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CHING C. LOO

3,340,671

METHOD OF FILLING CONTAINERS UNDER ASEPTIC CONDITIONS

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2 Sheets-Sheet 1

Fig. 1

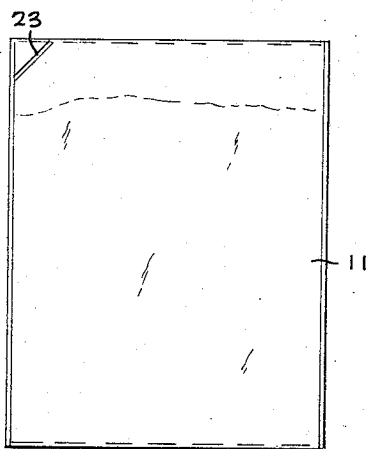


Fig. 2

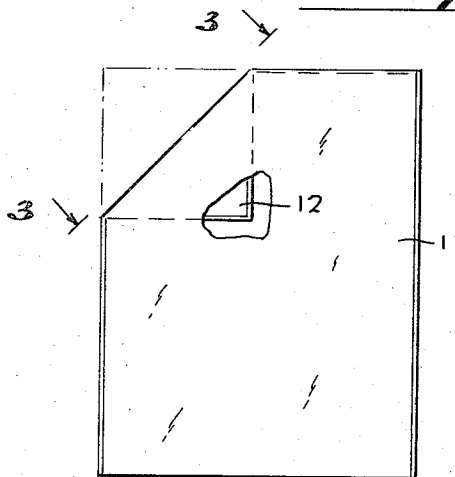


Fig. 4

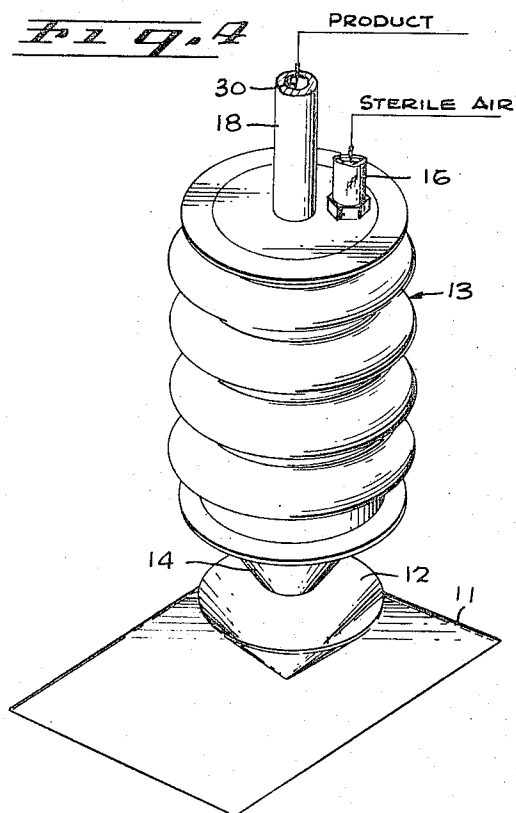


Fig. 5

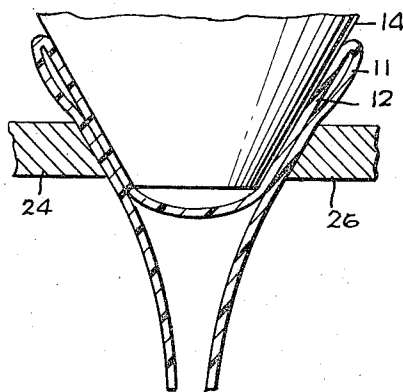
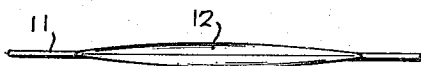


Fig. 3



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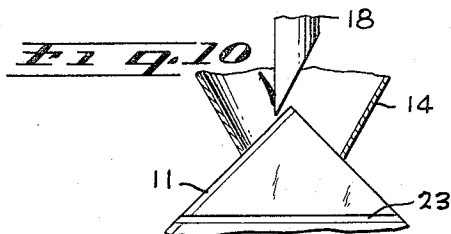
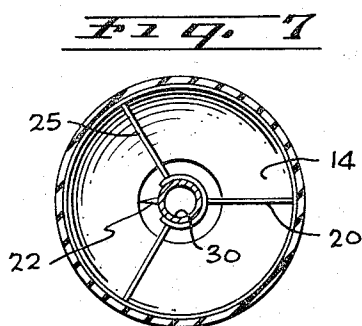
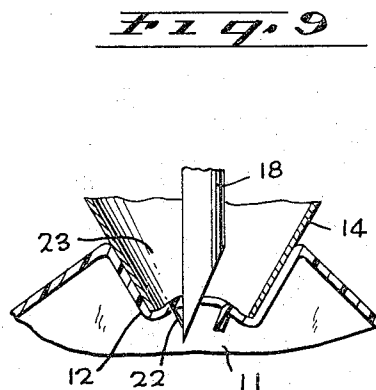
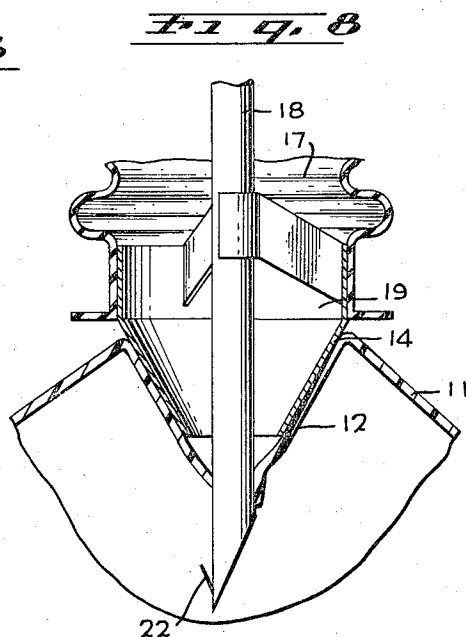
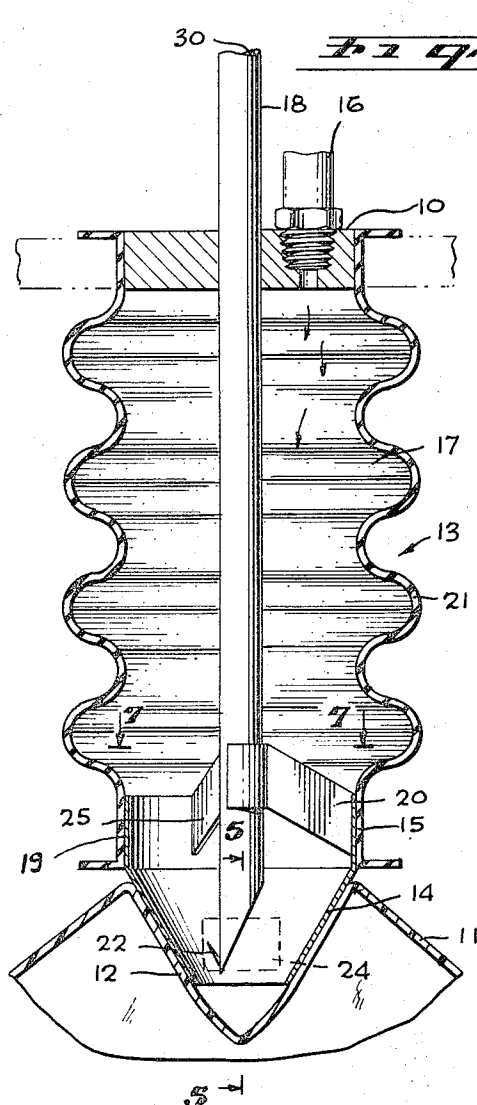
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2 Sheets-Sheet 2



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METHOD OF FILLING CONTAINERS UNDER ASEPTIC CONDITIONS

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5 Claims. (Cl. 53—37)

This invention relates to a method and apparatus for introducing a fluid or flowable material into a flexible container. More particularly, the invention concerns a method for aseptically filling a flexible container with a liquid or liquids having entrained solids, and a method for protecting a sealing surface during filling flexible containers.

Many liquids, including foods, are packaged for sale in flexible containers such as laminated plastic, aluminum foil and cellophane. The introduction of foods to flexible containers has presented a number of problems. Major among these is sealing the container after introducing the food. A common practice is to fill the flexible container through the top while maintaining the container under aseptic conditions, and then seal the container along the top edge. Most liquid product introduced to containers under pressure splashes over the inside wall of the container. Steam or liquid sterilizing agents, such as chlorine, used to sterilize the opening in the container often oxidizes a part of the inner surface of the container. If the liquid product splashes on the area of the container where the seal is to be made, or if this area is oxidized, it is extremely difficult to obtain a positive seal of the container along this surface. A major portion of food product spoilage or leakage of liquids in flexible packaging is attributed to such imperfect seals.

It is an object of this invention to provide a new method and apparatus for introducing fluids to flexible containers. A further object of this invention is a method of introducing liquids to flexible containers under aseptic conditions. A further object is a filling method which insures a dry, clean inner surface will be available for sealing the container.

Yet, another object of the invention is a unique method and apparatus for filling sterilized containers under aseptic conditions. Further objects will be apparent to those skilled in the art upon reading the following detailed description of the invention.

FIGURE 1 is a side view of a flexible container which has been filled with a liquid and sealed by the method of this invention.

FIGURE 2 shows a side view of a flexible container prior to filling, and it particularly illustrates the pocket utilized by this invention.

FIGURE 3 is an oblique view along line 3—3 looking directly into the pocket formed in the corner of the container shown in FIGURE 2.

FIGURE 4 is a perspective view of the preferred apparatus for introducing liquid to the flexible container. The figure also illustrates the position of the flexible container just prior to engaging the filling apparatus.

FIGURE 5 is a section view of the cone of the filling apparatus and a portion of the flexible container after the cone is positioned in the pocket of the container.

FIGURE 6 is a section through the filling apparatus and a part of the flexible container; it further illustrates the relationship of the container to the filling apparatus just prior to puncturing the container.

FIGURE 7 is a section through the filling apparatus along line 7—7 of FIGURE 6, and it illustrates the general construction of the cone.

FIGURE 8 is a section through a portion of the filling

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apparatus and flexible container as shown in FIGURE 6, except the view is subsequent to puncturing the container.

FIGURE 9 is also a side section showing the withdrawal of the filling tube from the container and the simultaneous unfolding of the pocket.

FIGURE 10 illustrates the seal across the corner of the flexible container after withdrawal of the filling tube.

The invention embodies concepts of: (1) Filling a flexible container so as to provide a protected inner sealing surface. This involves forming a depending pocket in the container so that the inner surface of the pocket and inner surface of the container form a protected surface during filling; filling the container through an opening in the pocket; unfolding the pocket to bring together the protected inner surfaces; and sealing the container along the protected inner surface, and (2) Filling a sterile flexible container under aseptic conditions by sterilizing a depending pocket in the flexible container, and purging the pocket during filling to maintain the pocket sterile; puncturing the pocket, and filling the container through the opening in the pocket; unfolding the pocket and sealing the opening in the container.

The invention will be described with reference to the preferred embodiment using aseptic filling conditions and a liquid food product. In the preferred embodiment, the flexible container 11 is a presterilized sealed container made of impermeable material, such as laminated plastic, cellophane, laminated metal foil, etc. It is not essential to use a presterilized container if the product is to be subsequently sterilized, or if sterility is not important. The invention is applicable to non-food products (where sterility is not important) and will provide a clean, dry sealing surface for any flexible packaging filled with a flowable solid or liquid. In particular, the invention is useful to form a clean, dry sealing surface in flexible containers for non-sterilized products which are filled with liquid containing entrained fibrous material, solid chunks, grease, chemicals or corrosives which would bridge a heat seal.

In a commercial operation the pocket 12 may be formed pneumatically, or mechanically by simply pressing a blunt wedge into a corner of a suspended container 11. To facilitate forming the pocket 12 in the sealed container 11, it is desirable to slightly preheat the container 11 to release the partial vacuum inside the sealed container 11. It is preferred that the pocket be formed in a corner of the container since this facilitates easy sterilization, puncturing and sealing of the container 11. The container may have any number of corners. For example, a pentagon has been found to be an advantageous shape since it provides a balanced center corner in which to form the pocket.

FIGURE 3 is a view looking directly in the pocket 12, and it illustrates that the preferred pocket 12 is a depending fold or crease in the corner of container 11.

During the filling operation the container 11 may be suspended by mechanical means, such as the clamps 24 and 26 shown in FIGURE 5. The pocket 12 may be held open pneumatically or mechanically if desired. The apparatus suspending the container 11 during filling has been eliminated from all figures except 5 and 6 to more clearly illustrate the relation between the filling apparatus 13 and container 11.

If a rectangular container, as shown herein is used, the initial pocket 12 formed in the container 11 will have approximately 45° walls. When the pocket 12 is opened to form a cone, the walls will be approximately 60°, as shown in FIGURE 4. It is desirable that the truncated cone 14 of the filling apparatus 13 have an angle of about 60°, so that the cone 14 and pocket 12 fit snugly. While it is not necessary to form a seal between the cone 14

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and pocket 12 during the filling operation, the snug fit between the cone 14 and pocket 12 facilitates maintaining sterility during the filling operation. It is also possible to use an elliptical cone and pocket, so the particular angle of either the cone 14 or pocket 12 is not important, so long as they fit snugly together at some point inside the pocket.

FIGURE 5 shows the cone 14 of the filling apparatus 13 after it has been inserted into the pocket 12. As explained, the container 11 may be held in position against the cone 14 by the clamps 24 and 26. FIGURE 5 particularly illustrates a distinctive feature of the invention. The pocket 12 and the container 11 form a double wall around the perimeter of the cone 14. The inner surface of the pocket 12 is adjacent to the inner surface of the container 11. The inner surface of the pocket 12 along the elevation of the cone 14 is protected from splashing product and oxidation in the loop formed by the container 11 and pocket 12. The clamps 24 and 26 as shown serve a dual purpose: they help hold the container 11 in position against the cone 14 during filling; and they press the wall of the container 11 against the wall of the pocket 12 so as to further protect the inner wall of the pocket 12 during the filling operation. Thus, the inner surface of the pocket 12, and protected area of the container 11, which will be the sealing area when the pocket 12 is unfolded, are protected. The conical clamps 24 and 26 are not essential to the invention, since the inner surface of the pocket 12 will be protected by the wall of the container 11 if the container is supported during filling.

In FIGURE 6 the cone 14 of the filling apparatus 13 is shown in the pocket 12. The pocket 12 is maintained sterile by introducing a purge gas such as steam or sterile gas through tube 16 and annulus 17. The pocket 12 may be presterilized by means such as chlorine washing. Small amounts of residual chlorine left in the pocket are useful in keeping the outside surface of cone 14 free from contaminants. During the filling operation and prior to puncturing, pocket 12 is purged. The flow of purge gas through tube 16 and annulus 17 may continue for the entire filling operation to maintain the container 11 sterile.

The filling apparatus 13 comprises a filling tube 18, flexible rubber tube 21, cone 14, an upper housing 10 and lower housing 19. In the illustrated embodiment, the lower housing 19 and cone 14 remain stationary during filling. The lower housing 19 may be supported by means attached to flange 15. The housing 10, cone 14 and rubber tube 21 form a seal so that air may enter only through the nose of cone 14 or through tube 16. As illustrated, the filling tube 18 moves with the upper housing 10 and slideable within the lower housing 19. Supports 20 and 25 guide the sliding tube 18.

Purge gas is introduced to the annulus 17 through the tube 16. All apparatus inside the flexible rubber tube 21 are sterilized by means such as steam, chlorine solution, etc., and can be maintained sterile by continuing to purge the annulus 17 with sterile gas. Product enters the filling apparatus 13 through the annulus 17 in the filling tube 18. Suitable means for controlling the flow of product and metering the product may be provided at the input to the filling tube 18.

FIGURE 8 shows the filling tube 18 after puncturing the pocket 12. In the illustrated embodiment, the filling tube 18 slides downwardly by depressing upper housing 10 and slidable tube 18 as shown in FIGURE 6. The slidable tube 18 affixed to the housing 10 as a means of inserting the tube 18 into the container has the additional advantage of causing the rubber tube 21 and annulus 17 to act as a bellows when the housing 10 and filling tube 18 are depressed. The surge of gas through the nose of the cone 14 at the instant the tube 18 punctures the pocket 12 causes the container 11 to partially inflate so that the filling tube 18 or barb 22 does not tear the walls of the container.

It is desirable to have a slight positive pressure within

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the annulus 17 when filling the pocket 12. The positive pressure prevents contaminated air from entering between the pocket 12 and cone 14, and aids in expanding the container 11 so that the filling tube 18 or barb 22 does not accidentally rip the sides of the container 11 when inserted or withdrawn.

After puncturing the pocket 12 sterile product such as milk, tomatoes or any other liquid susceptible of spoilage, is fed into the container 11 through annulus 30 in the filling tube 18. As mentioned, the purge of annulus 17 with steam or sterile gas may continue during the filling operation in order to prevent contamination entering between the cone 14 and pocket 12.

When a prescribed amount of product has entered container 11, the flow of product is discontinued and the filling tube 18 is retracted. The filling tube 18 is provided with barb 22. The function of the barb 22 is to simultaneously unfold the pocket 12 as the filling tube 18 is withdrawn from the container 11. FIGURE 9 particularly illustrates the withdrawal of the filling tube 18 from the container 11. As the filling tube 18 retracts, the barb 22 snags the pocket 12. The pocket 12 is drawn into the nose of the cone 14. The continuous flow of purge gas down the annulus 17 and out the nose of the cone 14 maintains the container 11 sterile while the pocket 12 is unfolded.

The container 11 is lowered, or alternatively the cone 14 and filling tube 18 are raised so as to completely unfold the pocket 12, and the container 11 is sealed at 23 by a method such as heat sealing or other techniques known in the art. When using the pocket 12 to aseptically fill a sterile container 11, it is preferred to seal the container along the protected inner surface formed by the pocket 12. However, it is not essential to do so. The sequence of removing the filling tube, unfolding the pocket and sealing the container is illustrated by FIGURES 8, 9 and 10.

When the invention is to be used to fill a container with a liquid which need not be aseptic and a clean sealing surface is desired, the preferred procedure is like that described for aseptic filling, except the pocket need not be sterilized and no purge is necessary. The pocket is formed, preferably in the corner of the container, and a filling apparatus similar to that illustrated in FIGURE 6 may be used to puncture the pocket 12, fill the container, and unfold the pocket to bring into sealing relationship the protected inner surfaces of the pocket and container. The container is sealed along the protected surface by a method such as heat sealing.

Naturally, the invention can be used for aseptically filling a flexible container with some solids, pastes, flowable solids and powder, and for providing a protected sealing surface when packaging any of these materials.

While the invention has been described with reference to a particular preferred embodiment, it will be appreciated that modifications of the preferred embodiment will occur to those skilled in the art upon reading the foregoing specifications. Accordingly, it is intended that those modifications which fall within the broad scope of the appended claims be included.

Having described the invention, what is claimed is:

1. A method of filling a flexible container under aseptic conditions which comprises:

- (A) Forming a depending pocket in the container;
- (B) Sterilizing the pocket and continuously purging the pocket with a sterile purge gas;
- (C) Puncturing the pocket with a filling means, and filling the container through the opening in the pocket;
- (D) Unfolding the pocket while continuing to purge the area surrounding the opening in the pocket;
- (E) Sealing the container.

2. A method of filling a sterile, sealed, flexible container under aseptic conditions which comprises:

- (A) Forming a depending pocket in a corner of the container;

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- (B) Sterilizing the pocket and continuously purging the pocket with a sterile purge gas;
- (C) Inserting a filling means into the pocket to puncture the pocket and fill the container;
- (D) Withdrawing the filling means and simultaneously unfolding the pocket; 5
- (E) Sealing the opening in the container.
3. The method of claim 1 wherein the containers is sealed along the protected inner surface exposed by unfolding the pocket. 10
4. The method of claim 2 wherein the container is sealed along the protected inner surface exposed by unfolding the pocket.
5. A method of filling a sterile, sealed, flexible container under aseptic conditions which comprises: 15
- (A) Forming a depending pocket in a corner of the container so as to form a protected inner surface between the walls of the pocket and the container;

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- (B) Inserting a filling means into the pocket and continuously purging the pocket;
- (C) Puncturing the sterile pocket and filling the container through the opening in the pocket;
- (D) Withdrawing the filling means and simultaneously unfolding the pocket to bring into sealing relation the protected inner surfaces of the container, while continuing the purge from the filling means in the area of the opening so as to prevent contamination from entering the opening;
- (E) Sealing the container along the protected inner surfaces.

References Cited

UNITED STATES PATENTS

2,708,067	5/1955	Paton	229—62.5
2,861,406	11/1958	Holsman et al.	53—385 X
3,040,967	6/1962	Klein	229—62.5

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