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CLOSURE AND CONTAINER

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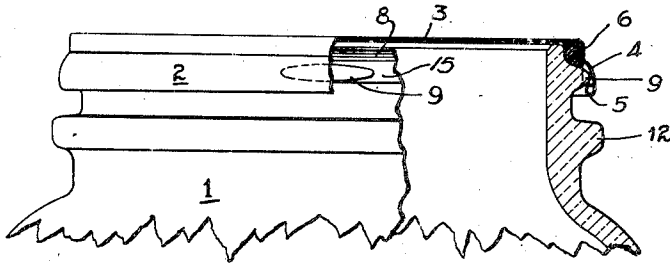


Fig. 1.

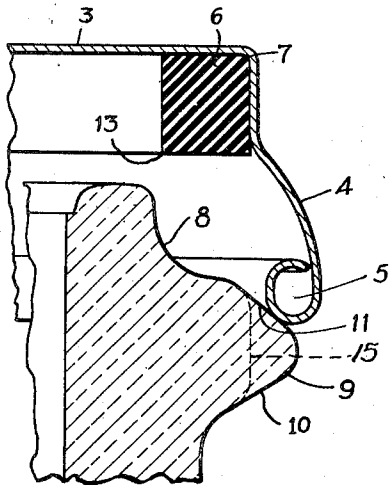


Fig. 2.

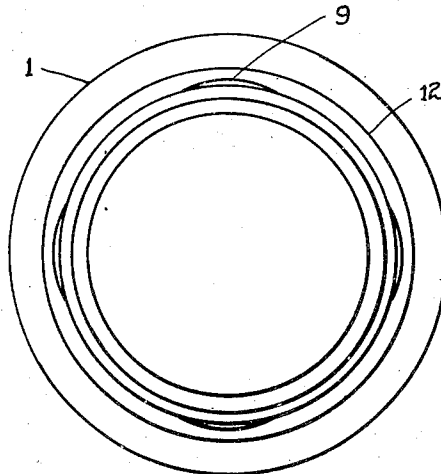


Fig. 5.

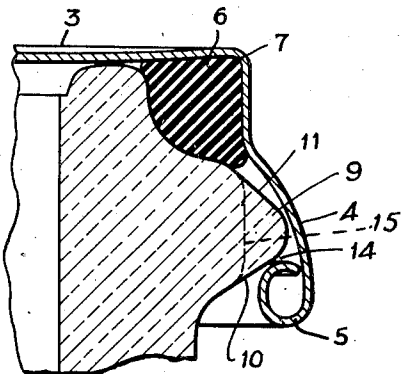


Fig. 4.

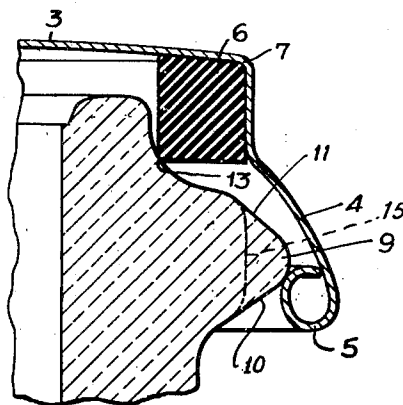


Fig. 3.

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CLOSURE AND CONTAINER

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3 Claims. (Cl. 215—40)

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This invention relates to a snap-on closure for containers and more particularly to a container-closure combination for forming vacuum seals.

The present container-closure combination is particularly suitable for use with methods of processing the container contents, such for example as foodstuff, wherein a filled container on which a closure has been placed is vacuumized and the contents of the container cooked or sterilized and sealed by heating the container-closure assembly in a hot atmosphere and partial vacuum or in a hot atmosphere alone, and thereafter cooling the assembly to room temperature, the closure being secured in sealing relationship with the container by the vacuum so formed. In such processing methods it is ordinarily desirable to provide a means for securing the closure on the container before the vacuum has been created in the container, yet permitting the vapor in the container to escape during the processing operation. One of the problems arising from the use of this type of construction, however, is that the strength required of the closure-securing means to form an effective seal without the aid of vacuum prevents the container from properly venting during the food processing operation, and when the container is thereafter cooled it is not properly vacuumized.

An object of the present invention is to provide a combination container and closure wherein the closure may be secured to the container in sealing relationship, and the container thereafter effectively vacuumized by the foregoing processes. Another object of the present invention is to provide an easily removable closure in a closure and container combination having a yieldable closure-securing means, wherein a highly effective seal is obtained between the gasket and the container sealing surface with comparatively low compressive forces maintained by the closure-securing means. Still another object is to provide a combination container and closure which is adapted to be used either as a vacuum seal or as a snap-on seal.

The present closure and container combination has been developed to provide particular utility in the processing of food in the manner mentioned hereinbefore and broadly consists of a flexible top portion, a resilient, depending skirt, a yieldable closure-securing means at the lower portion of the skirt, a resilient gasket having a sharp protruding corner for forming the seal between the closure, and a cross sectionally concave sealing surface on the container, and inclined closure-

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retaining means on the container. The gasket is preferably secured in the closure by an adhesive material, which may be of a thermoplastic character, so that in the food processing step a hermetic relationship between the gasket and closure will be maintained at all times.

To attain the objects of this invention, it has been found that success depended upon three major factors, assuming that the sheet metal of which the closure is formed is of a gauge and consequently possesses the resiliency normally used and found in sheet metal closures. These factors are the concavity of the sealing surface on the container, the angularity of the closure-retaining means of the container which cooperate with the securing means carried by the closure, and an angular portion of the sealing gasket for presentation to the sealing surface of the container. The hardness of the sealing gasket material is also an influential factor, but I do not consider it to be of the same magnitude of consequence to the invention as the other factors just mentioned.

The preferred embodiment is shown in the accompanying drawings wherein Fig. 1 is an elevation of a container finish and closure embodying my invention prior to vacuumizing, with a portion of both being shown in cross section;

Fig. 2 is a detail cross sectional view, on an enlarged scale, of the container finish and closure showing the closure out of sealing relationship with the container;

Fig. 3 is a detail cross sectional view, on an enlarged scale, of the container finish and closure showing the position of the closure in relation to the container during the procedure in which the pressure in the container is relieved;

Fig. 4 is a detail cross sectional view, on an enlarged scale, of the container finish and closure showing the closure in sealing relationship with the container; and

Fig. 5 is a top plan view of the container finish with the closure removed therefrom.

In the drawings, numeral 1 designates a cylindrical glass container and 2 a sheet metal closure, shown in Figs. 1 through 4 on the container in various relationships to the container finish. In the present embodiment the closure consists of a flexible top portion 3, a flaring depending skirt 4, a continuous annular bead 5 at the lower edge thereof, and a cross sectionally square, resilient gasket 6 seated in the corner 7 formed by the juncture of top portion 3 and depending skirt 4. Gasket 6, which is of a rubber or other similarly resilient sealing material having a hardness with-

in the range of about 60 to 70 points of a blunt point durometer, is cemented or otherwise secured to panel 3 and the top portion of skirt 4 to form a hermetic seal between the gasket and the metal blank of the closure. The skirt 4 below gasket 6 is flared outwardly and the edge thereof rolled under to form the round internal bead for slipping beneath and engaging the wedge-shaped lugs on the container and in cooperation therewith forming a yieldable closure-securing means for retaining the gasket in sealing relationship with the container finish whether a vacuum is present in the container or not, yet permitting the pressure to be relieved in the container during the food processing operation. It will be understood that while a bead is shown, any suitable inwardly disposed surface for engaging and slipping on the underside of the lug may be provided.

On container 1 a container finish is provided having an exterior and concave sealing surface as shown at 8 below the pouring lip, the radius of which is within a range of $\frac{3}{64}$ to $\frac{5}{64}$ of an inch, and a plurality of equally spaced, wedge-shaped lugs 9 arranged around the finish beneath the concave sealing surface over which bead 5 of the closure slips to retain gasket 6 in sealing relationship with sealing surface 8. The lower edge of concave sealing surface 8 merges into a substantially vertical surface in the form of an external bead 15, the lugs 9 being locally projected protuberances on this external bead, as clearly illustrated in the various figures in the drawing. In the embodiment shown in the drawings, four lugs are provided on the container finish although a smaller or larger number of lugs, depending on the size of the container mouth, may be used to form the present seal. The bottom side 10 of the lugs extends downwardly and inwardly at an angle between approximately 25° and 35° , to a horizontal plane beneath bottom side 10. The top side 11 of lug 9 extends upwardly and inwardly at an angle preferably within a range of 30° to 45° from a horizontal plane above top side 11; the exact angle of the top side is not important so long as it provides an adequate camming surface for cooperation with the bead 5 to distort the cap skirt into a shape allowing ready passage of the lugs 9 past the bead 5 upon application of the cap. The angular top and bottom sides preferably do not meet as a sharp edge, but instead juncture is effected by a rounded edge of suitable radius. The radius of the concave sealing surface and the angle of bottom side 10 of the lugs must fall within the respective ranges for these features as mentioned above to obtain maximum sealing effect of the gasket and removability of the closure from the container in an opening operation. It will be understood, however, that the cap retentive bearing of the arcuate bead 5 on the bottom sides 10 of the lugs is substantially a line contact of relatively narrow width so that the bearing may obtain anywhere along the portions of the bottom sides 10 having the angularity aforesaid.

Below the lugs on the container finish an annular bead or shoulder 12 is preferably provided against which an instrument such as a knife or spoon can be placed for prying the closure from the container.

The seal is formed by initially contacting the concave sealing surface of the container with an angular edge of the gasket 6 which in the specific embodiment herein shown is the protruding corner 13 and then progressively compressing the gasket equally on either side thereof against the container sealing surface. The protruding cor-

ner, being more readily deformable than a flat or curved body, requires less pressure on the gasket to form an effective seal and provides a more uniform contact between the gasket and the sealing surface of the container. Consequently in the present combination, less strength is required in the yieldable closure-securing means for compressing the gasket than that required where other types of gaskets are employed, and as a result a closure is provided which can easily be removed in the opening operation. Furthermore, less resistance is offered to the internal vapor pressure created during the food processing operation. Accordingly, vapor under pressure in the container becomes more nearly exhausted at the elevated temperature in the processing operation, and on cooling the container after substantially all the pressure has been relieved in this manner, a highly effective vacuum seal is formed.

In employing the present closure for vacuum sealing containers by one specific method of processing, uncooked or unsterilized food to be packaged is placed in the container and the closure is placed thereon and pressed into sealing relationship with the container finish. As the closure is pressed into sealing relationship, the bead and the adjacent skirt portion, which are normally round in plan, are forced outwardly at the four lugs and inwardly between these lugs so that the bead and skirt assume a somewhat four-cornered appearance which is most apparent as the bead passes the apex of the lugs. When the bead contacts the bottom side 10 of the lugs, the resiliency of the metal comprising the closure causes the bead to slip down this inclined surface until it again assumes its original round shape, thereby compressing gasket 6 against the concave sealing surface as shown in Fig. 1. After the container has been sealed in this manner, it is heated to the cooking or sterilizing temperature and there maintained for a predetermined time. As the temperature increases, the vapor pressure likewise increases, causing the top portion to bulge and the closure to rise bodily, forcing bead 5 outwardly along the bottom side 10 of lugs 9, and releasing the pressure of gasket 6 on sealing surface 8 until only corner 13 is in contact with the sealing surface as shown in Fig. 3. At this point the vapor under pressure within the container escapes between the gasket and sealing surface. When the pressure in the container has been substantially equalized with the atmosphere surrounding the container, the closure automatically snaps downwardly into sealing relationship with the container and, when the container has been cooled, maintains the vacuum created by said cooling. In some instances the vacuum, in pulling the closure down onto the container, compresses the gasket sufficiently to disengage the bead from the lugs, as shown in Fig. 4 at numeral 14. Since by the present construction substantially all the pressure created during processing is readily relieved, a greater vacuum is created in the subsequently cooled container than in the container-closure combination generally employed in which relatively high pressure is required to lift the closure to the point where the vapor can escape. Furthermore, there is no possibility at any time for contaminating substances to enter the container after the closure has originally been secured to the container and there is no danger of the closure being accidentally removed from the container during the cooking or sterilizing process.

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In removing the present closure from this vacuum sealed container, a knife or other suitable instrument is inserted between bead 12 of the container finish and bead 5 of the closure, and then twisted or pressed downwardly to lift bead 5 upwardly and outwardly over one of the lugs. When bead 5 passes the apex of the lugs, the vacuum in the container is relieved by the atmosphere entering between the gasket and the sealing surface adjacent the lug, and thereafter the closure may be lifted from the container. Although the closure is flexed somewhat during the sealing and opening operations, it does not become permanently deformed and may be repeatedly used to reseal the container. The closure may be manually pressed into sealing relationship with the container finish.

It is to be understood that the invention is not limited to the specific embodiment disclosed herein, but may be embodied in other forms within the scope of the appended claims.

I claim:

1. The combination comprising a container and closure for use in food processing operations involving heating the container after the closure is applied, said container having an arcuately concave outside sealing surface and outwardly disposed closure retaining means therebelow, and said closure including an upper skirt portion, a resilient lower skirt portion, inwardly disposed closure retaining means at the lower margin of said resilient skirt portion, and a resilient gasket located in said upper skirt portion and presenting a bottom corner of a substantially right angular shape when not compressed to bear upon said sealing surface, said inwardly disposed retaining means engaging and extending along the under side of said outwardly disposed retaining means far enough to permit raising of the closure to bring said gasket corner into substantially line contact on said sealing surface with said retaining means in engagement, whereby the pressure developed in heat processing raises the closure to permit escape of vapor between said gasket and said sealing surface without disengagement of said retaining means.

2. The combination comprising a container and closure for use in food processing operations involving heating the container after the closure is applied, said container having an arcuately concave outside sealing surface of from about $\frac{3}{64}$ to $\frac{5}{64}$ of an inch in radius and outwardly disposed closure retaining means below said sealing surface, said retaining means having a bottom engaging surface at an angle of 25° to 35° to a horizontal plane therebelow, and said closure including an upper skirt portion, a resilient lower

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skirt portion, inwardly disposed closure retaining means at the lower margin of said resilient skirt portion, and a resilient gasket located in said upper skirt portion and presenting a bottom corner of a substantially right angular shape when not compressed to bear upon said sealing surface, said inwardly disposed retaining means engaging and extending along the angular engaging surface of said outwardly disposed retaining means far enough to permit raising of the closure to bring said gasket corner into substantially line contact on said sealing surface with said retaining means in engagement, whereby the pressure developed in heat processing raises the closure to permit escape of vapor between said gasket and said sealing surface without disengagement of said retaining means.

3. The combination comprising a container and closure for use in food processing operations involving heating the container after the closure is applied, said container having a concave sealing surface of from $\frac{3}{64}$ to $\frac{5}{64}$ of an inch in radius and outwardly disposed closure retaining lugs below said sealing surface, said retaining lugs having a bottom engaging surface at an angle of 25° to 35° to a horizontal plane therebelow, and said closure including an upper skirt portion, an arcuately flaring lower skirt portion, an inwardly disposed closure retaining bead at the lower margin of said flaring skirt portion, and a resilient gasket of rectangular cross-section when not compressed located in said upper skirt portion and presenting a corner to bear upon said sealing surface, said inwardly disposed retaining bead engaging and extending along the angular engaging surface of said outwardly disposed retaining lugs far enough to permit raising of the closure to bring said gasket corner into substantially line contact on said sealing surface with said retaining lugs and bead in engagement, whereby the pressure developed in heat processing raises the closure to permit escape of vapor between said gasket and said sealing surface without disengagement of said retaining lugs and bead.

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