SIDE-SEAL CLOSURE FOR CONTAINERS

Filed Sept. 4, 1948

Fig. 1

Fig. 2

Fig. 3

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SIDE-SEAL CLOSURE FOR CONTAINERS
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Application September 4, 1948, Serial No. 47,778

6 Claims. (Cl. 215—40)

1 This application is a continuation in part of an application for United States patent filed by me on March 13, 1948, and bearing Serial Number 14,775. The invention relates to side-seal closures for containers, such as glass containers used by food packers and others in the processing and preserving of foods. An object of the invention is to produce a new and improved side-seal closure which is readily applied to a container as the final step in a food processing operation, and which is effective in maintaining the vacuum within the container resulting from such operation, but which may be readily removed from the container and reapplied thereto so as to again hermetically seal the interior thereof.

A further object is the production of a side-seal closure in the form of a unitary structure, and in which the gasket forming a part thereof is secured by adhesion to the carrying member therefor with the result that the gasket-carrying member is fully completed prior to securing the gasket in place theron. Figure 3 illustrates a container 4 fitted with a closure embodying my invention. In the illustrated embodiment the closure consists of a cap-shaped member to which a gasket is secured by means of the adhesive characteristic of the material from which the gasket is formed. As illustrated, the cap-shaped member consists of a disc-shaped portion 5 which is generally substantially circular, and is formed with a continuous flange 6 extending around the disc-shaped portion and so formed that the gasket-carrying part thereof extends substantially at right angles to the portion 5. Where the disc-shaped portion 5 is substantially circular, the flange 6 is annular and, independently of the shape of the portion 5, constitutes a continuation thereof.

Figure 1 is an enlarged fragmental sectional view of the neck finish 7 of a container such as the container 4 of Figure 3. Where the neck finish of the container terminates in a substantially circular edge, the disc-shaped portion 5 of the closure will be of circular shape, and the flange 6 formed thereon will be such as to encircle at least the upper portion of the neck finish when the closure is in place on the container. As shown the mouth...
of the container, i.e., the upper edge of the neck finish, is rounded on both its inner and outer portions so as to avoid sharp edges or corners. The rounded outer edge merges into a cylindrical surface of substantial width longitudinally of the container. The upper edge of the container is other than circular, for example elliptical, the shape of the surface will conform, but in all cases it will be parallel to the major or vertical axis of the container.

The general direction of the flange forming a part of the closure is at right angles to the portion of the closure, but as shown in both Figures 1 and 2 the flange may be formed in two diameters so as to provide a shoulder located on the inner face of the flange between the portion of smaller and the portion of larger diameters. As illustrated the gasket is located between the shoulder and the free edge of the flange and preferably is engaged by the shoulder.

As shown in both Figures 1 and 2 the free edge of the flange is rolled so as to provide a bead at that edge. The bead has the use of providing a smooth edge for the flange, and of reinforcing it so as to strengthen it against unintentional distortion. As shown in both Figures 1 and 2, the major portion of the flange is so formed that the inner surface thereof extends substantially parallel to the surface of the neck finish, which for convenience of description is defined as a plane vertical surface.

As illustrated in Figure 1 the lower portion of the flange, i.e., the gasket-carrying part thereof, may be inclined inwardly with relation to the major portion of the flange. This, together with the shoulder, provides a recess around the inner face of the flange for the reception of the gasket. In Figure 2 the free edge of the flange is not inclined inwardly but extends in the same direction as the remainder of the flange. Where the flange is annular, the inner face thereof is cylindrical from the shoulder to a point adjacent the bead. In both Figures 1 and 2 the gasket is supported by the shoulder as well as the portion of the flange adjacent thereto which as noted, is parallel with the surface of the container.

The gasket is formed of a material or composition having the characteristics of rubber in its ability to avoid an appreciable amount of permanent set after having been distorted. The dot-dash line 12 of both Figures 1 and 2 discloses the normal or free shape of the gasket when in place on the flange. Both Figures 1 and 2 show the cross-sectional shape of the gasket when in cooperative sealing relationship with the plane vertical surface, such as the surface of a container.

In the commercial manufacture of articles such as glass containers and closures thereof, it is difficult to produce a number of articles which are exactly similar in dimensions. A permissible variation in certain dimensions is, therefore, agreed upon as a commercial tolerance, and articles having dimensions falling within such commercial tolerances are considered acceptable as commercial articles. Figure 1 discloses a relationship between the closure and neck finish in which the external diameter of the cylindrical portion of the neck finish approximates the maximum diameter, within commercial tolerances. On the other hand, Figure 2 illustrates the functioning of the gasket under conditions where the plane vertical surface of the neck finish is of the smallest diameter, and the internal diameter of the flange is of the largest diameter acceptable under commercial tolerances now in force.

From the foregoing, it will be apparent that the closure and the gasket must be so formed as to accomplish an effective seal for all dimensional variations within the commercial tolerances of both articles, i.e., of the neck finish of the container and also of the gasket-carrying flange of the closure. In order to accomplish this material of which the gasket is formed must be selected to provide the necessary resilience, and the initial shape of the gasket must be established and duplicated on all closures, within relatively close limits. In both Figures 1 and 2 the portions cross-hatched to indicate rubber or similar material are close approximations of the cross-sectional shape assumed by the gasket under varying conditions of compression such as may be encountered due to allowable differences in the diameters of the surface of the flange and the gasket-supporting face of the container, thereby securing the carrying member by means of relatively simple procedure and without the necessity of reforming the carrying member. As commercially carried forward, this involves an approximation of an extrusion process, i.e., a procedure wherein the compound from which the gasket is formed, is "flowed" onto the gasket-carrying portion of the flange and is of such consistency that the final form of the gasket is developed during the "flowing-on" step or in connection with that step.

The operation of forming the gasket may be performed while the cap-shaped member of the closure is being rotated at a fixed speed. The compound from which the gasket is formed, is delivered onto the inner face of the flange of the rotating member while in a viscos state and under conditions such that it forms a band located upon and extending around the flange. It preferably lies against the shoulder so that the surface of the shoulder forms a part of the supporting surface therefor and, in effect, defines one edge of the band. The band is of such width that it covers a substantial portion of the inner face of the flange, extending from the shoulder toward the free edge of the flange.

This extruding or applying operation may be accomplished while the cap-shaped member is rotating with the flange or the extending upward the standing portion of the member may be manipulated for the purpose of imparting the desired shape to the gasket forming compound after it is in place on the flange and while it is still in a plastic or viscous state. For example, the position of the cap-shaped member may be varied so that the compound is applied thereto so that gravity will cause a movement or flow of the compound and thereby contribute to the final shape of the gasket formed as a part of the closure member.

As previously pointed out, an object of my invention is to produce a side-seal closure which...
will accomplish an effective seal as the final step of a food processing operation, and which may be readily removed from its cooperating container, the gasket, in the initial stage, then be placed on the container and again hermetically seal the interior thereof. In order to accomplish this the closure and the container must be such as to fulfill the following requirements:

The cap portion of the closure must be rigid enough to permit removal thereof, under conditions of maximum vacuum with the container, without being permanently distorted or otherwise damaged. On the other hand, the gasket-carrying flange of the cap portion must be sufficiently flexible to accommodate itself to various shapes and sizes of the neck finish on the container within the limits of commercial tolerances.

The gasket-carrying flange of the closure preferably should be formed in two diameters so as to provide a shoulder on the inner face thereof which is located adjacent the disc-shaped portion of the cap and extends circumferentially thereof in parallel relationship thereto. By so forming the flange, the shoulder provides a support for the lateral edge of the gasket and consequentlty, aids the adhesive force of the gasket in resisting movement of the gasket relatively to the supporting flange, as the closure is moved into sealing relationship with the cooperating surface of the container. The shoulder also reinforces the gasket in such a way as to exert some control on the movement or flow of the material of which the gasket is formed, in responses to compression forces to which the gasket is subjected as the closure is moved to sealing position on the container.

The cap preferably should be so formed that the disc-shaped portion thereof engages the edge or mouth of the container, and provides a stop which positions the gasket relatively to the cooperating sealing surface of the container. The disc-shaped portion of the cap preferably should be substantially flat, when the interior of the container is under vacuum so as to avoid collecting water or other liquid on the closure during or after the food processing operation.

The edge of the gasket-carrying flange of the closure should be sufficiently stiff to prevent undue distortion of the flange or nicking or notching of the edge thereof during the operation of removing the closure from the container. Particularly during the operation of initially removing the closure after the food processing operation. On the other hand, such reinforcing or beading of the edge as is employed, must not be such as to stiffen the gasket-carrying flange that it will not readily accommodate itself to neck finishes of slightly different shapes and sizes. The beaded edge of the closure must also be sufficiently spaced from adjacent portions of the container to permit the easy insertion of a simple implement or tool, such for example as the handle of a spoon or fork, in the operation of removing the closure from the container.

The gasket when completed must be highly resilient, i.e., must resist appreciable permanent set under the forces encountered during initial and subsequent sealing operations. The gasket must also be heat resistant at normal food processing temperatures and have a composition which will not impart either flavor or odor to the food within the container.

The coefficient of friction between the material of the gasket and the cooperating surface of the container should be such as to hold the closure firmly on the container so as to prevent unintentional movement of the closure. But the gripping action between containers and gasket must not be of such tenacity as to break or tear the gasket as the closure is removed from the container. The frictional grip between the gasket and the container can be controlled by the makeup of the gasket forming compound. A slight amount of a hydrocarbon such as paraffin, or a wax such as beeswax, included as a constituent of the compound, will make itself apparent on the surface of that gasket, and will prevent the gasket from sticking or adhering to the surface of the container under conditions such as is likely to destroy or damage the gasket during the operation of sealing, unsealing and rescating the container. On the other hand, the frictional relationship between the surface of the gasket and the cooperating surface of the container must be such that the gasket will readily move across the cooperating surface of the container without being torn free from the supporting flange of the closure. As to this it is noted that the friction between the gasket and the container should be such that during the operation of initially sealing the container, the movement of the closure to place on the container will distort the gasket to a slight amount in the direction it will tend to distort when the interior of the container is subjected to conditions of maximum vacuum. The distortion here referred to is in addition to that occasioned by the fact that the gasket is compressed between the surface of the container and the flange of the cap as the closure is moved to position on the container.

The shape of the gasket should be such as to contribute to an easy centering of the closure on the edge of the neck finish as a preliminary to the sealing operation. The shape of the gasket also should be such that during the operation of moving the closure to sealing position on the container the surface of the neck finish first engages the surface of the gasket at a point intermediate the edges of the gasket. This initial contact should preferably be between surfaces which are substantially tangential at their point of contact. The gasket should also be of such a shape that the compression forces acting on the gasket when the closure is in place on the container will occasion a reshaping of the gasket such that the surface thereof forced into intimate contact with the cylindrical surface of the neck finish, will be of sufficient width, transversely of the circumferential axis of the gasket, to insure effective sealing of the container under maximum vacuum within the container. In addition the shape of the gasket must be such that the compression forces acting thereon and the pressure of the atmosphere, rendered effective by vacuum within the container, will not only accentuate the sealing effect of the compression forces, but will also tend to force the atmospheric edge of the gasket against the supporting flange.

It is particularly important that the shape be such that atmospheric pressure exerted on the external edge of the gasket shall tend to force that edge against the supporting flange of the closure and thus avoid a tendency of the gasket to be torn free from that flange.

All this is accomplished by employing a gasket which is generally wedge shaped in cross-section, but in which the free surface is in general a curved surface both circumferentially of the gasket and at right angles to the circumferential
axis thereof. While the cross-section of the gasket is generally in the form of a wedge, its cross-sectional shape is more accurately described as similar to the cut surface of a quarter pear, where the quarter section is formed by planes extending at right angles to each other and intersecting at the central major axis of the pear. The gasket is so located on the flange of the cap that the thicker portion thereof is located between the shoulder 9 and the free edge of the flange 6 but remote from the shoulder 9. Another feature of the invention is that the container is so formed that its surface thereof which cooperates with the closure gasket in accomplishing a seal, is a plane vertical surface which merges into the rounded edge which surrounds the mouth of the container. That is to say, the sealing surface of the container forms a part of the neck finish, is in general a plane surface parallel to the vertical axis of the container, and merges into a well rounded edge which surrounds the mouth of the container.

With this arrangement, after the closure gasket is compressed to the normal sealing position by its engagement with the plane vertical surface of the neck finish, further movement along that surface will not appreciably change the compression strains on the gasket.

In the foregoing description I have outlined the requirements of the closure and its cooperating container because it is impossible to submit dimensions and definite instructions essential for all the various sizes of closures and all the various conditions under which closures of my invention may be employed. In addition, it is assumed that those skilled in the art, knowing the conditions involved and the requirements imposed by such conditions, will be able to produce side-seal closures having the beneficial features of my invention as herein set forth and as defined by the appended claims.

What I claim is:

1. A side-seal closure for a container provided with a neck finish having a plane cylindrical surface devoid of ridges, extending around and concentric with the vertical axis of the container and merging into a rounded edge portion surrounding the mouth of the container, which closure consists of a substantially circular disc-shaped portion having an annular flange extending at right angles thereto around the edge thereof, and a resilient gasket engaging the inner surface of said flange; said gasket being normally wedge-shaped in cross section transversely of the circumferential axis thereof, with the flange-engaging surface thereof conforming in contour to the surface of the portion of the flange engaged thereby and with the free surface thereof convex, transversely of the circumferential axis of the gasket, and devoid of corners and with the end portions thereof continuously changing in direction both transversely and circumferentially of the gasket and with the thicker portion of the socket located intermediate the ends thereof and closer to the end adjacent the free edge of the flange.

2. A side-seal closure for a container provided with a neck finish having a plane surface extending around and substantially parallel to the vertical axis of the container and merging into a rounded edge portion surrounding the mouth of the container, which closure consists of a substantially disc-shaped portion having a continuous flange extending at right angles thereof and in adhering engagement with the inner surface thereof; said gasket being normally wedge-shaped in cross section, transversely of the circumferential axis thereof, and with the free surface thereof convex transversely of the circumferential axis of the gasket, with the thicker portion of the socket located intermediate the ends thereof but closer to the end adjacent the free edge of said flange, and with each end of the gasket rounded and continuously changing in direction both transversely and circumferentially of the gasket.

3. A container having a plane cylindrical surface devoid of ridges and extending around the neck finish in substantially parallel relationship to the vertical axis of the container and merging into a rounded edge portion surrounding the mouth of the container, which closure consists of a substantially disc-shaped portion having a continuous flange extending substantially at right angles thereto around the edge thereof and formed with a rounded shoulder extending around the flange in parallel spaced relation to said disc-shaped portion, and a solid, resilient and continuous gasket extending around said flange in engagement with the portion thereof including said shoulder and a portion of the part located beyond the shoulder and remote from said disc-shaped portion said gasket being substantially wedge-shaped in cross section transversely of the circumferential axis thereof with the flange-engaging surface thereof conforming in contour to the portion of the flange engaged thereby and with the free surface thereof devoid of corners and having rounded ends each continuously changing in direction both transversely and circumferentially of the gasket and with the thicker portion of the socket located intermediate the ends thereof and closer to the end remote from said disc-shaped portion.

4. A container having a plane cylindrical surface constituting a part of the neck finish of the container, said surface extending around and substantially concentric with the major axis of the container and merging into a well rounded edge portion of the cylindrical surface of the container, in combination with a side-seal closure for said container including a disc-shaped portion having a continuous, substantially rigid annular flange formed around the edge thereof and extending substantially at right angles thereto; and an annular, resilient gasket extending around and adhering against the inner face of said flange; said gasket being normally wedge-shaped in cross section with the flange-engaging surface thereof conforming in contour to the contour of the portion of the surface of said flange contacted thereby and with the free surface thereof convex, transversely of the circumferential axis of the gasket, with the thickest portion of the socket located intermediate the ends thereof but closer to the end adjacent the free edge of said flange; said flange being so formed as to extend around said cylindrical surface of the neck finish in such portion thereof that said closure is in place on said container and said gasket being of such thickness and so located on said flange that the convex surface thereof engaeges the cylindrical surface of said neck finish and is distorted by said engagement to conform in part to the contour of the said surface engaged thereby and said gasket is so extended by said engagement that it is of greater width transversely of its circumferential axis than the normal transverse width of the gasket.
5. A container having a plane cylindrical surface constituting a part of the neck finish of such container, said surface extending around and substantially concentric with the major axis of the container and merging into a well rounded edge portion surrounding the mouth of the container, in combination with a shaft-seal closure for said container including a circular, disc-shaped portion having an annular flange formed around the edge thereof and extending substantially at right angles thereto; and an annular resilient gasket extending around, lying against and adhering to the inner face of said flange; said gasket being normally wedge-shaped in cross section with the flange-adhering surface thereof conforming in contour to the contour of the surface of the flange engaged thereby and with the free surface thereof convex, transversely of the circumferential axis of the gasket, and having rounded ends continuously changing in direction both transversely and circumferentially of the gasket, and with the thicker portion of the gasket located intermediate the ends of the gasket but closer to the end thereof adjacent the free edge of said flange; said flange being so formed on said closure as to extend around the cylindrical surface of the neck finish in spaced relationship to the closure when the closure is in container-closing position on said neck finish; and said gasket being of such thickness and so located on said flange that the convex surface thereof engages the cylindrical surface of the neck finish and is distorted thereby so that the portion thereof in engagement with said surface conforms to the contour of such surface and the gasket is so extended by such engagement that it is of greater width transversely of its circumferential axis than the normal transverse width of the gasket.

6. A side-seal closure for a container provided with a neck finish having a plane cylindrical surface devoid of ridges, extending around and substantially concentric with the vertical axis of the container and merging into a rounded edge surrounding the mouth of the container, which closure consists of a substantially circular disc-shaped portion having an annular flange extending at right angles thereto around the edge thereof and formed with a rounded shoulder extending around the flange in parallel, spaced relationship to said disc-shaped portion, and a solid resilient annular gasket extending around said flange and in adhering engagement with a portion of the inner face thereof including said shoulder and a part of the flange located beyond the shoulder and remote from the disc-shaped portion; said gasket being normally wedge-shaped in cross section, transversely of the circumferential axis thereof, with the surface thereof in engagement with said flange conforming in contour to the engaged portion of the flange and with the free surface thereof convex transversely of such axis with the thicker portion of the gasket located intermediate the ends thereof but closer to the end remote from the disc-shaped portion and with each end of the gasket rounded and continuously changing in direction both transversely and circumferentially of the gasket.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,178,903</td>
<td>Campo</td>
<td>Apr. 11, 1916</td>
</tr>
<tr>
<td>1,346,654</td>
<td>Ingram et al.</td>
<td>July 13, 1920</td>
</tr>
<tr>
<td>1,440,986</td>
<td>Hammer</td>
<td>Jan. 2, 1923</td>
</tr>
<tr>
<td>1,524,596</td>
<td>Tallaferro</td>
<td>Jan. 27, 1925</td>
</tr>
<tr>
<td>1,682,234</td>
<td>Moyer</td>
<td>Aug. 28, 1928</td>
</tr>
<tr>
<td>2,030,062</td>
<td>Green et al.</td>
<td>Feb. 11, 1936</td>
</tr>
<tr>
<td>2,181,799</td>
<td>Carvalho</td>
<td>Nov. 28, 1939</td>
</tr>
<tr>
<td>2,463,701</td>
<td>Krueger</td>
<td>Mar. 5, 1949</td>
</tr>
</tbody>
</table>