Sept 10, 1957 O. B. SHERMAN 2,805,787

DOUBLE-WALLED CONTAINER AND METHOD OF FABRICATING

Filed April 8, 1954 3 Sheets-Sheet 1

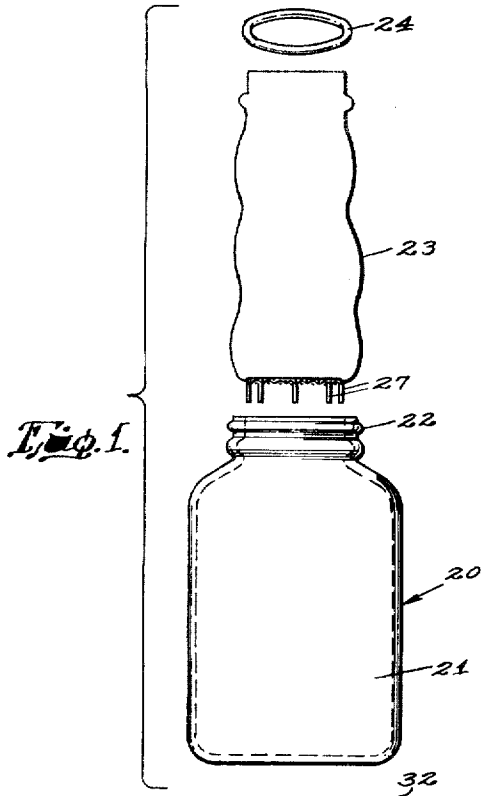

Fig. 1.

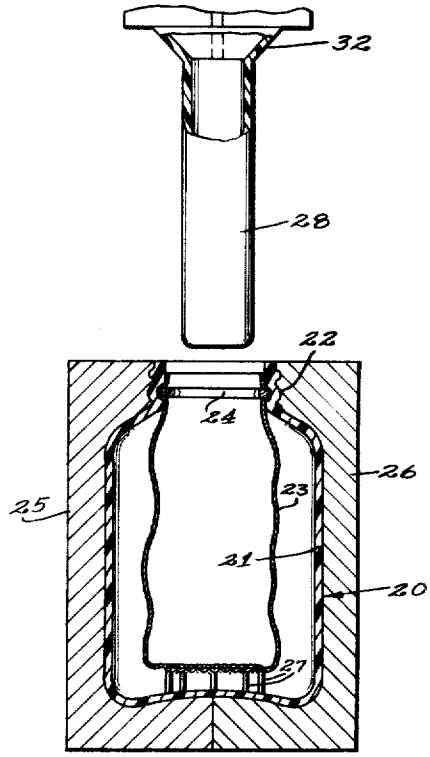

Fig. 2.

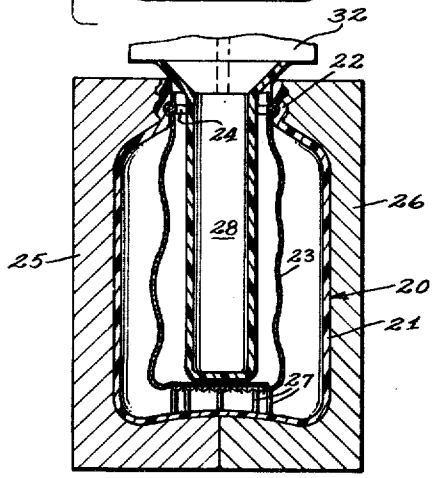

Fig. 3.

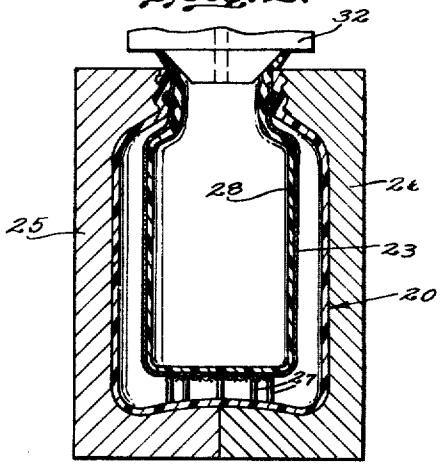

Fig. 4.

INVENTOR.
ORVILLE B. SHERMAN
BY W. A. Schaich
B. C. Toussiance
ATTORNEYS

Sept 10, 1957 O. B. SHERMAN 2,805,787

DOUBLE-WALLED CONTAINER AND METHOD OF FABRICATING

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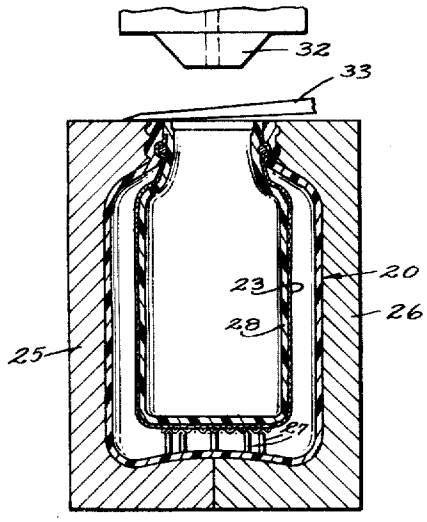

Fig. 5.

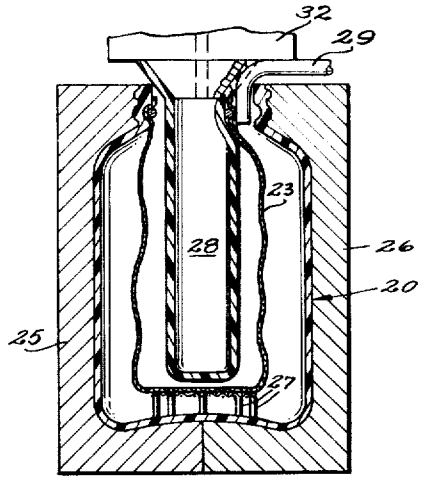

Fig. 6.

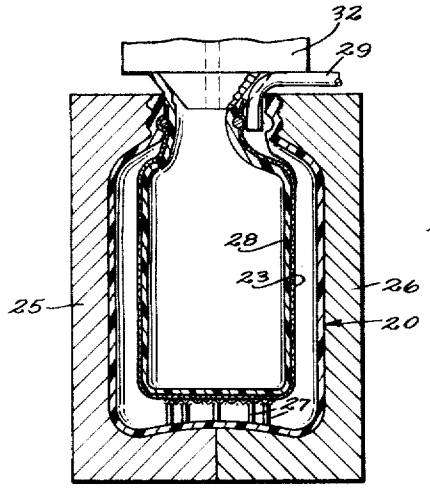

Fig. 7.

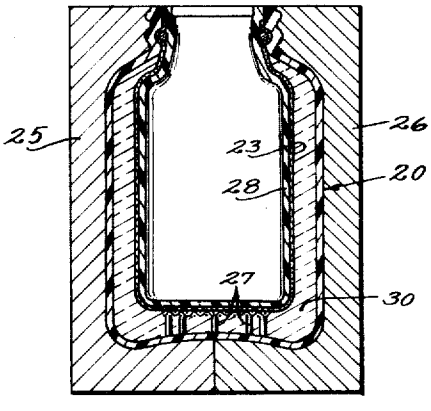

Fig. 8.

INVENTOR.
ORVILLE B. SHERMAN
BY W A Schaich
B C Fourcianes
ATTORNEYS

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DOUBLE-WALLED CONTAINER AND METHOD OF FABRICATING

Filed April 8, 1954 3 Sheets-Sheet 3

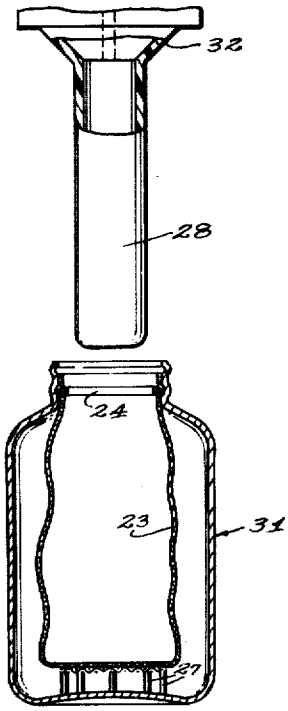

Fig. 9.

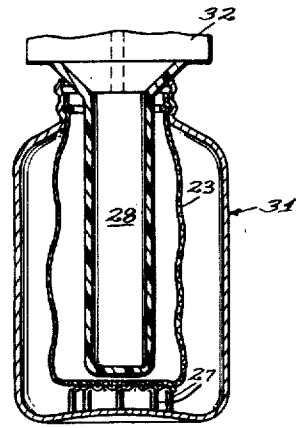

Fig. 10.

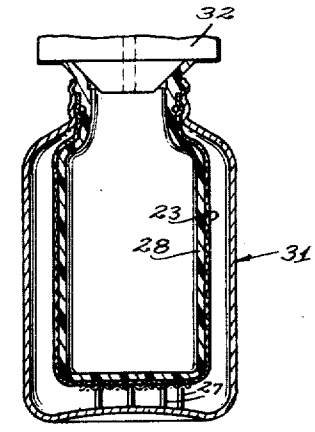

Fig. 11.

INVENTOR.
ORVILLE B. SHERMAN
BY W A Schaich
B C Toussiane
ATTORNEYS

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DOUBLE-WALLED CONTAINER AND METHOD OF FABRICATING

Orville B. Sherman, Toledo, Ohio, assignor to Owens-Illinois Glass Company, a corporation of Ohio

Application April 8, 1954, Serial No. 421,831

12 Claims. (Cl. 220—15)

This invention relates to an improved construction of a double-walled container, more particularly of the heat-insulating or thermos type, and to an improved method for fabricating such.

The most common form of double-walled containers is utilized for heat-insulating purposes and comprises an outer container wall which surrounds and is spaced from an inner container wall, the inner container wall being utilized to receive the material for which temperature maintenance is desired. While, commonly, the air space between such inner and outer container walls provides adequate heat-insulating properties, such space may also be filled with well-known forms of heat-insulating materials.

In order to utilize economical single-piece constructions of both the inner and outer container walls, it has been necessary to provide the outer container wall with a mouth opening sufficiently large to permit the inner container wall to be inserted therethrough. When it is desired to fabricate the outer container wall from inflexible materials such as metal, glass, or plastics, it has been physically impossible to utilize an inner container having a body portion whose cross-sectional configuration exceeded that of the mouth portion of the outer container. Of course, from the standpoint of convenient application of a closure to the mouth portions of the inner and outer container walls, it is desirable that such mouth portions be relatively small in size. Accordingly, a considerable compromise in capacity of the inner container versus the diameter of the closure for the outer container had to be heretofore effected.

Accordingly, it is an object of this invention to provide an improved construction for a double-walled container and, more particularly, for double-walled containers of the heat-insulating or thermos type.

A further object of this invention is to provide a double-walled container construction wherein the inner container wall is produced by expansion of material of the type which becomes plastic and flowable when heated.

A particular object of this invention is to provide an improved double-walled container wherein the inner wall of the container is defined by a flexible form which is deformable to permit insertion thereof through the open mouth of the outer wall of the container and which is subsequently expanded and rigidified by the expansion of an inserted bubble of heated material of the type which is flowable or plastic when heated.

Still another object of this invention is to provide an improved method for fabricating a double-walled container.

The specific nature of this invention, as well as other objects and advantages thereof, will become apparent to those skilled in the art from the following detailed description if taken in conjunction with the annexed sheets of drawings on which:

Fig. 1 is an elevational view of certain component parts used in forming the double-walled container;

Figs. 2 through 5, inclusive, are sectional elevational views of an apparatus for performing the method, showing the position of the apparatus during various steps in the method;

Figs. 6, 7 and 8 are sectional elevational views of an apparatus for performing a modification of the method; and

Figs. 9, 10 and 11 are sectional elevational views of the apparatus showing the steps in performing the method wherein different materials are used.

Referring to Fig. 1, the invention is directed to the method of forming a double-walled container utilizing a previously formed container **20**. The container **20** is formed with a body portion **21** and a neck or mouth portion **22**, the body portion having at least a part thereof of cross-sectional configuration greater than the mouth portion. The container **20** may be made of any form-retaining material such as plastic, glass, metal, and the like. As shown in Figs. 1 through 5, the outer container **20** is made of plastic.

As further shown in Fig. 1, a form **23** of flexible material having an internal configuration, when extended, comparable to the configuration which is desired for the inner container, is deformed and inserted through the mouth portion of the outer container **20** and is held in position within the mouth portion by any suitable means such as a ring **24**. The entire container with the form therein may be enclosed, if desired, in a suitable support such as a mold consisting of mold halves **25**, **26**.

The form **23** may consist of any flexible material such as webbing of gauze, glass fibers, wire mesh and the like, which is capable of being deformed but which will assume the desired shape as presently described. The form **23** may be provided with outwardly directed projections **27** which engage with the portions of the body **21** to position the form in spaced relationship to the inner surface of the outer container.

The inner container is formed by inserting a tubular or bubble-like mass **28** of blowable material through the open mouth of the container **20**, with the form **23** therein, and expanding said bubble by applying fluid under pressure, for example, through a blowhead **32** to the interior of the bubble. The outermost movement of the blowable material is limited by the form **23**.

The form **23** is preferably at least partially pervious to the blowable material in order that the blowable material will become physically bonded to the form.

The method of forming the double-walled container may be briefly summarized as follows:

The form **23** is first deformed and placed in position in the outer container **20** (Fig. 2). A bubble **28** of blowable material is then inserted through the open mouth (Fig. 3) and expanded by applying fluid under pressure to the interior of the bubble (Fig. 4). The outward movement of the bubble is limited to a predetermined distance by the form **23**. If necessary, the neck of the double-walled container may be trimmed by a shear blade **33** (Fig. 5).

The resultant double-walled container consists of an outer container, portions of which have a greater cross-sectional area than the area of the mouth. The double-walled container includes an inner container, the mouth portion of which is contiguous to the mouth portion of the outer container thereby forming a sealed space between the inner and outer containers. The inner container has portions thereof of greater cross-sectional area than the area of its mouth portion.

A modification of the method is shown in Figs. 6, 7 and 8 wherein a hollow tube is positioned between the mouth portion of the outer container **20** and the form **23**. The bubble **28** of blowable material is then inserted, as in the previous method, and expanded by the application of fluid under pressure (Fig. 7). Insulating material **30** may then be introduced into the space between the outer con-

tainer and the inner container through the tube **29**. The insulating material may be any of the well-known types of material such as glass fibers, asbestos, magnesium silicates, calcium silicates and the like.

After the space has been filled with the insulating material the tube **29** is removed and the plastic material forming the mouth of the inner container is expanded until it is contiguous to the mouth portion of the outer container. The application of heat may be necessary in order to provide the required degree of plasticity to the mouth portion of the inner container.

The resultant article is a double-walled container including insulating material between the walls of the inner container and outer container, and in addition both the inner and outer containers have portions thereof with cross-sectional configurations of greater area than the area of the mouth portions.

A further modification of the method may be performed by the apparatus shown in Fig. 6, by drawing a vacuum through tube **29** after expansion of the bubble of blowable material. After drawing of the vacuum, the inner neck would be sealed thereby resulting in a double-walled container having a partial vacuum between the inner and outer walls.

It should, of course, be apparent that the outer container may be made of various materials. For example, as shown in Figs. 9, 10 and 11, the outer container **31** is formed of metal. The double-walled container is formed in the same manner as previously set forth, namely, by insertion of the form **23** and subsequent insertion of the bubble **28** of blowable material and expansion of the bubble by the application of fluid under pressure.

It should further be apparent that should any trimming operation be necessary about the neck of the container, this can be accomplished in accordance with well-known methods and devices.

The terms "blowable" and "expandable" material as used herein are intended to define any material which is capable of being expanded and set in predetermined form by the application of fluid under pressure. Such materials include, but are not necessarily limited to, organic, thermoplastic materials which acquire the required degree of plasticity by the application of heat.

Modifications may be resorted to within the spirit and scope of the appended claims.

I claim:

1. A double-walled container comprising a unipiece rigid outer container having a body portion and a mouth portion, the cross-sectional configuration of at least part of said body portion being greater than said mouth portion, an inner container disposed within said outer container, said inner container having at least part of its body of greater cross-sectional configuration than said mouth portion of said outer container, said inner container comprising a hollow form of pervious flexible material and a homogeneous layer of solidified blowable thermoplastic material formed on the interior surface of said form, said inner container being integrally united to said outer container at said mouth portion and having side walls located centrally and independently of the body portion of said outer container and a plurality of spacing members positioned between the bottom portions of said inner and outer containers.

2. The combination defined in claim 1, wherein said form is fabricated from material which is at least partially pervious to said blowable material while in heated, expandable condition.

3. The method of forming a double-walled open-mouth container comprising the steps of inserting a flexible form through said mouth of the outer container, said flexible form being expandable to define the desired shape of said inner container wall, inserting a hollow bubble of blowable material heated to a semi-plastic condition into said flexible form through the open-mouth portion thereof, and applying fluid pressure to the interior of said bubble to expand same to the extent permitted by said form to define the inner container wall.

4. The process defined in claim 3, wherein said form is fabricated of material which is at least partially pervious to said blowable material when in said semi-plastic condition, thereby forming a physical bond between said form and said blowable material upon cooling and solidifying of said blowable material.

5. The method of forming a double-walled open-mouth container comprising the steps of fabricating a form of flexible material to substantially the desired shape of said inner container wall, inserting said form into the outer wall of the container through the open mouth thereof, coaxially aligning the open mouth portions of said form and said outer container wall, inserting a hollow bubble of blowable material heated to a semi-plastic condition into said flexible form through the open-mouth portion thereof, and applying fluid pressure to the interior of said bubble to expand same to the extent permitted by said form to define the inner container wall.

6. The method defined in claim 5, wherein said flexible form is fabricated of material which is at least partially pervious to said blowable material when in said semi-plastic condition, thereby forming a physical bond between said form and said blowable material upon cooling and solidifying of said blowable material, said flexible form and blowable material constituting an impervious inner container interiorly spaced-apart from said outer container.

7. The method of forming a double-walled open-mouth container comprising the steps of inserting a flexible form through said mouth of the outer container wall, said flexible form being expandable to define the desired shape of said inner container wall, inserting a hollow bubble of blowable material heated to a semi-plastic condition into said flexible form through the open-mouth portion thereof, applying fluid pressure to the interior of said bubble to expand same to the extent permitted by said form to define the inner container wall, limiting the expansion of at least a portion of the neck areas of said inner container wall to provide an access passage communicating with the space defined between said outer and inner container walls, and filling said space with heat-insulating material by inserting same through said access passage.

8. The method of forming a double-walled open-mouth container of the type wherein a cross-sectional portion of the inner container wall has a larger configuration than the mouth area of the outer container wall comprising the steps of inserting a flexible form through said mouth of the outer container wall, said flexible form being expandable to define the desired shape of said inner container wall, inserting a hollow bubble of blowable material heated to a semi-plastic condition into said flexible form through the open-mouth portion thereof, applying fluid pressure to the interior of said bubble to expand same to the extent permitted by said form to define the inner container wall, limiting the expansion of at least a portion of the neck area of said inner container wall to provide an access passage communicating with the space defined between said outer and inner container walls, filling said space with heat-insulating material by inserting same through said access passage, and then expanding said neck area portion of said inner container wall into engagement with said outer container wall to close said access passage and seal said heat-insulating material within said space.

9. The method of forming a double-walled open-mouth container of the type wherein a cross-sectional portion of the inner container wall has a larger configuration than the mouth area of the outer container wall, comprising the steps of inserting a flexible form through said mouth of the outer container wall, said flexible form being expandable to define the desired shape of said inner con-

tainer wall, inserting a hollow bubble of blowable material heated to a semi-plastic condition into said flexible form through the open-mouth portion thereof, applying fluid pressure to the interior of said bubble to expand same to the extent permitted by said form to define the inner container wall, limiting the expansion of at least a portion of the neck area of said inner container wall to provide an access passage communicating with the space defined between said outer and inner container walls, drawing a vacuum between said space, and then expanding said neck area portion of said inner container wall into engagement with said outer container wall to close said access passage and seal said heat-insulating material within said space.

10. The method of forming a double-walled open-mouth container of predetermined size and shape comprising the steps of forming an outer container having a neck and body portion of final finished shape, fabricating a pervious flexible material into a form of predetermined shape and dimensions with the body portion thereof having approximately the same shape as the body portion of the outer container, the body dimensions of said form being less than the body although greater than the neck dimensions of the outer container, deforming and inserting said form within the outer container through the open end thereof, coaxially aligning and integrally joining the neck portions of said form and said outer container, inserting a hollow bubble of blowable material heated to a workable condition into said aligned form and container through the open end thereof, and expanding the major portion of said bubble to greater than the neck dimensions to form a physical bond with said form to constitute a spaced-apart impervious inner container.

11. The method of forming a double-walled open-mouth container comprising the steps of inserting a prefabricated pervious open-mouth flexible form into a single-walled outer container engageably contacting the mouth portions of said flexible form and outer container, inserting a hollow bubble of expandable thermoplastic material into said form and outer container through the open mouths thereof, said bubble material being in a condition of plasticity to permit expansion and setting in predetermined form, expanding said bubble by applying fluid under pressure to the interior of said bubble, and limiting the outward movement of the material forming said bubble by said pervious form in expanded condition in order to form an impervious inner container of predetermined configuration internally spaced-apart from said outer container to provide an insulating annulus.

12. The method of forming a double-walled open-mouth container of predetermined size and shape comprising the steps of forming an outer container having a neck and body portion of final finished shape, fabricating a pervious flexible metallic material into a form of predetermined shape and dimensions with the body portion thereof having approximately the same shape as the body portion of the outer container, the body dimensions of said form being less than the body although greater than the neck dimensions of the outer container, deforming and inserting said form within the outer container through the open end thereof, coaxially aligning and engaging the neck portions of said form and said outer container with an expansible ring, inserting a preformed hollow bubble of blowable thermoplastic material heated to a workable condition into said aligned form and outer container through the open end thereof, and expanding said bubble to the limits of expansion permitted by the shape and dimensions of said form at least partially to provide an impervious inner container integrally united to said outer container at their neck portions.

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