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(54) METHOD OF FILLING AND SEALING A DEFORMABLE CONTAINER.

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Description

This invention relates to a method of filling and sealing a container with a product, and more particularly, to a method of producing a package in which the integrity of the seal is preserved and voids within the container are virtually eliminated.

Prior methods for filling and sealing a container have provided a substantial "headspace" within the container in order that the seal area of the container is not contaminated with the product, which will result in incomplete and leaking seals.

This headspace gas hinders exploitation of sterilizable containers, because of the difficulty of accurately controlling the pressure within the containers during temperature changes, to ensure the seals are not ruptured or containers otherwise deformed or damaged. If the headspace gas is air, this will cause spoilage of oxygen-sensitive products.

This headspace also has the appearance of a partially filled container, giving a poor value impression to the consumer.

Additionally, the headspace allows movement of product during shipment, resulting in stressing of the lid material (which may rupture), and also damage to the product.

It is well known to use a diaphragm of stretchable lid material to close a container which is deformed to eliminate headspace. This stretchable lid material, however, typically is not puncture resistant and, hence, requires some secondary protection to maximize quality control of the product.

US-A-3492773 (Bergstrom) describes a method for vacuum packaging a container. The bottom wall 12 of the container C in Bergstrom moves toward the open end of the container after filling and sealing to thereby reduce the volume of the container to "full" condition. A weakened area is provided in the bottom wall 12 which includes a V-shaped groove or rib 17 and a second groove or rib 18 which is formed inwardly of rib 17. These ribs form fold lines for the take-up of material as bottom wall 12 moves toward the upper end of the container.

After the product P in Bergstrom has been placed into the container C, the container is placed in an evacuable chamber and air is evacuated therefrom. A cover is thereafter sealed to the container and the evacuation released. The container, however, remains inside the chamber. Thus, when the sealed package is exposed to atmosphere, the atmosphere pressure causes the container to deform along the weakened areas. According to Bergstrom, the bottom 12 moves towards the cover and the volume of the container is reduced substantially to that volume of the product contained therein.

It is a general aim of this invention to provide an improved method of filling and sealing a package with a product.

It is also an aim of this invention to provide a method of producing an extended package in which the integrity of the seal of the lid is preserved and the voids within the container that allow product movement are eliminated.

It is another aim of this invention to provide a method for filling and sealing a container which does not require that a diaphragm or flexible lid be used in addition to the seal to close a container body.

It is a further aim of this invention to provide a method for filling and sealing a container which not only reduces seal area contamination but also increases value impression.

It is another aim of this invention to provide a method for filling and sealing a deformable container which enables the fill volume of the container to be less than the initial container volume to thereby isolate the product from the seal area and avoid seal area contamination.

It is still a further aim of this invention to provide a retortable container which allows for shorter cooking time.

Other aims and advantages of the invention will become apparent from the detailed description and from the appended drawings in which like numbers have been used to designate like parts in the several views.

With the foregoing in mind, the present invention provides a method of filling and sealing a bi-stable container, subjected to a gaseous environment, with a product, the method including the steps of placing the container bottom in its stable downwardly extended position; charging the product into the container to a level having a volume less than the container volume but equal to the filled volume with such level defining a headspace opening; placing the container in a vacuum environment chamber; and sealing a generally flat lid to said container; the method being characterised in that a semi-rigid container is provided having a bi-stable, flexible, unribbed bottom of continuous wall thickness having a hoop member surrounding the rigid side edges of the container and movable between a first position, wherein said container bottom is moved into a stable downwardly extended position, and a second position, wherein said container bottom is moved into a stable inverted domed configuration; and the vacuum environment is removed from the container so as to return the container to atmospheric pressure wherein hoop stress of said hoop member overcomes the bending stress around said unribbed bottom such that the unribbed bottom of the container is inverted into said stable inverted domed

configuration thereby forcing the product into close contact with the lid to reduce the headspace between the product and the lid and wherein the lid remains in its generally flat configuration.

The present invention also provides a container having a generally flat lid sealed to said container housing for covering a product within said container housing, said container being characterised in that:

a semi-rigid container housing is provided for receiving a product filled therein to a volume less than the container volume but equal to the filled volume with such level defining a headspace opening; and

said semi-rigid container housing having rigid side edges surrounding a bi-stable, flexible, unribbed bottom of continuous wall thickness having a hoop member surrounding the rigid side edges of the container and being movable between a first position, wherein said container bottom is moved into a stable downwardly extended position and remains in that position whilst the product is entered into the container housing in a vacuum environment, and a second position, wherein said unribbed bottom is inverted into a stable inverted domed configuration when the hoop stress overcomes the bending stress around the unribbed bottom on returning to atmospheric pressure thereby forcing the product into close contact with the lid to reduce the headspace opening between the product and the lid and wherein the lid remains in its generally flat configuration.

The following detailed description, given by way of example, but not intended to limit the invention solely to the specific embodiments described, may best be understood in conjunction with the accompanying drawings in which:

Figure 1 is a front perspective view of a preferred embodiment of the container of this invention.

Figure 2 is a side cross-sectional view taken along line 2-2 of Fig. 1 with the base of the container in its downward position.

Figure 3 is a side cross-sectional view taken along line 2-2 of Fig. 1 with the base of the container in its intermediate position.

Figure 4 is a side cross-sectional view taken along line 2-2 of Fig. 1 illustrating the base of the container in its upward position.

Figures 5-9 illustrate a preferred method of filling and sealing a deformable container.

This invention relates to a method of filling and sealing a package with a product, and more particularly, to a method of producing an extended life package in which the integrity of the seal and the lid is preserved and the voids within the container that allow product movement are eliminated. Referring now to Fig. 1, a preferred embodiment of a container 10 is provided. The body 10 has a bot-

tom 12 which has a flexible insert 14 substantially deformable in shape. Since the hoop stress provides for tension along the circumference of the container base, the container is "bi-stable" in that it is stationary in either the up or down positions of the container. The base includes a deformable hoop webbing 16 between the insert 14 and the side edges 18 of the container. These rigid side edges 18 support an upper flange 20 which extends outwardly therefrom. The upper flange 20 includes a sealing surface 22 which terminates in a crimped raised rim section 24.

As is best shown in Fig. 2, the container body is capable of receiving and retaining a top cut lid 26 which is sealed to the container in the grooves 27 formed between the sealing surface 22 and the raised rim section 24. This lid is preferably formed of a puncture-resistant plastic material, but any material, including a nonplastic material, such as reinforced paper, which is substantially puncture-resistant may be utilized. As a force A (see Fig. 2), moves the base 12 upwardly, the outer rim or hoop member 16 of the base is stretched. As is illustrated in Fig. 3, the bending at the edges of the body induces stress to restore the body 10 to its original shape in the intermediate position of the deformable bottom. After a force A is applied to the container bottom, the bottom is inverted forming an inverted U shape (see Fig. 4). This angle α is decreased as the hoop stress of the hoop member 16 resists the bending stress around the base.

As a result of this design, the bottom is stable in either the up or down position, and as such, the bottom is bi-stable. Since the whole container is made of a semi-rigid material, the bottom is not a stretchable diaphragm. The base 12 is thus held stable in either position by the hoop stress of the outer diameter 16 of the base 12.

In another preferred embodiment of the deformable container of this invention, the container body may have a deformable bottom which is entirely deformable in shape. In this configuration, the base does not include a hoop member, such as 16 (see Fig. 1). The body of this preferred embodiment also includes semi-rigid side members which support an upper flange which extends outwardly from the side surfaces. The upper flange includes a sealing surface which terminates in the rim section. A force A applied to the container base, moves the base upwardly thereby stretching the outer rim of the base. In the intermediate stage, the side walls of the container are pushed outward as the base is inverted. The bending at the edges induces stress to restore the container to its original shape. When the base is in its final upward position, the hoop stress along the side edges resists this bending stress and holds the base stable in the up position.

In these or other embodiments, the containers may be manufactured with the base either up or down, provided the hoop stress induced in the outer diameter of the base can resist the restoring stresses, and can hold the base stable in the position opposite to the manufactured position.

A preferred method for filling and sealing these deformable containers is shown in Figs. 5-9. Referring now to Fig. 5, the sealing surface 22 of the container body 10 is mounted on support arms 28 of an anvil 30. The cavity 32 of container body 10 is charged with a product 34 from a filler 36. This product charge is sufficiently fluid or malleable so that it will not tend to assume any specific natural shape, but however, will fill the void volume of the container with a secured lid. In this configuration, the container is filled with the insert 14 of the base 12 in its downwardly position. After the product has been initially charged into the container, there is still sufficient headspace, however, to permit lid placement without squeezing the top of the product fill onto the sealing surface (see Fig. 6).

Referring now to Fig. 7, the filled container supported on anvil 30 and lid are then transferred into a vacuum chamber 38. When the container and lid are initially transferred into the vacuum chamber, a sealing head 40 is disposed in the vacuum chamber immediately above anvil 30 in its raised position. In this position, the gas in the vacuum chamber 38 is evacuated through multiple ports 42a, b and c. Due to the force of the evacuation, an opening 44 is formed between lid 26 and sealing surface 22 of the container body 10, and as a result thereof, the pressure of the headspace air within the container is lowered to that of the vacuum chamber.

When the desired vacuum level is achieved within the chamber 38, and as such, gas has been exhausted through ports 42a, b and c, the seal head 40 is lowered and the lid 26 is sealed to the sealing surface 22 of the container body 10, as is shown in Fig. 8. Even though the preferred embodiment herein discloses that the lid may be heat sealed to the sealing surface 22 of container body 10, other methods of dealing may be utilized. These include induction sealing, spin welding, cold seal, ultrasonic sealing or seaming. The edges 46 of the seal head 40 apply pressure to the outward edges 48 of the continuous top lid 26 such that the outward edges 48 are closely confined to the sealing surface 22 of container body 10 (see Fig. 8). During this sealing process, the vacuum is maintained.

As is illustrated in Fig. 9, the container is removed from the vacuum chamber such that the container is brought back to atmospheric pressure. As a result thereof, the deformable insert 14 of base 12 is inverted upwardly, thereby forcing the

product 34 in the direction of arrow B to fill the headspace and voids 50. The wet or dry products within the container must be sufficiently mobile to move into the voids. Since the product is forced into the voids 50 when the container is brought back to atmospheric pressure, the value impression of the product to the consumer is thereby improved. As a result thereof, such a method of filling and sealing a deformable container enables the fill volume to be less than the initial container volume to thereby isolate the product from the seal area to avoid seal area contamination. This process, however, also eliminates voids within the container which allow product movement.

While the preferred embodiment of the present invention has been described, it should be understood that various changes, adaptations and modifications may be made therein without departing from the scope of the invention as defined in the appended claims. For instance, the force A, as is shown in Figs. 2, 3, and 8 may be caused by either the return to atmospheric pressure of the container after the vacuum environment is terminated or by a mechanical push. Further, if the container is not bi-stable, such that the deformable bottom remains in the down position unless held up by a vacuum, or partial vacuum, within the container, a worker will then be able to recognize that a loss of sufficient vacuum occurred during filling. As a result thereof, the product should be rejected.

Additionally, this method may be utilized for steam flushing, as is shown in Figs. 10 and 11, which is an important alternative for filling the container with a hot product. Without steam flushing, the vacuum maintained during the process would cause the hot product to boil. With this steam flushing process, the evacuation of the pack may be achieved by flushing out the headspace gas 52 (see Fig. 10) with steam 54 from a steam duct 56 just prior to sealing the lid. The steam exits the headspace through an extract duct 58. While the steam flushing is taking place, the lid 60 of container 62 is held above the container 62 by a lid holding device 64. As in the previous preferred embodiment, the sealing surface 66 of the container is mounted on support arms 68 of an anvil 70. Additionally, a sealing head 74 is in its raised position above the sealing surface of the container.

After the headspace gas is steam flushed, the sealing head is lowered and the lid is sealed to the sealing surface of the container body (see Fig. 11). This steam will then condense to water, on cooling, resulting in a vacuum within the container headspace. As in Fig. 9, the container is then subjected to atmospheric pressure to invert the container bottom into its upward position thereby forcing the product into close contact with the lid to thereby reduce the headspace between the product and the

lid.

With steam flushing, it is possible to utilize a container that has a bottom which is stable only in the up position. This base can be held down with a vacuum suction cup during filling and sealing, then released to invert to its original and stable position aided by the vacuum induced by the steam flush. This container design, with its dome base stable in the up position, could be used with a vacuum chamber, but, in order to deform the bottom of the container downwardly, a mechanical gripper could engage any suitable attachment member extending from the container bottom.

Claims

1. A method of filling and sealing a bi-stable container (10), subjected to a gaseous environment, with a product, the method including the steps of placing the container bottom (12) in its stable downwardly extended position; charging the product (34) into the container to a level having a volume less than the container volume but equal to the filled volume with such level defining a headspace opening (50); placing the container in a vacuum environment chamber (38); and sealing a generally flat lid (26) to said container; the method being characterized in that a semi-rigid container (10) is provided having a bi-stable, flexible, unribbed bottom (12) of continuous wall thickness having a hoop member (16) surrounding the rigid side edges (18) of the container and movable between a first position, wherein said container bottom (12) is moved into a stable downwardly extended position, and a second position, wherein said container bottom (12) is moved into a stable inverted domed configuration; and the vacuum environment is removed from the container (10) so as to return the container to atmospheric pressure wherein hoop stress of said hoop member (16) overcomes the bending stress around said unribbed bottom such that the unribbed bottom (12) of the container is inverted into said stable inverted domed configuration thereby forcing the product (34) into close contact with the lid (26) to reduce the headspace (50) between the product (34) and the lid (26) and wherein the lid (26) remains in its generally flat configuration.
2. The method as recited in claim 1, wherein the sealing step is achieved by sealing the lid (26) onto the container body at a sealing surface (22) of the container.
3. The method as recited in claim 2, wherein the lid (26) is located adjacent to the sealing sur-

face (22) and a rim section (24) of the container body (10) before the headspace (50) is eliminated.

4. The method as recited in claim 3, wherein the lid (26) is supported by a groove (27) of said container formed by said rim section (24) and said sealing surface (22).
5. A method as recited in any preceding claim, wherein the lid (26) is formed of a puncture-resistance nonplastic material.
6. The method as recited in any one of claims 1 to 4, wherein the lid (26) is formed of a puncture-resistant plastic material.
7. The method as recited in any preceding claim, wherein the charged product is sufficiently liquid or mobile so as not to tend to assume any specific natural shape.
8. The method as recited in any preceding claim further including evacuating the gas within the vacuum chamber (38) and container (10) such that the pressure of the headspace gas within the container (10) is lowered to that of the vacuum chamber (38).
9. The method as recited in any preceding claim further including positioning the container (10) in the vacuum chamber (38) below a sealing head (40).
10. The method as recited in claim 9 further including lowering the sealing head (40) within the vacuum chamber (38) when the desired vacuum level is achieved such that the sealing head (40) impinges upon said lid (26) to seal said lid to the sealing surface (22) of the container (10).
11. The method as recited in any preceding claim, wherein the deformable portion may be inverted inwardly by a mechanical push when the chamber (38) is brought back to atmospheric pressure thus forcing the product to fill the headspace voids (50).
12. The method as recited in any preceding claim and further including mounting the sealing surface (22) of said container (10) within the vacuum environment along a leading edge (28) of an anvil (30).
13. The method of filling and sealing a bi-stable container of claim 1 further characterised in that:

said generally flat lid (26) is positioned adjacent to a sealing surface (22) and rim section (24) of said container;

the container (10) is placed in the vacuum environment chamber (38) below a sealing head (40);

the sealing surface (22) of said container (10) is mounted within said vacuum chamber (38) along a leading edge (28) of an anvil (30);

the gas within said vacuum chamber (38) and container (10) is evacuated such that said pressure of the headspace air within said container is lowered to that of said vacuum chamber (38); and

said sealing head (40) is lowered within said vacuum chamber (38) when the desired vacuum level is achieved such that the sealing head (40) seals the lid (26) to said sealing surface (22) of said container (10).

14. The method of filling and sealing a semi-rigid, bi-stable container (10) as recited in claim 1, further characterised in that the headspace gas is flushed out with steam; the headspace (50) is allowed to cool, and the steam is condensed to water resulting in a vacuum within the headspace (50).

15. A container having a generally flat lid (26) sealed to said container housing (10) for covering a product (34) within said container housing (10), said container being characterised in that:

a semi-rigid container housing (10) is provided for receiving a product (34) filled therein to a volume less than the container volume but equal to the filled volume with such level defining a headspace opening (50); and

said semi-rigid container housing (10) having rigid side edges (18) surrounding a bi-stable, flexible, unribbed bottom (12) of continuous wall thickness having a hoop member (16) surrounding the side edges (18) of the container housing (10) and being movable between a first position, wherein said container bottom (12) is moved into a stable downwardly extended position and remains in that position whilst the product (34) is entered into the container housing (10) in a vacuum environment, and a second position, wherein said unribbed bottom (12) is inverted into a stable inverted domed configuration when the hoop stress overcomes the bending stress around the unribbed bottom (12) on returning to atmospheric pressure thereby forcing the product (34) into close contact with the lid (26) to reduce the headspace opening (50) between the product (34) and the lid (26) and wherein the lid (26)

remains in its generally flat configuration.

Patentansprüche

1. Verfahren zum Befüllen und Abdichten eines bistabilen Behälters (10), der einer gasförmigen Umgebung ausgesetzt ist, mit einem Produkt, bei welchem Verfahren:
 - der Behälterboden (12) in seine stabile, nach unten erstreckte Position gebracht wird;
 - das Produkt (34) in den Behälter bis zu einem Niveau mit einem Volumen gegeben wird, welches kleiner als das Behältervolumen, jedoch gleich dem eingefüllten Volumen ist, wobei ein solches Niveau eine Leerraumöffnung (50) begrenzt;
 - der Behälter in eine Vakuumkammer (38) gegeben wird; und
 - der Behälter mit einem gewöhnlich flachen Deckel (26) abgedichtet wird;
 welches Verfahren dadurch gekennzeichnet ist, daß ein halbstarrer Behälter (10) mit einem bistabilen, elastischen, ungerippten Boden (12) mit kontinuierlicher Wandstärke vorgesehen wird, der eine Umreifung (16) aufweist, welche die starren Seitenkanten (18) des Behälters umgibt, und welcher Boden zwischen einer ersten Position, in der der Behälterboden (12) in eine stabile nach unten erstreckte Position bewegt wird, und einer zweiten Position, in der der Behälterboden (12) in eine stabile, umgekehrte, gewölbte Konfiguration bewegt wird, bewegbar ist; und daß das Vakuum vom Behälter (10) entfernt wird, um den Behälter auf atmosphärischen Druck zurückzubringen, wobei eine Umreifungsbelastung der Umreifung (16) die Durchbiegungsspannung um den ungerippten Boden herum überwindet, so daß der ungerippte Boden (12) des Containers in die stabile, umgekehrte, gewölbte Konfiguration umgekehrt wird, wodurch das Produkt (34) in engen Kontakt mit dem Deckel (26) gezwungen und der Leerraum (50) zwischen dem Produkt (34) und dem Deckel (26) verringert wird und der Deckel (26) in seiner gewöhnlich flachen Konfiguration verbleibt.
2. Verfahren, wie in Anspruch 1 angegeben, worin der Abdichtschritt durch ein Abdichten des Deckels (26) mit dem Behälterkörper an einer Abdichtoberfläche (22) des Behälters erzielt wird.
3. Verfahren, wie in Anspruch 2 angegeben, worin der Deckel (26) an die Abdichtoberfläche (22) und an einen Krempeabschnitt (24) des Behälterkörpers (10) angrenzend angeordnet wird, bevor der Leerraum (50) beseitigt wird.

4. Verfahren, wie in Anspruch 3 angegeben, worin der Deckel (26) von einer Nut (27) des Behälters getragen wird, welche Nut durch den Krepfenabschnitt (24) und der Abdichtoberfläche (22) gebildet wird. 5
5. Verfahren, wie in irgendeinem vorhergehenden Anspruch angegeben, worin der Deckel (26) aus einem rißbeständigen, nicht plastischen Material gebildet ist. 10
6. Verfahren, wie in irgendeinem der Ansprüche 1 bis 4 angegeben, worin der Deckel (26) aus einem rißbeständigen, plastischen Material gebildet ist. 15
7. Verfahren, wie in irgendeinem vorhergehenden Anspruch angegeben, worin das eingebrachte Produkt ausreichend flüssig oder beweglich ist, so daß es nicht dazu neigt, irgendeine spezifische natürliche Form anzunehmen. 20
8. Verfahren, wie in irgendeinem vorhergehenden Anspruch angegeben, bei dem ferner das Gas innerhalb der Vakuumkammer (38) und des Behälters (10) evakuiert wird, so daß der Druck des Gases im Leerraum innerhalb des Behälters (10) auf jenen der Vakuumkammer (38) herabgesetzt wird. 25
30
9. Verfahren, wie in irgendeinem vorhergehenden Anspruch angegeben, bei dem ferner der Behälter (10) in der Vakuumkammer (38) unter einen Abdichtkopf (40) positioniert wird. 35
10. Verfahren, wie in Anspruch 9 angegeben, bei dem ferner der Abdichtkopf (40) innerhalb der Vakuumkammer (38) gesenkt wird, wenn das erwünschte Vakuum erreicht ist, so daß der Abdichtkopf (40) auf den Deckel (26) trifft, um diesen Deckel mit der Abdichtoberfläche (22) des Behälters (10) abzudichten. 40
11. Verfahren, wie in irgendeinem vorhergehenden Anspruch angegeben, bei dem der verformbare Teil durch einen mechanischen Stoß nach innen umgekehrt werden kann, wenn die Kammer (38) auf Atmosphärendruck zurückgebracht wird, was das Produkt dazu zwingt, die Leerräume (50) zu füllen. 45
50
12. Verfahren, wie in irgendeinem vorhergehenden Anspruch angegeben, bei dem ferner die Abdichtoberfläche (22) des Behälters (10) im Vakuum entlang einer Führungskante (28) eines Ambosses (30) befestigt wird. 55
13. Verfahren zum Befüllen und Abdichten eines bistabilen Behälters nach Anspruch 1, welches ferner dadurch gekennzeichnet ist, daß:
der gewöhnlich flache Deckel (26) an eine Abdichtoberfläche (22) und einen Krepfenabschnitt (24) des Behälters angrenzend positioniert wird;
der Behälter (10) in die Vakuumkammer (38) unter einen Abdichtkopf (40) gestellt wird;
die Abdichtoberfläche (22) des Behälters (10) innerhalb der Vakuumkammer (38) entlang einer Führungskante (28) eines Ambosses (30) befestigt wird;
das Gas innerhalb der Vakuumkammer 38 und des Behälters (10) evakuiert wird, so daß der Druck der Luft im Leerraum innerhalb des Behälters auf jenen der Vakuumkammer (38) herabgesetzt wird; und daß
der Abdichtkopf (40) in der Vakuumkammer (39) gesenkt wird, wenn das erwünschte Vakuum erreicht ist, so daß der Abdichtkopf (40) den Deckel (26) mit der Abdichtoberfläche (22) des Behälters (10) abdichtet.
14. Verfahren zum Befüllen und Abdichten eines halbstarren, bifunktionellen Behälters (10), wie in Anspruch 1 angegeben, ferner dadurch gekennzeichnet, daß das Gas im Leerraum mit Dampf ausgespült wird, der Leerraum (50) abkühlen gelassen wird und der Dampf zu Wasser kondensiert wird, was zu einem Vakuum im Leerraum (50) führt.
15. Behälter mit einem gewöhnlich flachen Deckel (26), der mit dem Behältergehäuse (10) abgedichtet ist, zum Abdecken eines Produktes (34) innerhalb des Containergehäuses (10), welcher Behälter dadurch gekennzeichnet ist, daß:
ein halbstarres Behältergehäuse (10) zum Aufnehmen eines Produktes (34) vorgesehen ist, das bis zu einem Volumen eingefüllt ist, welches kleiner als das Behältervolumen, jedoch gleich dem befüllten Volumen ist, wobei ein solches Niveau eine Leerraumöffnung (50) begrenzt; und daß
das halbstarre Behältergehäuse (10), welches starre Seitenkanten (18) aufweist, einen bistabilen, elastischen, ungerippten Boden (12) mit einer kontinuierlichen Wandstärke besitzt, welcher Boden eine Umreifung (16) besitzt, die die Seitenkanten (18) des Behältergehäuses (10) umgibt, und zwischen einer ersten Position, in der der Behälterboden (12) in eine stabile, nach unten erstreckten Position bewegt wird und in dieser Position verbleibt, während das Produkt (34) in das Behältergehäuse (10) im Vakuum eingebracht wird, und einer zweiten Position bewegbar ist, in der der ungeripp-

te Boden (12) in eine stabile, umgekehrte, gewölbte Konfiguration umgekehrt wird, wenn die Umreifungsbelastung die Durchbiegungsspannung um den ungerippten Boden (12) herum, beim Zurückkehren zu atmosphärischem Druck überwindet, wodurch das Produkt (34) in engen Kontakt mit dem Deckel (26) gezwungen und die Leerraumöffnung (50) zwischen dem Produkt (34) und dem Deckel (26) verringert wird, und worin der Deckel (26) in seiner gewöhnlich flachen Konfiguration verbleibt.

5

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Revendications

1. Procédé pour remplir avec un produit et fermer de façon étanche un conteneur bistable (10), soumis à un environnement gazeux, le procédé comportant les étapes consistant à placer le fond (12) du conteneur dans sa position stable dans laquelle il s'étend dans une position déployée vers le bas; charger le produit (34) dans le conteneur jusqu'à un niveau correspondant à un volume inférieur à celui du volume du conteneur, mais égal au volume rempli, un tel niveau définissant une ouverture supérieure (50); placer le conteneur dans une chambre à environnement sous vide (38); et appliquer d'une manière étanche un couvercle de forme générale plate (26) sur ledit conteneur; le procédé étant caractérisé en ce qu'il est prévu un conteneur semi-rigide (10) possédant un fond flexible bistable non nervuré (12) possédant une épaisseur de paroi continue et comportant un élément en forme d'anneau (16) entourant les bords latéraux rigides (18) du conteneur et pouvant être amené entre une première position, dans laquelle ledit fond (12) du conteneur est amené dans une position stable qui s'étend dans une position déployée vers le bas, et une seconde position, dans laquelle ledit fond (12) du conteneur est amené dans une configuration stable en forme de dôme renversé; et on supprime l'environnement de vide du conteneur (10) de manière à ramener le conteneur à la pression atmosphérique, la contrainte dudit élément en forme d'anneau (16) dépasse la contrainte de flexion autour dudit fond non nervuré de sorte que le fond non nervuré (12) du conteneur est inversé et prend ladite configuration en dôme inversé stable, ce qui force le produit (34) à venir en contact étroit avec le couvercle (26) en réduisant l'espace supérieur (50) présent entre le produit (34) et le couvercle (26), le couvercle (26) conservant sa configuration de forme générale plate.
2. Procédé selon la revendication 1, selon lequel l'étape de fermeture étanche est obtenue par application du couvercle (26) de façon étanche sur le corps du conteneur au niveau d'une surface d'étanchéité (22) du conteneur.
3. Procédé selon la revendication 2, selon lequel, le couvercle (26) est situé au voisinage de la surface d'étanchéité (22), et une section formant rebord (24) du corps (10) du conteneur avant que l'espace supérieur (50) soit éliminé.
4. Procédé selon la revendication 3, selon lequel le couvercle (26) est supporté par une gorge (27) dudit conteneur, ménagée dans ladite section formant rebord (24) et dans ladite surface d'étanchéité (22).
5. Procédé selon l'une quelconque des revendications précédentes, selon lequel le couvercle (26) est formé d'une matière non plastique résistante à une perforation.
6. Procédé selon l'une quelconque des revendications 1 à 4, selon lequel le couvercle (26) est formé d'une matière plastique résistante à une perforation.
7. Procédé selon l'une quelconque des revendications précédentes, selon lequel le produit chargé est suffisamment liquide ou mobile pour ne pas tendre à prendre une forme naturelle spécifique quelconque.
8. Procédé selon l'une quelconque des revendications précédentes, comportant en outre l'évacuation du gaz dans la chambre à vide (38) et dans le conteneur (10) de sorte que la pression du gaz dans l'espace supérieur à l'intérieur du conteneur (10) est réduite à celle de la chambre à vide (38).
9. Procédé selon l'une quelconque des revendications précédentes, comportant en outre le positionnement du conteneur (10) dans la chambre sous vide (38) au-dessous d'un élément de tête d'étanchéité (40).
10. Procédé selon la revendication 9, comprenant en outre l'abaissement de l'élément de tête d'étanchéité (40) à l'intérieur de la chambre à vide (38) lorsque le niveau de vide désiré est obtenu, de sorte que l'élément de tête d'étanchéité (40) s'applique sur ledit couvercle (26) de manière à appliquer de façon étanche ledit couvercle sur la surface d'étanchéité (22) du conteneur (10).

11. Procédé selon l'une quelconque des revendications précédentes, selon lequel la partie déformable peut être inversée en étant dirigée vers l'intérieur sous l'effet d'une poussée mécanique lorsque la chambre (38) est ramenée à la pression atmosphérique, ce qui force le produit à remplir les vides de l'espace supérieur (50). 5
12. Procédé selon l'une quelconque des revendications précédentes et comprenant en outre le montage de la surface d'étanchéité (22) dudit conteneur (10) dans l'environnement de vide, le long d'un bord avant (28) d'une enclume (30). 10 15
13. Procédé de remplissage et de fermeture étanche d'un conteneur bistable selon la revendication 1, caractérisé en outre en ce que:
- ledit couvercle de forme générale plate (26) est disposé au voisinage d'une surface d'étanchéité (22) et d'une section formant rebord (24) dudit conteneur; 20
- le conteneur (10) est placé dans la chambre à vide (38) au-dessous d'un élément de tête d'étanchéité (40); 25
- la surface d'étanchéité (22) dudit conteneur (10) est mise en place à l'intérieur de ladite chambre à vide (38) le long d'un bord avant (28) d'une enclume (30); 30
- on vide le gaz situé dans ladite chambre à vide (38) et dans le conteneur (10) de sorte que ladite pression de l'air situé dans l'espace supérieur à l'intérieur dudit conteneur est réduite à la pression de ladite chambre à vide (38); et 35
- on abaisse ledit élément de tête d'étanchéité (40) à l'intérieur de ladite chambre à vide (38) lorsque le niveau de vide désiré est atteint de sorte que l'élément de tête d'étanchéité (40) applique de façon étanche le couvercle (26) sur ladite surface d'étanchéité (22) dudit conteneur (10). 40
14. Procédé de remplissage et de fermeture étanche d'un conteneur bistable semi-rigide (10) selon la revendication 1, caractérisé en outre en ce qu'on évacue le gaz situé dans l'espace supérieur par balayage avec de la vapeur; qu'on laisse refroidir l'espace supérieur (50) et que la vapeur se condense en eau ce qui conduit à la formation d'un vide à l'intérieur de l'espace supérieur (50). 45 50
15. Conteneur comportant un couvercle de forme générale plate (26) fixé de façon étanche audit boîtier (10) du conteneur de manière à recouvrir un produit (34) situé à l'intérieur dudit 55

boîtier du conteneur (10), ledit conteneur étant caractérisé en ce que :

un boîtier semi-rigide (10) du conteneur est prévu de manière à recevoir un produit (34) qui y est introduit selon un volume inférieur à celui du volume du conteneur mais égal au volume introduit à un tel niveau définissant une ouverture supérieure (50); et

ledit boîtier semi-rigide (10) du conteneur possédant des bords latéraux rigides (18) entourant un fond flexible bistable et non nervuré (12) possédant une épaisseur de paroi continue et comportant un élément en forme d'anneau (16) entourant les bords latéraux (18) du boîtier (10) du conteneur, et étant déplaçable entre une première position, dans laquelle ledit fond (12) du conteneur est amené dans une position stable déployée vers le bas et reste dans cette position, tandis que le produit (34) est introduit dans le boîtier (10) du conteneur dans un environnement de vide, et une seconde position, dans laquelle ledit fond non nervuré (12) est inversé dans une configuration stable en forme de dôme inversé lorsque la contrainte de l'anneau dépasse la contrainte de flexion autour du fond non nervuré (12) lors du retour à la pression atmosphérique, ce qui a pour effet de forcer le produit (34) à venir en contact étroit avec le couvercle (26) en réduisant l'ouverture supérieure (50) située entre le produit (34) et le couvercle (26), le couvercle (26) conservant sa configuration de forme générale plate.

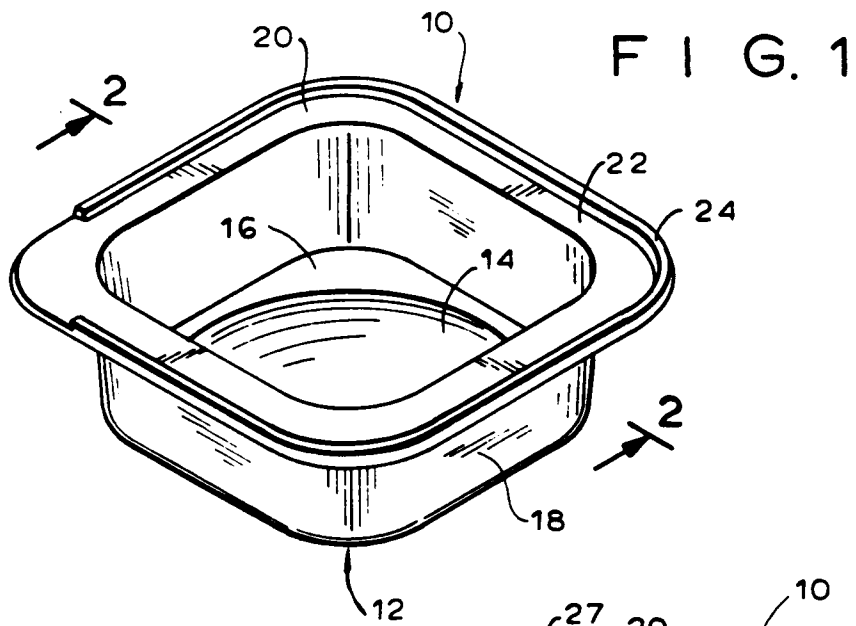


FIG. 2

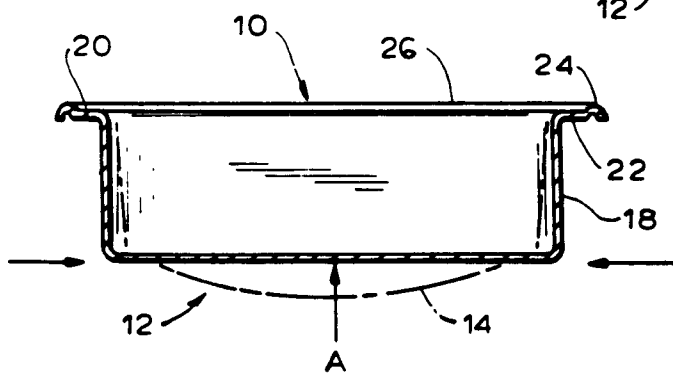
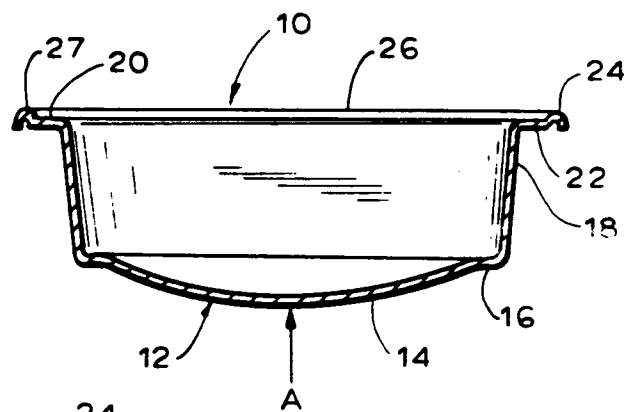


FIG. 3

FIG. 4

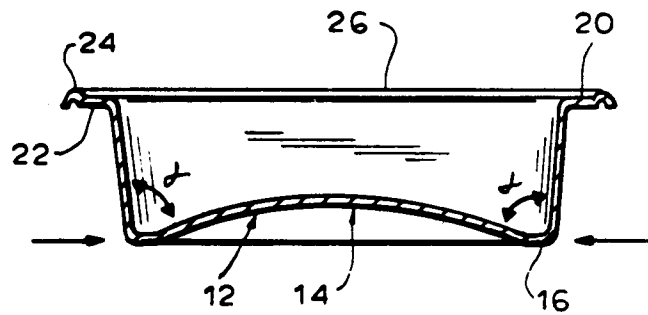


FIG. 5

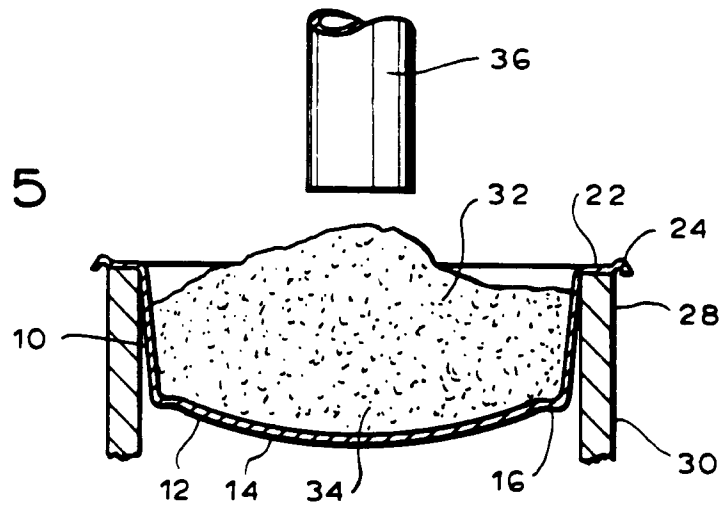


FIG. 6

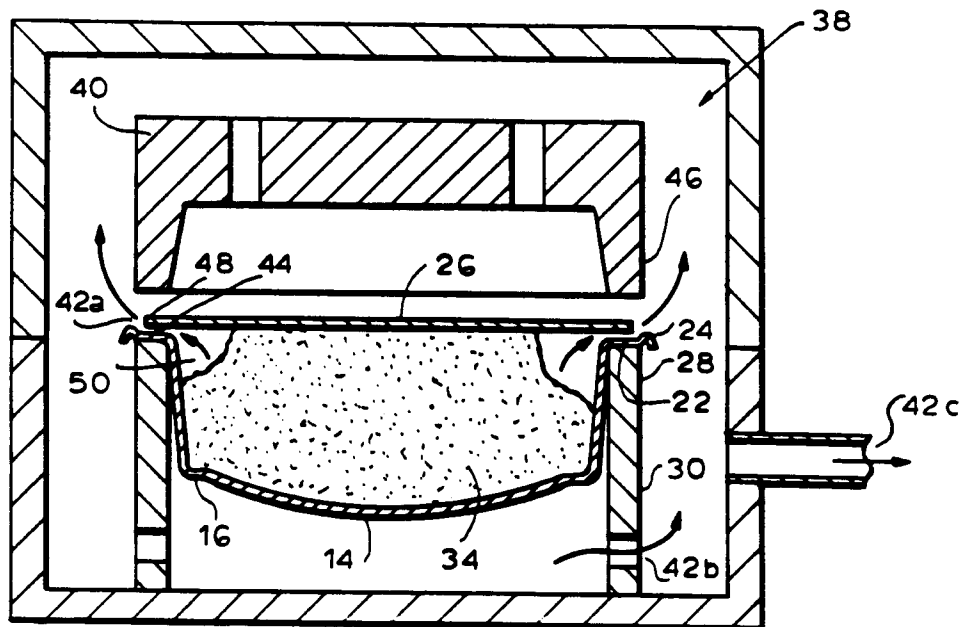
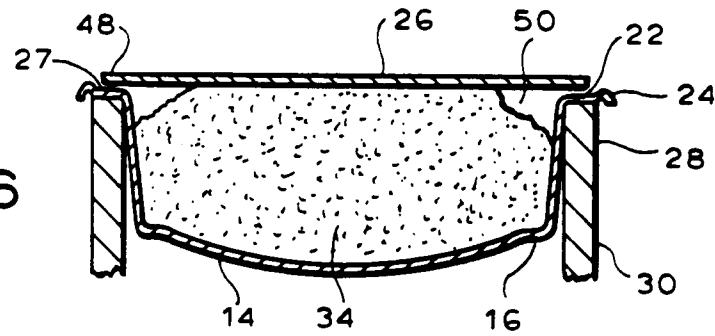


FIG. 7

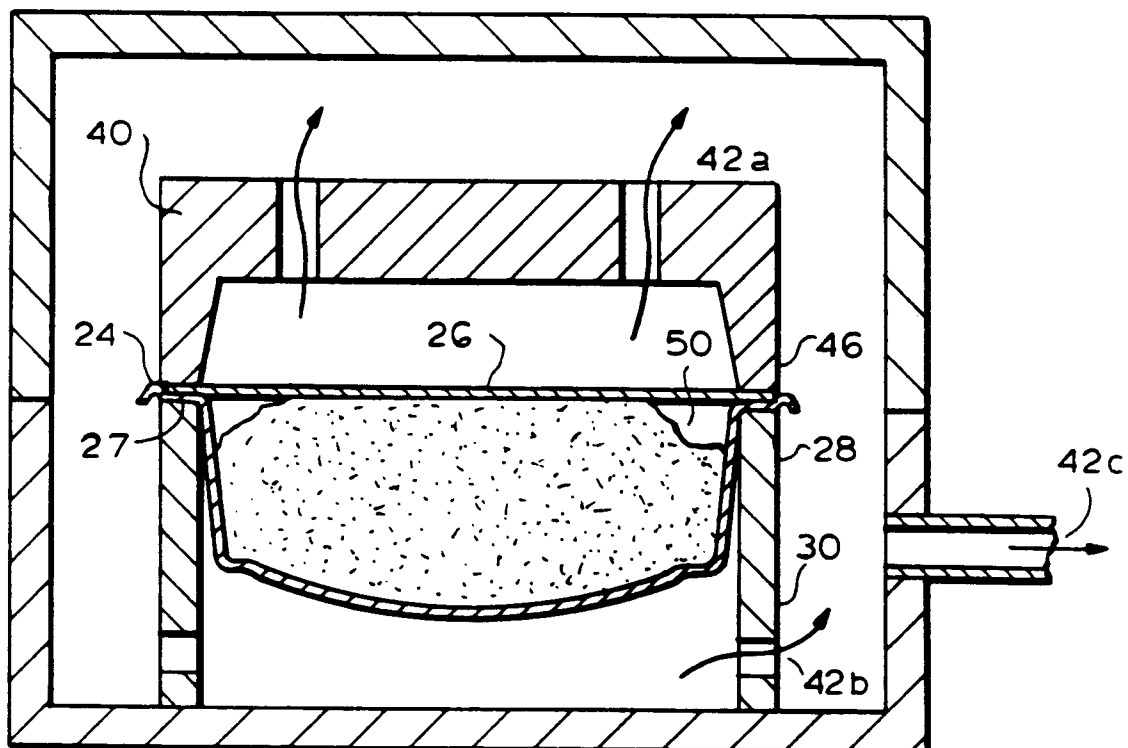


FIG. 8

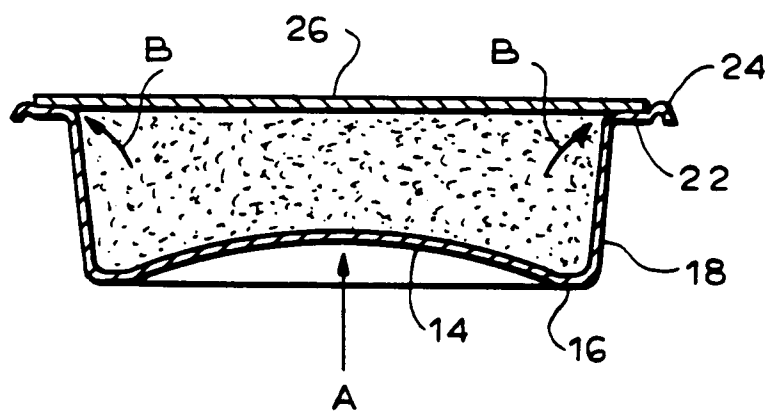


FIG. 9

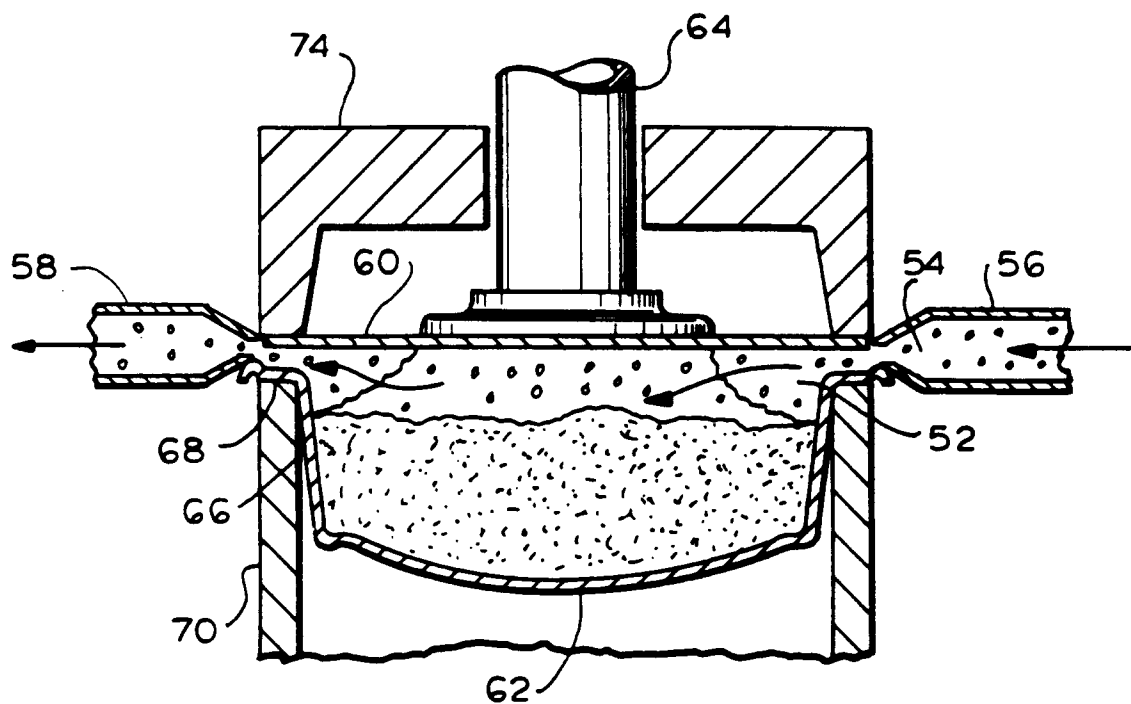


FIG. 10

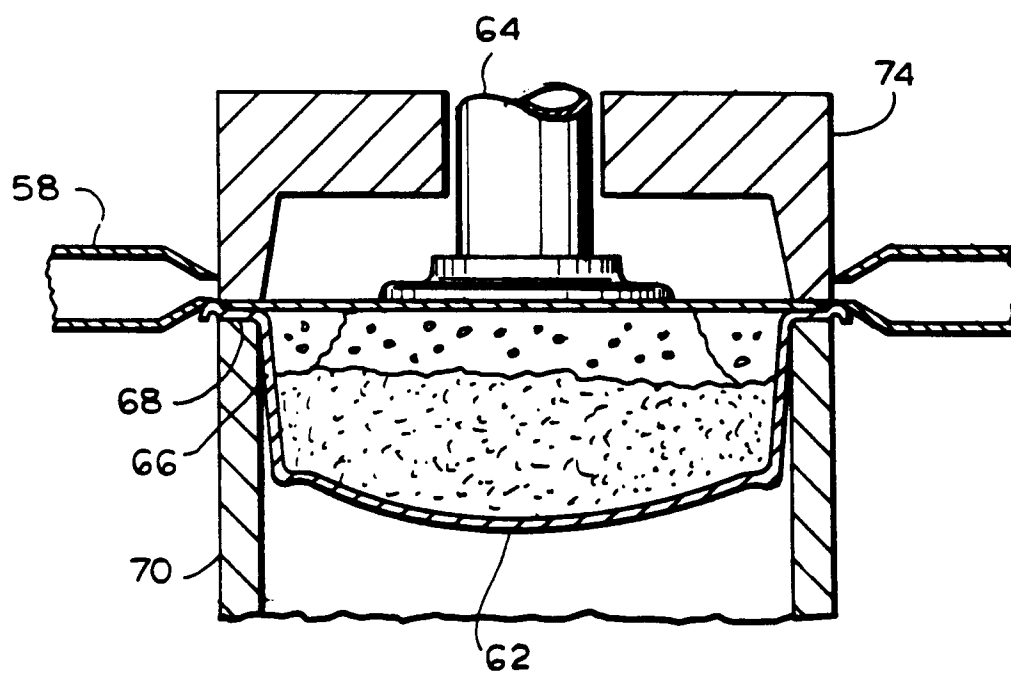


FIG. 11