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CONTAINER CLOSURE AND CAP

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This invention relates to improvements in sealing caps for containers, bottles and jars and to the combination of such containers, etc., with such sealing caps.

5 Generically the invention relates to caps having a suitable degree of resiliency along their sealing faces or at their gripping portions in contact with the lip wall, neck bead or mouth formation of a container of any shape or kind. For
10 purposes of illustration, however, only containers with lip or mouth constructions which may cooperate with my novel caps are shown.

While various cap arrangements are shown as being used with plastic containers, which normally have some degree of flexibility or resiliency, the caps may also be used with rigid walled containers, as the resilient features of the caps are particularly valuable and desirable providing the contour of the bottle mouth be such that a
20 proper seal can be effected. By the use of my novel caps for sealing or capping glass containers, much breakage and attendant loss of time and food products may be avoided.

The present invention is a continuation in
25 part of my copending application, Serial No. 499,771, filed Dec. 3, 1930. While several new forms are herein disclosed which involve certain new improvements and new uses, much of the same relationships are involved.

30 The materials of which the caps may be made can be almost any pressed fiber, paper or cellulose stock, laminated, coated, or otherwise combined with one or more plastic materials, such as rubber, cork, gums, synthetic compounds and
35 condensation products of different properties, as long as the cap has the required strength, extensibility, elasticity and flexibility at the points thereof where such properties are required.

The caps may be molded from fluid plastic
40 material, pressed from sheet stock, or produced by heat and pressure from suitable materials in a pasty state or plastic molding compounds in powdered form. They may be spun, blown or extruded into the desired shape, depending on
45 the materials used, as long as the required quality, appearance and capacity to function are present.

The elasticity of the material for use in making the caps should be gauged in accordance with
50 the elasticity or flexibility of the container material with which they are to be engaged. The greater the hardness of the neck portion of the bottle, the stronger the cap for use therewith should be and vice versa. It is quite possible that
55 a cap of this character may be useful with glass

bottles, if the necks of the bottles are constructed in accordance with the principles herein outlined for providing proper coordination between the cap configuration and that of a cooperating bottle neck, particularly when internal pressure
5 is active on the cap.

The utility of caps of the type herein disclosed is inherent from the brim and other features, which permit the easy removal of the cap from a bottle neck, and also from those features which promote easy insertion of the cap in
10 a bottle neck to seal the bottle or container.

The invention is especially directed toward the provision of novel combinations of shapes for bottle mouths and cooperating caps for containers for various uses, such as for carbonated beverages, canned goods, fruits, preserves, condensed milk, cheese products, candies, and numerous other foods and beverages, vacuum packed or otherwise, and also for drugs, proprietary preparations, etc. A principal object of the invention is to provide a self-locking, live seal between a cap and a container after they have been joined, which will normally prevent leaks at the seal.

A further object of the invention is to provide
25 a container neck or mouth portion and a cooperating cap especially for use with carbonated beverages and so constructed and arranged that a grip point or zone will be provided for a stopper or plug type of cap as herein shown and the
30 lip wall of a bottle, and also to provide adequate space for the cap to expand or assume its normal shape below or internally of the container from the grip point or zone, so that internal gaseous pressure in the container will serve to produce a
35 more intimate seal between the stopper portion of the cap and the cooperating edges or constricted portion of the lip wall at the mouth of the container or bottle.

A further object of the invention is to provide
40 such relationship between the walls of a closure and the wall at the mouth of a container that the pressure at one point between these walls will provide a good sealing pressure contact at some other point between the engaging faces
45 of the walls.

Another object is to coordinate the shaping of the coacting walls of a closure and a container with relation to the space or distance between the areas of sealing pressure, so that the wall sections
50 of either the cap or the bottle, which lie between the actual contact areas, will be stressed to obtain a live sealing area of close contact at points remote from the actual pressure contact points.

In the drawing:

Figure 1 is a composite fragmentary view in vertical section showing a bottle cap in two different positions relative to a bottle neck;

Fig. 2 is a composite fragmentary view in vertical section, similar to Fig. 1, and showing a modified form of the invention wherein an inner air-excluding seal is provided by a cap which engages both the inner and outer portions of a bottle neck;

Fig. 3 is a perspective view with parts substantially in central vertical section of a plug type of cap with reinforced brim;

Fig. 4 is a fragmentary view in vertical section showing the cap of Fig. 3 seated in the mouth of a bottle and having a retaining grip under the edge of the lip wall thereof;

Fig. 5 is a composite fragmentary view in vertical section illustrating a modification of the form of the invention shown in Fig. 1, in which the inwardly curving lip wall of the container is rigid and the depending portion of the cap has a resilient coating;

Fig. 6 is a composite fragmentary view in vertical section of a cap and an associated bottle mouth, in which there is a semi-resilient relation of the parts, and showing the cap before and after sealing and a rubber ring for providing an air-tight seal;

Fig. 7 is a perspective view with parts substantially in central vertical section of a plug type of cap with a reinforced and recessed brim arranged to provide a vertical wall section for gripping and sealing with the outer edge of the lip wall of a bottle;

Fig. 8 is a fragmentary view in central vertical section of the cap of Fig. 7 seated in the mouth of a bottle and engaging a cooperating, specially-shaped lip wall to provide a seal including inner and outer engaging portions;

Fig. 9 is a composite fragmentary view in central vertical section of a cap and jar combination, the jar having rigid or semi-rigid walls at the points or zone of engagement with the cap;

Fig. 10 is a view similar to Fig. 9 of a cap and jar combination with resilient engaging portions both inside and outside the mouth portion of the jar;

Fig. 11 is a composite fragmentary view in central vertical section of a cover type of cap provided with a compressible or deformable rim wall; and

Fig. 12 is a composite fragmentary view in central vertical section of a cap and the mouth portion of a bottle, the neck walls of the bottle having a groove for holding a rubber ring.

The combination of a cap and a bottle, Fig. 1, is illustrative of a sealing engagement between a cap of resilient material and a somewhat resilient bottle neck 1. This bottle neck has a curved lip wall 3 forming the mouth of the bottle and comprising a grip point or area 2 and a curved portion 4 terminating in an inner section 5. This inner section 5 extends downwardly into the space 6 in the bottle neck and defines the mouth opening 7 of the bottle.

A cap 8, Fig. 1, has a downwardly extending wall or skirt portion 9, which is curved to provide a constricted diameter portion 10 and then curves outwardly to form a flaring portion 11 at its lower edge. The cap 8 is also provided with a concentric, downwardly pressed, horizontal wall portion 12 forming a part of a seating plug and connected to the skirt portion 9 by a curved wall portion 13 arranged to bear against and be complementary to the curved portion 4 of the lip wall 3 of the

bottle, as shown at the right in Fig. 1. The wall portion 13, therefore, forms a recess into which fits the curved lip wall 3 of the mouth of the bottle.

When the flaring portion 11 of the cap is pressed down over the curved portion 4 of the bottle, there is a local inward flexing of the wall 3 of the bottle at its widest portion 2, while there is a slight outward flexing or elastic expansion of the wall or skirt 9. As the cap is seated, the curved wall portion 13 bears against the curved wall portion 4 of the bottle, the wall portions 4 and 9 flexing and mutually adjusting themselves to provide a good seal at the bottle mouth, while a good elastic grip is provided at the lower end of the wall portion 9 at or above the grip point or area 2 of the curved lip wall 3 of the bottle.

If the cap 8 is used with a glass bottle or other container having a rigid beaded neck or mouth portion, the cap may be easily positioned over such rigid bead by holding the cap diagonally relative to the bead of the bottle, and first seating one side of the curved wall portion 13 well down below the bead corresponding to the point 2 of the wall 3. At this time the juncture 10 of the wall portions 9 and 11 of the cap on the opposite side thereof may be passed down over the bead with a minimum of resistance by slightly raising the low part of the cap on one side of the bead while pressing downwardly and slightly outwardly on the higher side of the cap on the other side.

The cap and bottle mouth combination shown in Fig. 2 provides both inner and outer elastic sealing points or areas if the materials of both the bottle and the cap are of a flexible nature. There is shown a cap 14 having a plug or stopper portion 15 adapted to fit under an inwardly constricted lip wall portion 16 at the upper end of a lip wall 17 at the bottle mouth. The lip wall 17 also includes an enlarged, outwardly-bulging, flexible section 20 for engaging a depending side wall section or skirt 18 of the cap 14, which section has a constricted diameter portion 19 for bearing against and extending beneath the bulging portion 20 of the bottle neck.

When the cap 14 is pressed down over the lip wall 17 of the bottle, the constricted portion 19 of the cap will yield or expand outwardly while the portion 20 of the bottle neck may flex inwardly. When the lower point 22 of the stopper portion 15 of the cap bears against the lip wall portion 16, there is likewise a mutual flexing or yielding in opposite directions for each of these wall portions when passing one another and a subsequent reflex action for the wall portions in resuming their normal shape when the capping operation is completed. The degree of displacing pressures between the wall curves of the bottle neck and the cap will, of course, determine the amount of sealing pressure between the engaging wall sections after capping. A curved wall section 21 at the upper periphery of the cap will also preferably have a resilient grip with the upper part of the wall portion 16 of the bottle, thus sealing the mouth of the bottle.

A stopper type of cap 23 is shown in Fig. 3 and has a brim 24 with a raised rim wall 25, the lower end 26 of the stopper per se being slightly larger in diameter than intermediate portions thereof. When a stopper cap of this type is associated with a lip wall 27 of a bottle, as shown in Fig. 4, the edge 28 of the lip wall of the bottle will press in and contract the diameter of the stopper, as shown at 29, in a case where there is considerable elasticity of flexibility between these wall parts

due to their displacement in opposite directions. The lower end 26 of the stopper portion will be free to expand or to resume its normal shape below this grip line. Any upward or internal gaseous pressure against the inner side 30 of the lip wall and the lower face 31 of the cap will serve only to cause a more secure seal between the stopper portion 26 and the edge 28 of the lip of the bottle. This combination is thus especially advantageous for carbonated beverages. The brim 24 of the cap will permit the removal thereof by a twisting motion, by lifting the brim on one side or by wedging a suitable instrument in between the lower face of the brim and the upper lip wall curvature of the bottle, any one of these procedures giving satisfactory results.

The combination shown in Fig. 5 is a modification of that shown in Fig. 1, the wall of the bottle mouth being formed into a rigid ring 32, with which a curved wall 33 of the cap may be pressed into seating engagement as heretofore described. The lip wall of the bottle has an outer curved portion 34, which may yield or flex somewhat when the gripping portion 35 of the wall or skirt 33 of the cap is pressed thereover. The plug-like central portion 36 of the cap has a gum coating 37 on its annular side wall portion 38 by which a good seal is provided with the inner face portion 39 of the mouth of the bottle, the gum coating taking the place of a certain degree of resiliency for the inner face 39 of the bottle mouth.

A cap 40, Fig. 6, has an inner depending stopper portion 41, which is slightly larger in outside diameter at its upper curved wall section than the inside diameter between the upper and lower portions of a cooperating lip wall 42 of a bottle. When the cap is placed in the bottle, the stopper portion 41 will flex inwardly at a point 43, while an outwardly curved lip 44 at the upper edge of the wall 42 of the bottle will bend downwardly and flex inwardly at its edge 45, under the influence of an inwardly constricted wall or skirt portion 46 of the cap. When the cap is fully seated, the lower end 47 of the stopper portion seats against a soft rubber ring 48 disposed above and at the outer periphery of a ledge 49 in the mouth of the bottle, while the curved wall portion 50 of the cap engages against the curved lip 44 of the lip of the bottle with an outwardly displacing pressure. The combination in its entirety thus affords strong gripping portions and effects a good seal.

Caps and containers made from materials which normally would be ductile when in flat section or sheet form can be given sufficient resiliency by shaping them and providing the relations of parts as shown in Fig. 6, and when so used will provide good seals.

A stopper cap 52, Fig. 7, is similar to that shown in Figs. 3 and 4, but differs therefrom in that an annular recess 53 having a gripping wall portion 54 is formed therein. When this cap is associated with a lip wall 55 of a bottle neck, Fig. 8, the outer edge 56 of the lip wall of the bottle will bear at 57 against the wall 54, while the stopper portion 58 of the cap will be expanded at one point and contracted at another as above set forth for the caps shown in Figs. 2, 3, 4, and 6, considerable deforming stresses being set up between the lip wall 55 of the bottle and the side wall of the stopper.

A container cover 59, Fig. 9, is another example of means providing a resilient seal at the edge of the mouth of a container by imparting resilient properties to a flexible wall, first by a

proper configuration for the parts and then by allowing a clearance space for the curved wall to expand or contract relative to a deflecting surface in tending to resume its original shape.

The container 60, Fig. 9, may be formed of rigid material or be nearly rigid in its neck wall portion 61, which has a curved or rounded upper edge 62 and is slightly contracted in diameter as shown at 63. The cap 59 is formed with a two-ply rigid peripheral edge 64 and with a side wall or skirt 65, the latter being first turned downwardly and then curved upwardly at 67 with a space between the reversely curved wall portions. The upwardly turned, substantially cylindrical wall portion 67 freely extends from a lower curved portion 68, by which it is joined to the side wall 65, and terminates in an upper edge 66.

When the cover 59 is forced straight down or twisted down over the edge 62 of the container, the wall section 67 will normally adjust itself resiliently and will closely embrace the wall portion 63 of the container, making a good seal therewith. If a rubber ring (not shown) is placed in the top portion of the cap or located over the edge 62, the lower face 69 of the top portion or wall 70 will form a seal with the edge 62 of the container mouth, making a two-point seal for this type of cover or cap, which is desirable for tobacco containers or for cold-packing fruit or vegetables or vacuum-packing coffee and similar commodities.

The combination shown in Fig. 10 is a modification of the form of the invention shown in Figs. 2, 6, and 8, and comprises a cap having a large stopper portion 71 having practically the same clearance for resilient expansion or to be expanded by suitable capping means, as explained above for the other embodiments of the invention and as shown at 72. A side wall or skirt 73 of the cap provides a slight frictional grip with a curved portion 74 of the container. The straight side wall 73 affords adequate space for printing, labels or advertising matter on its outer face 75.

The combinations shown in Figs. 11 and 12 provide slipover caps 76 and 77 respectively, which may be formed of rigid or of slightly elastic material. The cap 76 bears against a wall 78 of a container, which if it be made of a plastic or ductile material will have some resiliency due to its configuration. If, however, this wall of the container be rigid, the side wall or skirt 79 of the cap may have some elastic properties, permitting a good seal.

The cap 77, Fig. 12, engages a lip wall 80 of a jar, which has been shaped with a deep annular recess 81 for receiving a rubber ring 84, the wall 80 also being shaped to provide an upper wall portion 82. When the constricted side wall portion 83 of the skirt of the cap is forced down, as shown at the right in Fig. 12, the inner curve of the wall portion 83 makes a tight seal.

It should be noted that in nearly all the bottle lips and bottle caps shown, the resilient and live sealing grips obtained depend in part on the novel relationships between the coating sections of the caps and the bottles or containers, the freedom to expand or contract provided resulting in the proper seating of the caps and contact between the parts. Also, in nearly all instances the cap walls are so curved during their manufacture as to be under a normal stress or tension. Also, they are so shaped with regards to their engaging relationships as to cause a certain amount of elastic resistance to be present in the wall portions which come under displacing pres-

sure without actually being displaced to such an extent as to cause permanent deformation of the walls or to prevent the easy removal of the caps from the containers, usually without the use of tools as are required with many kinds of sealing caps.

Nearly all the caps herein shown can be removed by imparting a twisting movement to the cap with one hand while holding the container with the other. For this reason these closure means are advantageous as they also meet all other normal requirements for structures of this type. The caps can be molded or fabricated from transparent materials.

The bottle lip formations shown in Figs. 1, 4, 5, 9, 11, and 12 will, with some modification, act to cause a one-point or area displacement in the wall of the associated cap, which will build up resilient stresses in the cap wall and also cause a conformative readjustment in such walls to the shape of the bottle lip. If the bottle is produced of a flexible plastic material, the lip thereof will compensate or yield to some degree, depending on the shape and clearance for movement, so that a live resistance will be effected therein. By utilizing these opposing forces, good seals are obtained.

The cap and lip combinations shown in Figs. 2, 6, 8, and 10 are calculated to give plural sealing areas between the caps and the lip walls of bottles or containers as aforesaid. These pressure-contact arrangements at one point or zone assist in producing a close seal and grip at the next or subsequent contact point during capping, and will also cause a closer bending engagement between separately curved wall areas and resilient stresses along the curves and in the areas located between pressure-contact points.

While I have shown several possible embodiments of my invention, I contemplate that the principles thereof may be otherwise applied, as will be obvious from the present disclosure to those skilled in the art. I do not wish to be limited, therefore, except by the scope of the appended claims, which are to be construed as broadly as the state of the prior art permits.

Having thus described my invention, I claim:—

1. A container having a flexible wall at its mouth portion, in combination with a sealing element having plural flexible walls shaped to press against opposite sides of the said wall of the container at points which are spaced a distance apart on the said flexible wall, the respective wall portions being so shaped with relation to one another that the pressure condition on one side of the container wall will act to reinforce said wall against the pressure condition at the spaced point on the other side of the said wall of the container, by which a sustaining pressure in opposite direction will be had between all the contact areas of the respective wall portion.

2. A container having a flexible body wall at its mouth portion, a sealing closure for engaging the opposite faces of the said body wall at different points thereof, said closure having inner and outer flexible walls which are so related to the said body wall of the container that flexing contacts sustained by opposing pressures will result between the respective wall portions, said flexing contacts being so related during the sealing operation and thereafter that the pressure at one point between said walls will be productive of a tensionally sustained compressive pressure seal at another point.

3. A cover having two annular, spaced, flexible wall portions, a container mouth having a stiff semi-rigid body wall, the respective wall portions of the cover and container mouth being so shaped and co-ordinated to one another that the walls of the cover will have elastic pressure contact at two different contact areas which are located a distance apart at interior and exterior points of the body wall of the mouth of the container, said contacts setting up an elastically stressed condition in the wall portion of the cover which connects said two annular portions and in the entire wall body of the cover which lies between the two contact points, the said stressed condition operating to accentuate the sealing grip of the cover with said body wall at both interior and exterior contact points.

4. A container having a stiff, elastically flexible wall body at its mouth, a cap of elastic wall structure and rigid body for pressure sealing with the container mouth progressively, first at one point and then at another, said points being on opposite sides of the said container wall and a distance apart from one another, the relationship during this progressive sealing being such that the wall portion of the container which lies intermediate between the inner and outer points of such sealing contact, and the wall portion of the cap intermediate its points of pressure contact, will be elastically stressed against one another, the opposing direction of pressure from the cap structure also reinforcing the resistance to deflection of the said wall body of the container.

5. A bottle having a neck wall of resilient properties which is flared outwardly to form a lip, a cap for sealing with said neck and lip, the wall portion of said cap having resilient properties, the neck wall of bottle, leading to the lip, curving inwardly to form a locally reduced opening in said neck, the cap having a stopper portion the lower end of which is of a larger diameter than the opening in the neck, said stopper portion being surmounted by a flanged rim, and a depending side wall which is located to constrictively engage the bottle lip at its outer edge to flex the inwardly curving neck wall portion of the bottle neck toward the said reduced opening after the stopper portion of cap has occupied said opening of the neck.

6. A bottle having an inwardly turned lip wall at its mouth portion, a one piece stopper therefor formed of a cellulosic material and having a seamless structure of wall body which is slightly incompressible and resilient, said bottle lip comprising a wall which is curved downwardly to form a grip edge for the said stopper and a constricted opening in the mouth of the bottle, the said stopper having a curved side wall portion which is preshaped to expandingly press against the said curve of the bottle lip and to be impressed thereby and to expand resiliently under the said grip edge when the stopper is fully pushed down through the constricted opening, said stopper having an upper laterally extending rim with a reinforced outer edge forming a means by which the stopper may be removed.

7. A bottle having a neck and lip molded in one integral piece, a stopper cap therefor made of incompressible, ductile and flexible material, both bottle and stopper having curved portions designed to contact with one another, the curved portion of the bottle lip terminating in an outwardly and upwardly turned edge and the curved portion of the stopper terminating in an outer

annular wall recess which is so related to the outer periphery of the said edge of the lip as to lock firmly thereagainst with a compressive force to form a water-tight seal therewith without the use of a gasket between the cap and the bottle.

8. A closure for sealing with the inner and outer faces of the wall which form the lip and mouth of a bottle or jar, said closure having wall parts forming a central stopper portion connected by an annular transversely extending wall curve with an outer concentric side wall which is spaced from the central stopper portion to form a recess therearound to enclose the upper end and the outer face of the said wall at the mouth of the container, said side wall of the cover having a rim part to give leverage for easy removal of the closure.

9. A bottle neck having a rim wall which is turned inwardly and downwardly in spaced relation to the said neck and forming a mouth opening into the said neck, a closure for sealing the said mouth, said closure having a stopper portion of slightly larger dimensions than the said mouth opening, the said stopper portion being formed of flexible, incompressible and yielding material adapted to be compressed when seated into the opening formed by the said rim wall, such compressed section of the stopper being capable of expanding to normal size when advanced to a point below the lower edge or limit of the rim wall which forms said opening.

10. A bottle having an inwardly turned lip wall at its mouth portion, a closure therefor formed in a hollow one piece seamless wall body with a reinforced brim and a depending stopper portion of resilient and incompressible composition material, said bottle lip terminating in a wall which is curved downwardly to form an edge for gripping the stopper portion of the closure, said stopper portion being shaped to press against the said lip wall and to be diminished in size thereby, the resiliency of the material comprising the wall of the stopper enabling the expanding of the lower end of the stopper to increase its size beneath said gripping edge.

11. A closure cap for a bottle, comprising a hollow stopper section having a flat brim portion at its upper limit, said brim having a vertically turned edge at its outer periphery extending upwardly with respect to said brim portion.

12. A closure for a bottle, comprising a hollow stopper portion which is provided with a brim at its upper end, which brim is reinforced at its outer margin and recessed immediately adjacent

to the stopper portion, said reinforcement comprising an edge extending upwardly with respect to said brim portion.

13. The combination of claim 1 wherein both container and sealing element are constructed of a cellulosic plastic composition.

14. The closure of claim 8 constructed of a resilient molded plastic material in one seamless piece, permitting expansion of said central stopper portion when seated.

15. The combination of a container having a constricted neck portion of slightly resilient material with a stopper type of closure for the container, said closure comprising a hollow stopper portion of slightly larger lateral dimensions than the mouth portion or constricted neck of the container and formed of flexible, incompressible and yielding sheet-like material constructed and arranged to be inwardly flexed when the stopper portion of the closure is inserted in the mouth of the container, and said stopper portion of the closure being capable of expanding to its normal size when advanced to a point inward of the constricted portion of the neck of the container to form a seal for the opening thereof particularly effective against internal pressure within the container.

16. The combination of a container formed of organic plastic material, which is to a certain extent resilient, said container having a constricted neck portion, with a stopper type of closure for the container, said closure comprising a hollow stopper portion of slightly larger lateral dimensions than the mouth portion or constricted neck of the container and being formed of flexible, incompressible and yielding sheet-like material of organic plastic origin and constructed and arranged to be inwardly flexed when the stopper portion of the closure is inserted in the mouth of the container, said stopper portion of the closure being capable of expanding toward its normal size in that portion thereof which is located inwardly of the constricted neck portion of the container subsequent to the insertion of the closure in the mouth of the container to form a seal for the opening of the container particularly effective against internal pressure within the container, and said closure further having a laterally extending brim portion formed with an up-turned peripheral edge by which the closure may be grasped for removing it from the mouth of the container.

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