. The flattened corrugations thus formed are triangular shaped and provide a roughened surface for the outside of the cap which serves as a grip.

An important locking function is also afforded by flattening the corrugations since the fold portions 30 and 31 of each corrugation, being parallel to both the top 29 of the corrugation and to the portion 28 of the flange, and being clamped between them will prevent any opening up of the corrugations but will reinforce the lower

edge of the cap. The flattened corrugations also lap over the portions of the screw-thread 26 and thus protect it.

In Figure 5 I have shown a bottle seal or cap 33 of the crown type embodying my invention which cap is designed to be secured to the usual bead at the mouth of a bottle or other container. The cap 33 is formed from a flat circular sheet metal blank in the same manner as the cap shown in Figure 4 and the flange thereof has the flattened corrugations 29' and intermediate curved portions or inner corrugations 28' corresponding to those in the cap of Figure 4, but the screw-thread 26 of the latter is omitted and instead I provide a depression 34 in each one of the inner faces of the inner corrugations 28'. The depressions 34 are located a distance from the bottom edge of the flange and form a circular series of interior beads or inward projections 35 which are adapted to engage the lip of a bottle below its largest diameter under the shoulder or bead on a container to hold the cap and its gasket in place on the bottle or container.

The depressions 34 which form the beads 35, may be formed in the flat blank, the flange then being formed around the bead of the bottle by corrugating and simultaneously bending down the peripheral portion in which the depressions 34 are located. Then when the corrugations thus formed are flattened the beads or projections 35 are forced inwardly under the bead on the bottle whereby the cap and its gasket are held in sealing position.

The bottle seal or cap 37 shown in Figure 6 is made by corrugating and bending a flat circular blank in the same manner as the cap of Figure 4. But instead of forming outwardly extending depressions such as those in Figures 4 which provide the screw-thread 26, I provide a spiral series of inwardly extending depressions or projections 39 on the inner faces of the inner corrugations 282 located between the corrugations 292. The depressions 39 form a spiral series of beads or inward projections on the interior surface of the inner corrugations of the skirt or flange of the cap conforming to the screw-thread on a container and capable of engaging beneath the said screw-thread on the container, thus forming in effect a screw-thread on the cap adapted to engage a corresponding screw-thread on a bottle or jar to hold the cap and its gasket in sealing position. It will be understood that the corrugations 292 may be flattened or not as desired. The depressions 39 may be substantially rectangular as shown and spirally formed in the flat blank before the same is corrugated and bent so that when the closure employing the blank is completed such depressions will provide helically ex-

tending means on the closure for coupling the same to a container.

The cap 40 shown in Figures 7, 8 and 9 is also made from a flat blank by corrugating and simultaneously bending down the flat peripheral edge portion of the blank. The corrugations 41 of the unfinished cap are shown in Figure 8, being flattened to form narrow flat folds or ribs which are bent at their bases and folded down against the body of the container. In order to lock the corrugations 41 and prevent them from opening up, the corners 42 thereof may be folded inwardly so that when the corrugations 41 are folded down against the body portion 283, the folded locking corners will be between the folded-down corrugations and said body portions, as in Fig. 9 and also shown on one fold of Fig. 4. It is to be understood that the folds throughout the periphery of the cap may be locked in the same manner.

When the corrugations have been folded down and locked, a spiral thread 43 is formed in the cap and extends upwardly from the bottom edge of the cap across the folded-down corrugations.

In Figure 10 the disk from which the cap 44 is made is corrugated at an angle to the radii. When the corrugations 45 are formed and folded downwardly flat against the body of the flange portion of the cap, the corners 46 of the folded-down and flattened corrugations are bent around the lower edge of the cap and up inside the same, flat against the inner surface of the cap thus locking the corrugations so that they will not pull out and also reinforcing the bottom edge of the cap. The cap may then be provided with a spiral thread 47 such as the spiral thread 43 of the cap shown in Fig. 7. In order to still further stiffen the edge of the cap 44 or any one of those described herein a spring wire ring may be rolled or otherwise secured to the edge of the cap. In the cap 44 the wire 461 is held in place by the corners 46 which are bent around the wire as shown.

The cap 48 shown in Fig. 11 is made of a flat blank which has an annular peripheral edge portion thereof radially corrugated and simultaneously bent so as to provide a cylindrical wall in the same manner as the previously described caps. This cap is designed for a closure for hot water bottles and similar containers. The open end of the cap is closed by a plate 49 which has a finger grip 50 thereon. The plate 49 is held in place over the open end of the cap 48 by means of an outer flange 51 which is bent around the edge of said plate and has the inwardly bent part 52 securing the parts together. A gasket 53 is secured to the under side of the shoulder formed by the flange 51, the gasket being held in sealing position on the mouth of the receptacle when the cap is screwed in place. A spiral groove

or thread 54 is formed in the outer surface of the cap 48 and extends from the end opposite the plate upwardly across the flattened bent-down corrugations 55 and is designed to fit the thread on the interior of the mouth of a receptacle.

In Figure 12 I have disclosed a tubular container such as a can 60, of metal, paper or the like, which has a cap 61 secured thereto by corrugating and simultaneously bending down both the flat rim portions 62 of the cap and the flat flange 63, shown in dotted lines before the corrugating and bending operation. The corrugations in both the flanges may be flattened and will interlock the two parts so that the cap cannot be turned relatively to the body of the container in but one direction. A spiral thread 64 is formed in both flanges and extends from the bottom edges of the flanges across the bent-down corrugations in the direction in which the cap may be removed. This construction provides in effect a non-refillable container since the cap cannot readily be screwed back on the container because the bent-down corrugations of the cap will interfere with those on the body 60. If desired, the interfitting bent-down corrugations may be bent at their lower corners in the manner that the corners 42 are bent, in Figs. 7 and 8, however both parts in the present case are bent in together so as to provide a permanent lock between the cover and body.

In Figure 13 is disclosed a tubular container 65 of metal, paper or the like which has no flange. The cap 66 for the container 65 is formed with a flat marginal portion 67, shown in dotted lines, which is corrugated and simultaneously bent down alongside the outside of the body 65. Within its margin the cap has a depressed portion 68, the outer wall 69 of which is substantially the same diameter as the inside of the mouth of the can 65, so that the cap fits snugly into the mouth of the can. The depressed part 68 is designed to receive a threaded die whereby interfitting spiral threads 70 may be simultaneously formed on the wall 69, the body 65 and the flange 67 after the cap is fitted in place on the mouth of the container. The thread 70 extends across the flattened corrugations on the cap and enables the latter to be readily removed from the can.

Suitable sealing material or gaskets may be used in the different devices to provide a more perfect seal on the mouths of the containers on which the closures are used. It will be understood that the depressions which form the threads of caps such as are shown in Figures 4, 5 and 6, for example, may be formed in the flat blank 71 as shown in Figure 14. The depressions 72 in the blank 71 are formed at predetermined points so spaced as to bring the depressions in the

proper position to form a practically continuous spiral thread when the cap is corrugated and bent to form the flange which fits the container.

The folds may be rolled up as shown at 73 in Figure 15, instead of being flattened down, as shown at 41 in Figure 7. If desired, the spiral thread may be continuous across the rolled-up portion, similar to the thread 43 of Figure 7.

I do not wish to be limited to the exact details shown as it will be obvious that variations are possible without departing from the spirit of the invention, and certain of the improvements described herein may be embodied in other articles of a similar type.

What I claim is:

1. The combination of a container having a cover-engaging means thereon, and a closure for said container, said closure having a rim provided with corrugations and secured to said cover-engaging means by depressed portions adjacent the bottoms of the corrugations, the tops of said corrugations being flattened whereby the closure is stiffened.

2. A new article of manufacture comprising a bottle cap having a rim provided with corrugations, and having indentations forming a screw thread thereon, said corrugations being bent to overlap a portion of the screw threads.

3. A new article of manufacture comprising a substantially rigid, undrawn, metallic bottle cap provided with a continuous depending flange having means thereon for coupling the same to a bottle or the like.

4. A new article of manufacture comprising a substantially rigid, undrawn, one piece, metallic bottle cap, said cap having a rim provided with corrugations and also provided with means for coupling the same to a bottle.

5. A new article of manufacture comprising a bottle cap having a rim provided with corrugations, each of said corrugations being flattened and having a lower end portion thereof bent back upon itself whereby the rim is stiffened and such flattened corrugations are locked.

6. A new article of manufacture comprising a flat circular cap blank, said blank having a series of spaced lugs arranged thereon whereby when the peripheral portion of the blank is bent through an angle of approximately 90° the lugs will provide a cover engaging means.

7. A new article of manufacture comprising a flat circular blank suitable for making caps, said blank having a series of spaced lugs spirally arranged thereon, whereby when the peripheral portion of the blank is corrugated and bent down through an angle of approximately 90°, a threaded rim will be provided.

8. The method of making closures without

drawing the material thereof which comprises corrugating a substantially flat circular blank and bending its peripheral edge so as to provide a flange, and forming receptacle-engaging means on said flange.

9. The method of making closures without drawing the material thereof which comprises radially corrugating a substantially flat circular metal blank, bending its peripheral edge so as to provide a flange, and forming a thread on said flange.

10. The method of making closures which comprises forming a corrugated flange on a flat blank, forming a thread on said flange, and bending down the corrugations to overlap a part of the thread.

11. A new article of manufacture comprising a cup-shaped member having corrugations extending longitudinally of the side wall thereof, the ends of the corrugations having corners which are bent so as to lock the corrugations and stiffen the edge of the article.

12. A blank for use in making a closure, said blank having portions thereof projecting from the plane of the blank and adapted and arranged to provide means whereby a completed closure employing such blank may be coupled to a container.

13. A blank of sheet material adapted for use in making a closure, said blank having a series of depressions therein providing a corresponding series of beads or lugs projecting from one face of the blank and adapted and arranged to provide means whereby a completed closure employing such blank in its manufacture may be coupled to a container.

14. A blank for making closures having a spiral row of depressions therein forming the receptacle engaging means of the closure when said closure is completed.

15. A new article of manufacture comprising a closure made from a blank having an initially substantially flat peripheral edge portion which is simultaneously corrugated and bent to form a depending rim flange, said rim flange having means thereon whereby said closure may be coupled to a container.

16. An article of manufacture comprising a circular wall having plaits or folds extending longitudinally thereof, each plait comprising a corrugation or loop flattened so that substantially one half of such plait lies on each side of the longitudinal median line of the corrugation from which it is formed and means on said wall whereby the same may be coupled to a container.

17. A bottle seal comprising a shell, a corrugated skirt depending therefrom and inward projections on the inner faces of inner corrugations.

18. A bottle seal comprising a shell, a corrugated skirt depending therefrom and in-

ward projections on the inner faces of the inner corrugations at a sufficient distance below the top to engage the lip of a bottle below its largest diameter.

19. A bottle seal comprising a shell, a corrugated skirt depending therefrom, inward projections on the inner faces of inner corrugations and a sealing gasket within the shell.

20. A bottle or jar closure having a top, a corrugated depending flange, and inward projections on the inner faces of inner corrugations for engaging beneath the exterior bead or shoulder near the mouth of a bottle or jar, such inward projections being formed in such closure prior to its application to a bottle or jar.

21. A container closure having a top, a radially corrugated depending flange, and a helical row of inward projections on the inner faces of inner corrugations adapted to form a screw thread for holding the closure in place on a container.

22. A substantially flat sheet metal blank adapted for use in making a receptacle closure, such blank having a series of depressions formed in one face thereof providing a corresponding series of beads or lugs projecting from the other face of the blank, such beads being adapted and arranged to provide the receptacle-engaging means of a completed closure employing such blank in its construction.

23. The method of making closures that comprises forming projections on one face of a blank and bending a portion of said blank into cylindrical form so that the part thereof having said projections shall form the container-engaging body portion of the finished closure.

24. An article of manufacture comprising a container closure having a top, a corrugated skirt or flange depending therefrom, and inward projections formed on the inner faces of inner corrugations before such closure is applied to the container and arranged at a sufficient distance below said top to engage below the largest diameter of a bead or other closure-coupling means on such container.

25. An article of manufacture having a substantially tubular wall comprising flattened corrugations, such flattened corrugations having corners which are folded beneath an adjacent portion to lock such flattened corrugations.

26. A blank for use in making a closure, such blank having a row of indentations therein forming a substantially helical means on the closure when such closure is completed.

27. A substantially flat sheet metal blank for making a receptacle closure, such blank having a row of indentations therein extending angularly from an edge of the blank and

adapted to form substantially helical means on the completed closure whereby the same may be coupled to a receptacle.

28. A blank for use in making a closure, 5 such blank having a row of rectangular indentations therein adapted to form a substantially helical means on a completed closure whereby the same may be coupled to a receptacle.
- 10 29. A receptacle closure comprising a skirt portion having a helical row of inward indentations of substantially rectangular shape providing means on such closure for coupling the same to a receptacle having 15 threads or the like.

30. An undrawn receptacle closure made from sheet material, such closure comprising a cylindrical skirt or body part having a series of inward indentations extending 20 helically thereof from one end, and a top part closing the opposite end of said body part.

31. A receptacle closure comprising a substantially tubular skirt part open at one end 25 and having a series of substantially rectangular projections extending helically thereof from such open end, and a top part closing the other end of said skirt part.

32. A blank for use in making a skirted receptacle closure, such blank having a series 30 of closely adjacent substantially rectangular depressions formed in one face thereof providing a corresponding series of closely-adjacent beads or lugs projecting from the other face of the blank, such depressions 35 being adapted and arranged so as to provide such beads or lugs on the skirt portion of a completed closure employing such blank in its construction.

33. A substantially flat sheet metal blank 40 for use in making a skirted receptacle closure, such blank having a series of closely adjacent depressions in one face thereof extending angularly from adjacent an edge of said blank and forming a corresponding 45 series of closely-adjacent beads projecting from the other face of the blank, such beads being arranged so as to provide a helically extending thread-like means on the skirt of a completed closure employing such blank 50 in its construction, such thread-like means constituting the means whereby such closure may be coupled to a receptacle having a thread or the like.

In testimony whereof I affix my signature. 55
EUGENE L. GREENEWALD.