July 9, 1963 J. HOHL ETAL 3,096,898

CONTAINER AND CLOSURE CAP THEREFOR

Filed Oct. 17, 1960 2 Sheets-Sheet 1

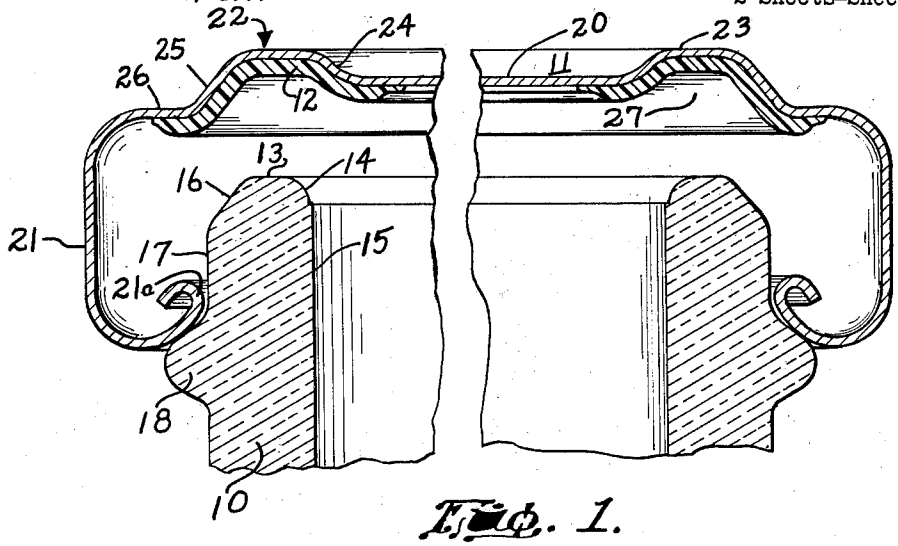


FIG. 1.

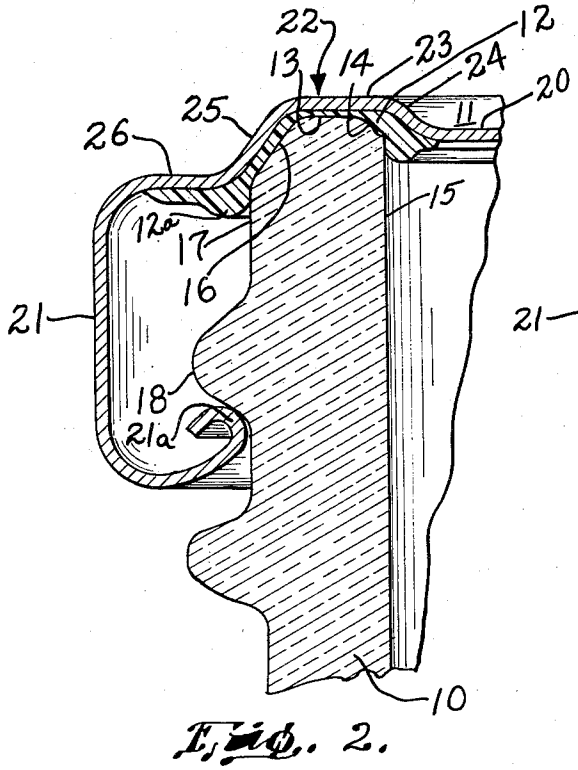


FIG. 2.

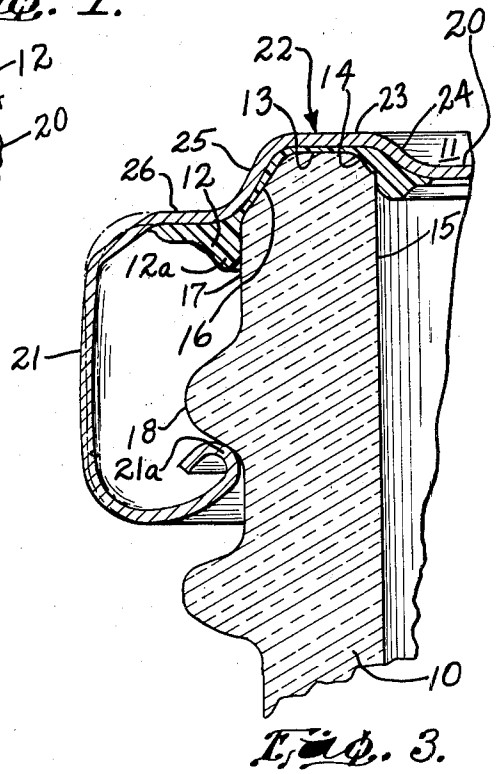


FIG. 3.

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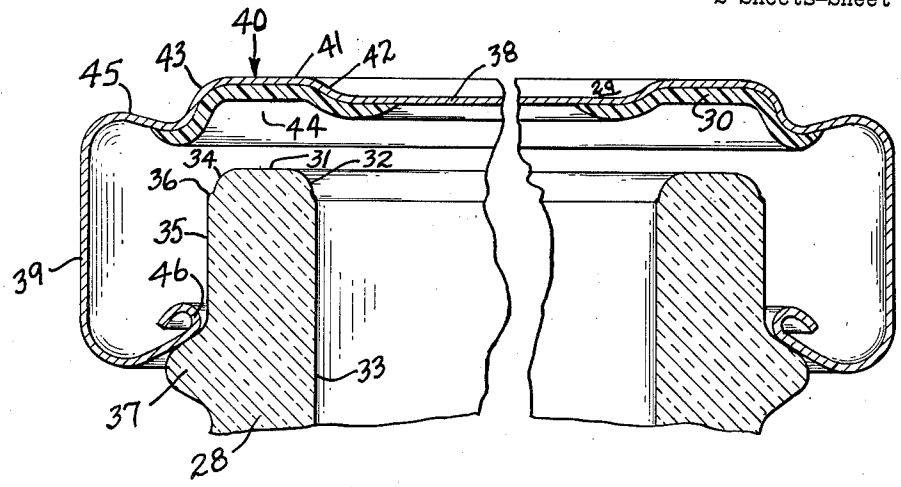
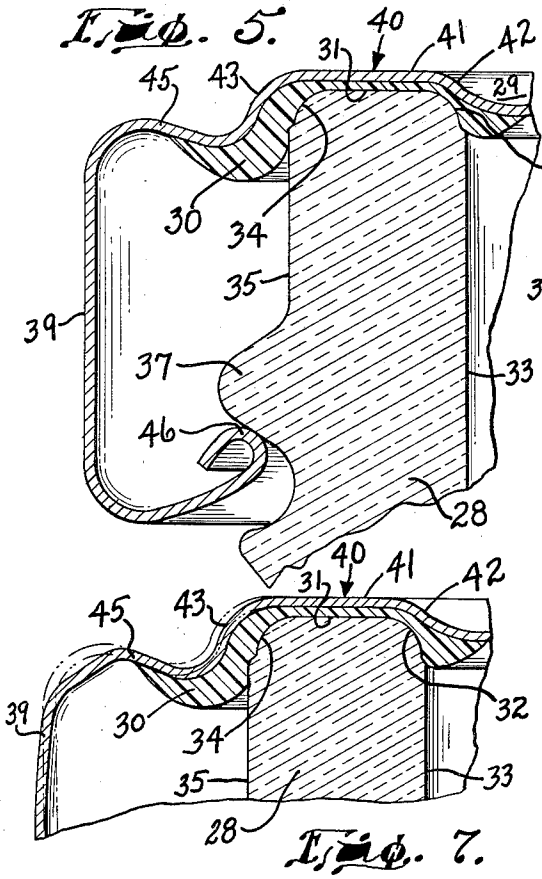


Fig. 4.

Fig. 5.



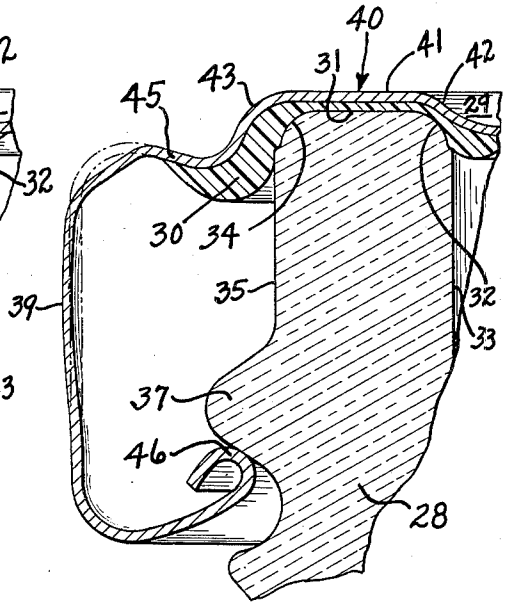


Fig. 6.

Fig. 7.

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CONTAINER AND CLOSURE CAP THEREFOR

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This invention relates generally to containers and closure caps therefor which are adapted for preservation of various commodities including food products such as fruits and vegetables. It relates more particularly to a package comprising a glass jar or container which after being filled is hermetically sealed by means of a gasketed sheet metal closure cap.

In the packaging of food products it is a common practice according to one method (hot pack) to place precooked or otherwise prepared food in a heated condition in a glass container and to provide a head-space above the product into which steam or an inert gas is introduced. This steam or gas evacuates and replaces any air that may be present in the "head-space" of the container. Immediately thereafter the container is closed with a gasketed cap. As the receptacle and its contents are cooled the entrapped steam condenses and a vacuum is created in the container. In another method (processed food), the product is placed in a glass container and steam or an inert gas is introduced into the head-space to evacuate any air therein. Thereafter the container is closed with a gasketed cap and subjected to high temperatures or autoclaving in the neighborhood of 240° to 250° F. After sufficient heating to sterilize the product therein, the container is cooled to condense the steam and create a vacuum in the container. The obvious purpose of these gaskets is to provide and maintain the hermetic seal in order that the food be preserved.

Heretofore, it has been difficult to consistently maintain an airtight seal during subsequent normal handling and packaging because frequently the cap may receive a blow in the area of the sealing gasket, which, even though insufficient to break the glass container does deform the cap and cause leakage. The blow may, for instance, be the result of machine handling, stacking of numerous jars for shipment or manual handling in the store. This blow which deforms the cap may force the top sealing surface of the container through the gasket thereby cutting through it to the bare metal and consequently permits air to enter the container and cause food spoilage. The blow, for example, may also cause a corner segment of the top panel portion of the cap to move away from the glass slightly, thereby breaking the seal between the gasket and the top sealing surface of the jar. Thus air may be permitted to flow into the container which will result in spoilage of the food. Clearly such defects are undesirable.

Various means have been suggested in an effort to overcome this difficulty. For example, very heavy metal which will resist distortion has been suggested. This, of course, is impractical because of the difficulty in forming the cap from such material, as well as the additional cost of the metal.

It is therefore an object of the present invention to provide a sheet metal closure cap free of the enumerated and other difficulties inherent in prior closure caps found in commerce and patent disclosures.

It is a further object of the present invention to provide a sheet metal closure cap which will continue to effectively seal a jar even after receiving severe blows in the region of the gasket, which ordinarily would develop leakers.

A further object of the present invention is to provide a novel and effective sheet metal, lug or screw-threaded

closure cap and container combination, which will remain effectively sealed even after the cap has been subjected to severe corner blows.

Another object of the present invention is to provide a sheet metal closure cap and container in which an effective seal is maintained even after gasket cut-through by the top sealing surface of the container.

These and other objects of the present invention will become apparent from a reading of the following detailed description taken in conjunction with the accompanying drawings, in which:

FIGURES 1–3 illustrate one form of our invention;

FIGURE 1 is a fragmentary sectional view of the container or jar with a cap embodying this invention loosely placed thereon;

FIGURE 2 is a fragmentary sectional view of the container or jar with the cap secured thereto and the gasket held under compression;

FIGURE 3 is a view similar to FIGURE 2 illustrating the deformation of the cap incident to receiving a blow and consequent redistribution of the gasket material, without detrimentally affecting the sealing effectiveness;

FIGURE 4 is a fragmentary sectional view of another container or jar with an alternative cap embodying this invention loosely placed thereon;

FIGURE 5 is a fragmentary sectional view with the alternative cap secured to a container and the gasket under compression;

FIGURE 6 is a view similar to FIGURE 5 illustrating the deformation of the alternative cap incident to receiving a blow; and

FIGURE 7 is a view similar to FIGURE 6 illustrating further probable character of deformation of the illustrated alternative cap.

Our invention in brief contemplates the combination of a glass jar or similar container having a special top and side sealing formation cooperating with a sheet metal closure cap embodying a novel sealing gasket arrangement; this to the end that normally expected blows directed against the skirt or marginal areas of the applied closure cap, although severely denting the metal causes only a localized redistribution of the sealing gasket material in the area of denting, and often creates an even better seal than the original.

Referring to FIGURES 1, 2 and 3 which illustrate a preferred form of the invention, reference numeral **10** denotes a mouth defining neck portion of a glass jar (not shown) which is hermetically sealed by means of a closure cap **11**, the latter provided with a sealing ring or gasket **12** composed of an elastomeric material such as a rubber composition, plastisol, or the like. The circular mouth-defining wall of the jar is formed with a relatively flat top sealing surface or rim **13** and an inner curved sealing surface portion **14** extending from surface **13** to the vertical cylindrical interior surface **15** of the neck **10** of the jar. The jar neck also includes an annular inclined corner sealing surface **16** which slopes downwardly and outwardly from the outer margin of the top surface **13** with its lower margin merging with an exterior cylindrical side sealing surface **17**. Immediately below the side sealing surface **17** is a closure cap retaining projection **18**. The projection **18** may be a continuous thread, or a series of lugs. It may also be formed to provide a conventional single annular rib over which the cap is forced. Such retaining projections are conventional and require no additional description or illustration.

The sheet metal cap **11** comprises a flat circular top portion or panel **20** having a depending annular attaching skirt **21** at its periphery which surrounds the neck **10** and is radially spaced therefrom. The panel **20** is deformed in an area adjacent its point of juncture with the skirt **21** to provide an upstanding hollow annular rib

22 which comprises a flat portion 23 and radially spaced apart inner side wall 24 and outer side wall 25. This rib provides an internal gasket accommodating channel 27. The flat top 23 of the rib 22 is positioned in a plane parallel to but above that of the major part of the panel 20. The inner side wall 24 slopes downwardly and inwardly from its juncture with the flat top 23 to the other periphery of the flat central portion of the panel 20. An annular, generally horizontal radial ledge 26 is positioned between the skirt 21 and rib 22 and lies in a plane below and substantially parallel to the panel 20. The outer side wall 25 of the rib slopes downwardly and outwardly from its juncture with the flat rib top 23 having its lower margin merging with the inner edge of the flat annular ledge 26. The slope of the outer side wall 25 is approximately the same as the slope of the corner sealing surface 16 and the wall 25 is of substantially greater width than the inner side wall 24.

The cap 11 may be secured to the glass container by any conventional means, such as an internal bead, a screw-thread, or as illustrated, peripherally spaced projecting internal lugs 21*a* which are integrally formed on the lower portions of the skirt 21.

The sealing ring or gasket 12 may, for example, be of the "flowed-in" type utilizing a plastisol or solvent rubber gasket. The gasket may be formed by flowing the viscous compound into the inverted cap or by being screened upon the unlithographed side of conventional tinplate from which sections are die cut to produce the closure caps.

The gasket 12 is applied and bonded to the cap shell in such manner that it covers not only the surface of the channel 27 but also is extended radially outward over that portion of the underside of the ledge 26 in close proximity to the channel 27. In the preferred embodiment, the gasket 12 is so constructed that is covers not only the channel 27 and an innermost portion of the underside of the ledge 26, as just described but also a portion of the underside of the top panel portion 20 in close proximity to the channel 27. This insures that if the portion of the gasket secured to the underside of the flat top 23 or the rib 22 or that portion secured to the underside of outer side wall 25 is cut through, there is remaining sufficient gasket material held in compression between the cap 11 and the sealing surface of the glass jar to prevent the entrance of air into the same.

An indicated heretofore our invention while not limited thereto, is especially adapted for use in the "hot-packed" product field, that is with those foods which are precooked, or prepared and packed while still hot. Such packaging involves filling a jar with the product, but providing a "head-space" above the fill line. Thereupon the filled jar is conveyed through a steam chamber so that the head-space is filled with steam which removes a substantial portion of the air. At this point the closure cap is applied to entrap the steam in the jar and hermetically seal it. Cooling of the container and contents produces a vacuum. Incident to initial cap application and the vacuum developed by subsequent cooling, the closure cap is securely attached to the jar and the sealing gasket compressed between the cap and glass sealing surfaces previously described. The gasket "flows" somewhat under heat and pressure so that it extends downwardly a short distance over the internal and external cylindrical sealing surfaces of the jar neck, as indicated at 12*a* in FIGURE 2.

Our invention is also adapted for use in the processed product field, that is with those foods which are cooked and sterilized in sealed containers. Here also, air is evacuated from the head-space and the subsequent cooling of the container causes the steam therein to condense and form a vacuum in the container. Here again the gasket is compressed between the cap and glass sealing surfaces previously described. It is during such processing that the gasket held in compression between the cap and the top sealing surface 13 of the container may be cut through. In prior art caps, the vacuum was lost, upon the occurrence of such cut through, however in the caps of this invention, the unique arrangement of the cap and gasket material 12 secured thereto retains its sealing contact with the container and prevents the loss of the vacuum when such cut through occurs.

If the cap is damaged, as for instance in the manner indicated in full lines in FIGURE 3 the gasket 12 remains in sealing contact with the glass jar thereby preventing the entry of air into the container. The figure illustrates in cross-section (full lines) one possible deformation of the caps. The dotted lines indicate the original and normal cross-sectional shape of the cap and the solid lines indicate the package in profile resulting from the application of some external force. As can readily be seen in the drawing the gasket 12 remains in sealing contact with the jar and the area of effective sealing is in fact enlarged by the flow of gasket material downwardly over the exterior sealing surface of the jar neck. This is contrary to what occurs in the caps and jars of the prior art whose designs are of such a nature that a similar deformation would result in a breaking of the gasket seal, entry of outside air and consequently food spoilage.

If the sealing surface of the rib 13 cuts through that portion of the gasket secured in the channel 27 there remains a substantial portion of the gasket 12 which is not cut through and which retains sealing contact with the inclined sealing surface 16 and particularly the exterior side sealing surface 17. The same is true if the cap is deformed in such a fashion so as to lift the gasket 12 in channel 27 from sealing contact with the top sealing surface 13. If that portion of gasket 12 which is secured to the side wall 25 is cut through, the compression to which the gasket is subjected forces the same downwardly thereby increasing the amount of gasket material in sealing contact with the outside surface 17. Thus it can readily be seen that the improved cap and jar of this invention have overcome the aforementioned difficulties of the prior art.

Referring now to FIGURES 4, 5, 6 and 7 wherein an alternative form of closure cap embodying our invention is illustrated, reference numeral 28 denotes a mouth defining neck portion of a conventional glass jar (not shown) which is hermetically sealed by means of a closure cap 29 which is provided with a sealing gasket 30 of a type similar to that hereinbefore described. The circular mouth-defining wall of the jar is essentially the same as that described in connection with FIGURES 1, 2 and 3 and is formed with a flat top sealing surface 31, an inner curved sealing surface portion 32, which extends from top surface 31 to the cylindrical interior surface 33 of the neck of the jar. The jar neck also includes an annular rounded corner sealing surface 34 which extends downwardly and outwardly from the top surface 31 with its lower margin merging with the external cylindrical side sealing surface 35. A shoulder 36 may, if desired, be provided at the juncture of side sealing surface 35 and corner sealing surface 34. Disposed along the side sealing surface 35 is a closure cap retaining projection 37 which may be of the character hereinbefore described.

This alternative form of sheet metal cap 29 comprises essentially the same configuration as that of cap 11 described in conjunction with FIGURES 1, 2 and 3. It comprises a flat circular top portion or panel 38 having an annular depending attaching skirt 39 at its periphery. The skirt 39 surrounds the neck 28 and is radially spaced therefrom. The panel 38 is also deformed in an area adjacent its point of juncture with the skirt 39 to provide an upstanding hollow annular rib 40 which comprises a flat portion 41 and radially spaced apart inner side wall 42 and outer side wall 43. This rib also provides an internal gasket accommodating channel 44. The flat top 41 of the rib 40 is positioned in a plane parallel to but above that of a major central portion of the panel 38. The in-

ner side wall **42** slopes downwardly and inwardly from its juncture with the flat top **41** to the outer periphery of the flat central portion of the panel **38**. An annular radial ledge **45** is positioned between the upper margin of the skirt **39** and the rib **40** and at least in part lies in a plane below the panel **38**. The ledge **45** is inclined upwardly and generally radially outwardly from its juncture with the downwardly and outwardly sloping outer side wall **43** of the rib **40** to the upper end of the skirt **39**. The contour of the outer side wall **43** is approximately the same as that of the corner sealing surface **34** and the wall **43** is of greater width than the inner side wall **42**.

The annular ledge **45** in the illustrated form is slightly inclined upwardly from its juncture with the outer side wall of the rib. It should be understood that the same may also be inclined at a larger or smaller angle than that shown.

The cap **29** may be secured to the glass container by any conventional means, such as those discussed hereinbefore. In the illustrated form, internal lugs **46** are used.

The gasket **30** may be applied to the cap **29** in any conventional manner such as those discussed above. It is applied and bonded to the cap shell in such manner that it covers not only the surface of the channel **44** but also that portion of the underside of the ledge **45** in close proximity to the channel **44**. In the preferred embodiment, the gasket **30** is so constructed that it covers also a portion of the underside of the top panel portion **38** in close proximity to the channel **44**.

This gasket **30** and also gasket **12** illustrated in FIGURES 1, 2 and 3 need not be bonded to all portions of the cap that it covers. It is sufficient that the same be bonded at only enough points to insure that it remains in the cap during handling and that the portion covering the underside of the ledge and outer side wall is not removed therefrom.

If the cap is damaged, as for instance in the manner indicated in full lines in FIGURES 6 and 7 the gasket **30** remains in sealing contact with the glass jar thereby preventing the entry of air into the container. The figures illustrate in cross-section (full lines) possible deformations of the cap. The dotted lines indicate the original and normal cross-sectional shape of the cap and the solid lines indicate the package in profile resulting from the application of some external force. As can readily be seen in the drawing the gasket **30** remains in sealing contact with the jar and the area of effective sealing is in fact enlarged by the flow of gasket material downwardly over the exterior sealing surface of the jar neck. This is contrary to what occurs in the caps and jars of the prior art whose designs are of such a nature that a similar deformation would result in a breaking of the gasket seal, entry of outside air and consequently food spoilage.

If the sealing surface of the rib **31** cuts through that portion of the gasket secured in the channel **44** there remains a substantial portion of the gasket **30** which is not cut through and which retains sealing contact with the inclined sealing surface **34** and particularly the exterior side sealing surface **35**. The same is true if the cap is deformed in such a fashion so as to lift the gasket **30** in channel **44** from sealing contact with top sealing surface **31**. If that portion of gasket **30** which is secured to the side wall **43** is cut through, the compression to which the gasket is subjected forces the same downwardly thereby increasing the amount of gasket material in sealing contact with the outside surface **35**. Thus it can readily be seen that the improved cap and jar of this invention have overcome the aforementioned difficulties of the prior art. The alternative cap described above also may be utilized to seal containers in the hot-packed and processed product fields equally as well as that form of our invention illustrated in FIGURES 1, 2 and 3.

It should be understood that the foregoing is a description of the preferred embodiments of this invention and

that various modifications may be made without departing from its spirit and scope.

We claim:

1. The combination comprising an open-mouth container and a sheet metal closure cap for sealing said container, said container having a vertically disposed neck portion terminating at its upper end and a sealing surface comprising a substantially flat top sealing surface, a vertically disposed side-sealing surface of minor axial extent and upwardly sloping annular sealing surface between said top and said side-sealing surface, and closure retaining means below said side sealing surface, said closure cap comprising a circular panel portion, a depending attaching skirt at the periphery of said panel portion, the panel portion being deformed in an area adjacent its point of juncture with said skirt to provide an annular upstanding hollow rib, said rib having radially spaced inner and outer side walls forming a sealing gasket accommodating channel internally of the panel portion, said outer wall being disposed at approximately the angle of said upwardly sloping annular sealing surface, an annular ledge between said skirt and rib lying in a plane below but parallel with said panel portion, an annular sealing gasket of elastomeric material disposed in said channel, the outer periphery of said gasket being secured to the inner peripheral portion of the underside of said ledge, said gasket being held under compression between said sealing surfaces and said cap whereby said gasket forms around said sealing surface, and means on the lower portion of said skirt cooperating with said closure retaining means.

2. The combination comprising an open-mouth container and a sheet metal closure cap for sealing said container, said container having a vertically disposed neck portion terminating at its upper end and a sealing surface comprising a substantially flat top sealing surface, a vertically disposed side sealing surface, an upwardly sloping annular sealing surface between and joining together said top and said side sealing surfaces, and closure retaining means below said side sealing surface, said closure cap comprising a circular top panel portion, a depending attaching skirt carried by said top panel portion, the top panel portion being deformed in an area adjacent its point of juncture with the skirt to provide an upstanding annular flat top hollow rib spaced radially inward from said skirt, said rib having radially spaced inner and outer side walls forming a sealing gasket accomomdating channel internally of the panel portion, said outer wall being disposed at approximately the angle of said upwardly sloping annular sealing surface, an annular ledge uniting said outer side wall and skirt and lying in a plane below but parallel with the top panel portion, a unitary annular sealing gasket of elastomeric material disposed in said channel, the outer periphery of said gasket being secured to the inner peripheral portion of the underside of said ledge, said gasket being held under compression between said sealing surfaces and said cap whereby said gasket forms around said sealing surface, and means on the lower portion of said skirt cooperating with said closure retaining means.

3. The combination comprising an open-mouth container and a closure cap for sealing said container, said container having a vertically disposed neck portion terminating at its upper end in a sealing surface, comprising a substantially flat top sealing surface, a vertically disposed side sealing surface spaced axially downward from said top sealing surface, an upwardly sloping annular sealing surface uniting said top and side sealing surfaces, an inner annular sealing surface sloping toward the container axis, said inner annular sealing surface being deformed at its end remote from said top sealing surface to form a ledge uniting said inner annular sealing surface and the interior surface of said neck, said ledge being parallel to but lying in a plane below said top-sealing surface and closure retaining means below said side sealing surface, said closure cap comprising a circular top panel portion, a depending attaching skirt carried at the periphery of said

top panel portion, the top panel portion being deformed in an area adjacent its point of juncture with the skirt to provide an upstanding annular flat top hollow rib spaced radially inwardly from said skirt, said rib having radially spaced apart inner and outer side walls providing a sealing gasket accommodating channel, an annular ledge adjoining said outer wall and lying in a plane below but parallel with said top panel portion, said outer side wall being of greater width than the inner wall and being disposed at approximately the angle of said upwardly sloping annular sealing surface and merging with said annular ledge, an annular sealing gasket of elastomeric material disposed in said channel and extending radially outwardly and inwardly from said channel, said outward radial extension being secured to a portion of the underside of said ledge and said inward radial extension being secured to a portion of the underside of said top panel portion, said gasket being held under compression between said sealing surface and said cap whereby said gasket forms around said sealing surface, and means on the lower portion of said skirt cooperating with said closure retaining means.

4. The combination comprising an open-mouth container and a sheet metal closure cap for sealing said container, said container having a vertically disposed neck portion terminating at its upper end in a sealing surface comprising a substantially flat top sealing surface, a vertically disposed side-sealing surface of minor axial extent and upwardly sloping annular sealing surface between said

top and said side-sealing surface, and closure retaining means below said side sealing surface, said closure cap comprising a circular panel portion, a depending attaching skirt at the periphery of said panel portion, the panel portion being deformed in an area adjacent its point of juncture with said skirt to provide an annular upstanding hollow rib, said rib having radially spaced inner and outer side walls forming a sealing gasket accommodating channel internally of the panel portion, said outer wall being disposed at approximately the angle of said upwardly sloping annular sealing surface, an annular ledge between said skirt and rib lying at least in part in a plane below said panel portion, an annular sealing gasket of elastomeric material disposed in said channel, the outer periphery of said gasket being secured to the inner peripheral portion of the underside of said ledge, said gasket being held under compression between said sealing surfaces and said cap whereby said gasket forms around said sealing surface, and means on the lower portion of said skirt cooperating with said closure retaining means.

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