March 14, 1967 S. DRY 3,309,004

CONTAINER AND METHOD OF MAKING A CONTAINER

Filed March 19, 1964 2 Sheets-Sheet 1

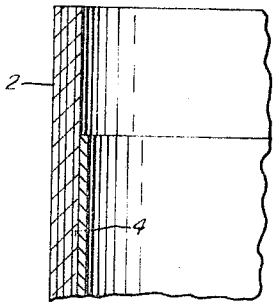



FIG. 1

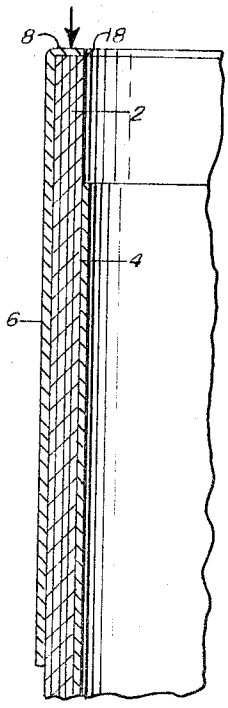



FIG. 2

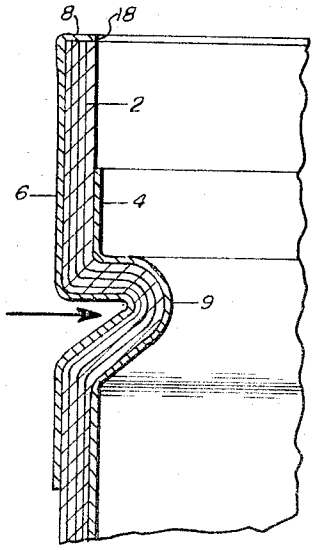



FIG. 3

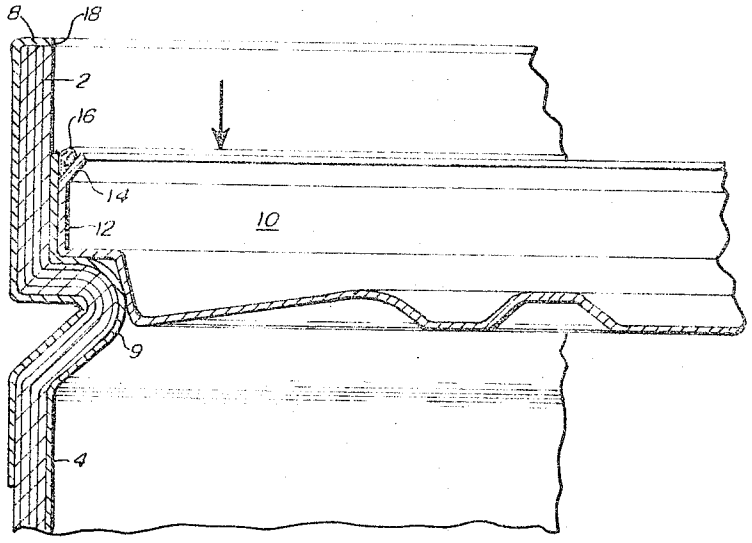



FIG. 4

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FIG. 5

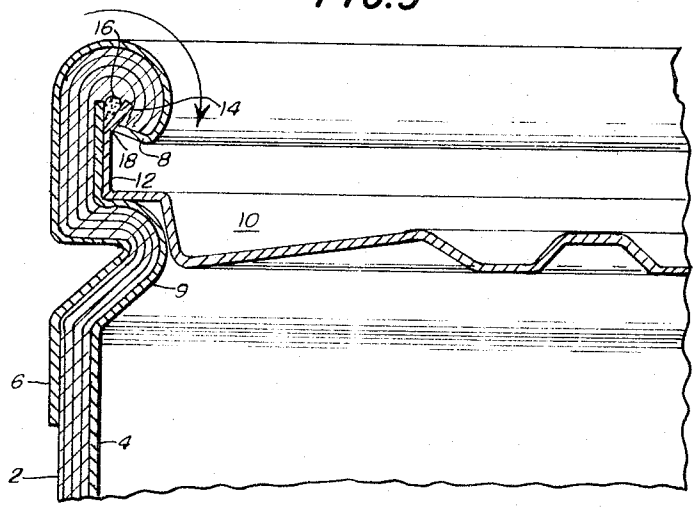
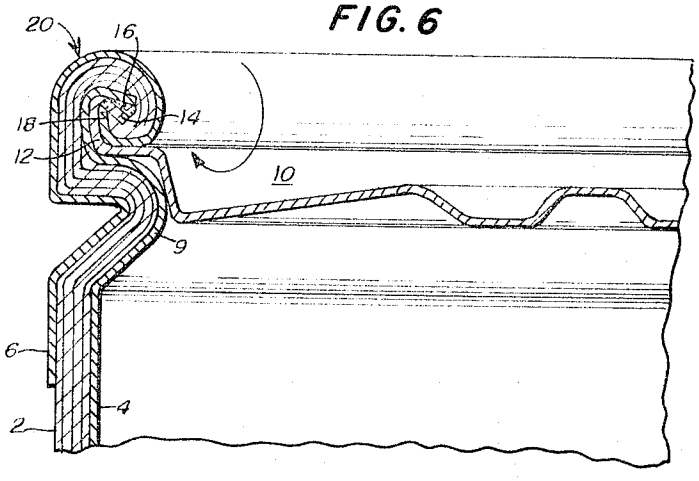



FIG. 6



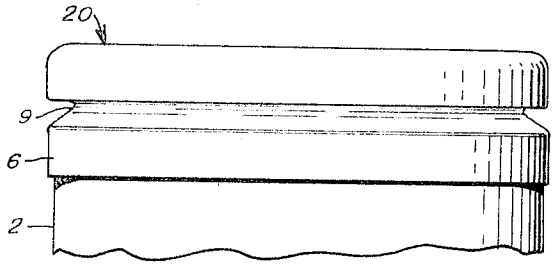




FIG. 7

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3,309,004

# CONTAINER AND METHOD OF MAKING A CONTAINER

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13 Claims. (Cl. 229—5.6)

This invention relates to a method for making containers and to containers which are produced thereby.

Various aspects of this invention are believed to be improvements over the prior art. This invention contemplates the formation of a tubular body by convolutely winding a sheet of kraft paper onto a rotating liner in a manner so there is substantial stretching of the paper as it is wound. This increases the strength of the container and provides for a greater adhesion between the fibrous body and the liner.

This invention also is directed to the joint which holds a tubular container body to a closure member which extends across an end thereof. This particular joint will be especially useful in containers of the type having an impermeable lining within a fibrous body, but may also be employed in containers having other wall structures.

The particular method of forming the joint disclosed herein is also considered to be a feature of this invention, and it conceivably may be used on unlined container bodies.

When liquids are shipped or stored in certain quantities, they are customarily handled in heavy metal drums which are relatively expensive and thus add to the cost of the commodity or must be returned to the supplier after they are emptied.

Drums made of a fibrous material such as a convolutely wound web of kraft paper are well known in the packaging industry, and due to their low cost they are used for a single time and then discarded. Unfortunately, these drums are not capable of carrying liquids, and therefore connot be substituted for the expensive steel drums.

It has been proposed heretofore to use a metallic liner within a fibrous container body in order to combine the advantages of both materials; i.e. the impermeability of metal and the economy of paper-like materials.

One object is to provide a joint between a container wall and an end closure, which joint is easily made and is capable of withstanding severe blows due to dropping or other mishandling of the containers.

Another object of this invention is to provide a method for forming a cylindrical container body by wrapping convolutely a sheet of paper onto a rotating tubular member, in a manner so that the paper shell will be firmly attached to the liner and to the other convolutions thereof.

Still another object is to improve over the prior methods of forming a joint between a container body and an end closure.

The realization of these and other objects is achieved by forming the cylindrical container body by stretching the web of paper impregnated with a bonding agent as it is being wound on the tubular impermeable body which will later serve as the container liner. This is done by feeding the paper from a supply roll at a speed of about 90% of the peripheral speed of the rotating liner.

Other objects are achieved by attaching the end closure to a container of the type described by providing an outer chime ring which is curled inwardly to form and enclose a bead portion, and locating the rim of the closure member within the bead, compacted within the mass of fibrous material which is curled within the chime.

The closure joint, the method of making it and the overall configuration of the container may be seen in the drawings wherein;



FIG. 1 is a section of a portion of the container wall after its formation and prior to the application of the end closure;

FIG. 2 is a view similar to that of FIG. 1, showing the chime ring over the end of the container body;

FIG. 3 shows the formation of an internal rib which later supports the end closure;

FIG. 4 is a view showing the insertion of the closure member across the open end of the container;

FIG. 5 shows the first step of the operation in which the chime ring is curled inwardly;

FIG. 6 shows the completed joint between the container wall and the closure; and

FIGS. 7 is illustrative of one end of a container which is made according to the present invention.

The lined container body 2 of FIG. 1 is preferably made by convolutely winding a web of kraft paper about the liner 4. The liner may be made from a single sheet of steel which is bent into generally cylindrical form and sealed at the mating edges by means of resistance welding, soldering or stitching. The tubular steel liner is then indexed onto a mandrel which is expanded radially to stretch and form the liner 4 to the preferred cylindrical shape. Then a sheet of kraft paper is led from a supply roll, fed through a device which coats or impregnates it with a bonding agent such as sodium silicate, and then passes onto the liner 4. The liner 4 is rotated to maintain a given peripheral speed, and the paper passing from the supply roller is held in tension so that the paper is stretched before it is wound onto the liner. The speed of the paper passing from the supply roll is maintained at approximately 90% of the peripheral speed of the rotating liner, to provide the desired stretching of the wet paper. Stationary cutting blades may cut the moving web of paper to the desired width.

After the convolutions of paper are laid on the liner, the rotating mandrel is stopped, the mandrel is reduced in size, and the lined container body is removed therefrom. It will be noted from FIG. 1 that the paper or fibrous body of the container extends beyond the edge of the liner by a relatively short predetermined distance, which may vary with the container size, but usually is ½ to ⅞ inch.

Although this invention contemplates the use of a wide variety of materials, the metallic liners used have varied in thickness from .008 to .062 inch. The paper has been kraft paper having a weight of about 47 pounds per 1000 square feet, having a thickness of .012 inch, and wound from 7 to 9 times around the liner. Obviously, the strength of the container body may be increased by laying on additional layers. Sodium silicate has proven to be the most practical bonding material by virtue of its relatively low cost and its ability to bond kraft paper to the steel liner. Other bonding materials may of course be used; for example, starches, polyvinyl acetate emulsions, acrylic emulsions or polyethylene.

During the winding of the paper onto the cylindrical liner, the web of paper passes from the supply rolls at approximately 325 feet per minute; and the winding speed, determined by the rotation of the mandrel is 345 to 365 feet per minute. This causes some stretching of the paper web which assists in producing a strong bonded construction of the container body.

After the composite liner and container body are removed from the mandrel, while the paper is still moist and the bonding agent has not yet set, an end closure is attached to the container body in the manner described hereinbelow.

As shown in FIG. 2, a metallic chime ring 6 is slipped over the end of the container and in tight engagement with the outer surface thereof. An inwardly extending upper flange 8 on the chime ring serves to prevent it from

slipping downwardly over the container body, and also is important during the beading operation to be described later. Preferably the lowermost edge of the chime portion is below the uppermost edge of the metallic liner **4**.

Then, as shown in FIG. 3, the chime ring, container body and liner are deformed to provide an internal rib **9** which extends around the container in a plane transverse to the main axis of the container body. This rib is located at a given distance from the end of the container, usually about 2 inches, and its purposes are to lock the chime ring **6** to the container body **2** and to provide a supporting surface for the container closure member. It is especially desirable that the upper portion of the rib be relatively flat and perpendicular to the central axis of the tubular container body, so that the closure member will lie flatly thereagainst. This rib is formed by radially acting segmented dies located on both sides of the container wall. By using radially acting dies rather than the more conventional rolling die, it has been found that the rib produced will conform to the relatively narrow dimensional tolerances which are required for a satisfactory joint of this type.

Next, the closure member **10** is placed across and within the end of the container body, to rest upon the rib **9** which was formed during the preceding operation. This closure member **10** has an upstanding rim portion **12** which is contiguous with the interior wall of the container. An upper portion **14** of this rim projects inwardly away from the wall at a slight angle which is less than ninety degrees to the container wall. Preferably the upper edge of the closure rim is approximately in the same plane as the upper edge of the container liner **4**. The inwardly bent rim portion **14** forms a crevice into which any suitable caulking or sealant **15** may be placed, and it especially serves an important function during the beading operation which will be later described.

The final step in affixing the closure **10** to the end of the container is performed by a press which contacts at the same time the entire periphery of the container end. This curling in, beading or hooking operation may be done during a single stroke of the machine, but for a complete understanding of the action, it is described herein in two phases.

The first phase of curling in is shown in FIG. 5. A portion of the chime ring **6** and the container body **2** are curled inwardly, i.e., in a general direction toward the center of the closure member, in a manner so that the edge **18** of the chime ring **6** contacts the upstanding rim portion **12** of the closure. Contact is made proximate to the line or point where the upper rim portion **14** is bent inwardly. At this stage, the portion of the chime ringe **6** near the contacting edge **18** is generally at a right angle to the upstanding rim portion **12** of the closure member **10**. An angle of less than forty-five degrees is undesirable here, since it would impede the subsequent action of the curling-in procedure.

As the curling-in of the container end progresses, the combined effects of the edge **18** of the chime ring, the pressure developed within the bead which is being formed, and the general depression of the uppermost portion of the bead causes the upper rim portion **14** of the closure and the upper end portion of the liner **4** to bend inwardly toward the central axis of the container and become firmly embedded and encased within the compacted fibrous material within the bead **20**. The upper rim portion **14** is bent to an angle which lies approximately at a right angle to its initial position.

The completed joint is shown in FIG. 6. The chime ring **6** is turned inwardly approximately one complete revolution to form the outer surface of the bead **20**. The fibrous material within the bead has been compacted to encase the upper rim portion **14** of the closure and the upper portion of the container liner. These encased upper portions of the liner and rim are of approximately the same dimensions as they are abruptly bent inwardly at a point proximate to the edge **18** of the chime ring, which lies within the bead **20**. Preferably, the angle between the end of the chime ring near its edge **18** and the inwardly bent portion **12** of the closure is ninety degrees or less. The caulking material **16** is also compacted and prevents the leakage of the fluid from the interior of the container into the fibrous material within the bead **20**.



After the closure has been attached, the container body is permitted to dry until the bonding agent in the paper body has set, so that the various elements will be firmly held in the position shown in FIG. 6. The drying also causes the paper to shrink somewhat to increase the strength of the bond between the liner and the various layers of paper.

This joint has been found to be extremely strong and resistant to internal pressure and to the many blows to which containers are frequently subjected. This improved result is due largely to the manner in which the bent-over portion of the closure is held in position by the compected material within the bead, and stands in opposition to the movement of the portion of the chime ring which lies within the bead. Experimental studies including drop tests have shown that this particular interlocking feature between the closure rim and the chime ring provides a much greater resistance to rupture and leakage than do the prior art structures known to the inventor.

Numerous modifications to the invention as described will occur to those skilled in the art. For example, the metallic chime portion itself may be a portion of the container wall and the material compacted within the bead may be some type of material other than that used for the container wall. The closure joint is of course capable of being used for both tops and bottoms of tubular containers.

From the foregoing, it will be seen that this invention represents a notable improvement over the prior art. The full scope of the invention is not limited to the single embodiment disclosed herein but is set forth in the following claims.

I claim:

**1.** A container comprising

(a) a tubular body of fibrous material having inner and outer walls, and an end portion curled inwardly to form a bead having a compacted mass of fibrous material;

(b) a chime ring having a portion thereof contiguous with said outer walls of said body and curled inwardly approximately one complete revolution to surround a major portion of said bead;

(c) an impermeable liner contiguous with the inner wall of said tubular body, said liner having an end portion embedded in said bead; and

(d) a closure member across the end of said container, said closure member having a rim portion embedded in said bead, said closure member rim portion and said liner end portion extending parallel and adjacent to the inner wall of said tubular body and then abruptly bending inwardly at approximately a same given point adjacent the end of the chime ring inside the bead where they are surrounded by said compacted mass, the inwardly bent portion of said closure member rim portion extending in a substantially straight line from said given point at an inclination which is no more than ninety degrees to the end of said chime ring inside said bead, said inclination being less than ninety degrees to the portion of said closure member rim portion which is parallel to the inner wall of said tubular body.

**2.** The container of claim **1** having

(f) a generally toroidal body of caulking material between said inwardly bent portions.

**3.** The container of claim **1** wherein

(f) said chime ring has an edge proximate to said closure rim at said given point where said closure rim bends abruptly inwardly.

4. The container of claim 1 wherein

(f) said closure rim and said liner end portions are of approximately the same dimensions.

5. The container of claim 1 wherein

(f) said body is a convolutely wound web of sheet material impregnated with a bonding agent.

6. The container of claim 1 wherein

(f) said container body has an inwardly extending rib beneath and in contact with said closure member, said rib having an upper surface which is generally transverse to said container walls.

7. A container comprising

(a) a tubular body portion,

(b) a metallic chime portion on said body,

(c) said chime portion being curled inwardly approximately one full revolution to form a bead portion,

(d) a closure member across the end of said container,

(e) said closure member having a rim portion bent at a given point abruptly inwardly toward the central axis of said container,

(f) said chime portion having an edge contacting said closure member at said given point where said closure rim is bent inwardly, the inwardly bent portion of said closure member rim portion extending in a substantially straight line from said given point at an inclination which is no more than ninety degrees to the end of said chime ring inside said bead, said inclination being less than ninety degrees to the inner wall of said tubular body below said rib, and

(g) material compacted within said bead and surrounding said inwardly bent portion of said closure.

8. The method of sealing a closure to the end of a container body having a tubular wall including the steps of

(a) forming an internal transverse rib a given distance from an end of said container body,

(b) placing said closure within and across the end of said container body, said closure resting on said rib and having an upstanding rim portion substantially contiguous with said container wall, said closure rim portion having an upper rim portion bent inwardly away from said wall to form a crevice,

(c) placing a toroidal ring of caulking material in said crevice, and

(d) curling inwardly a portion of said container wall above said closure to completely enclose said caulking material.

9. The method of sealing a closure to the end of a container body having a tubular wall of fibrous material and a liner with an edge spaced from the end thereof including the steps of

(a) forming an internal transverse rib a given distance from an end of said container body,

(b) placing said closure within and across the end of said container body, said closure resting on said rib and having an upstanding rim portion contiguous with said liner, said closure rim portion having an upper rim portion bent inwardly away from said liner to form a crevice,

(c) placing a toroidal ring of caulking material in said crevice, and

(d) curling inwardly a portion of said container wall above said closure to enclose said caulking material and portions of said rim portion and said liner.

10. The method of claim 9 wherein

(e) said portion of said container wall is curled inwardly until said upper rim portion of said closure and a portion of said liner are bent inwardly approximately at a right angle to said wall.



11. The method of sealing a closure to the end of a container body having a tubular wall of fibrous material and a liner with an edge spaced from the end thereof including the steps of

(a) placing an external chime ring about the end of said container body, said chime ring having a flange overlying the edge of said container body,

(b) forming an internal transverse rib a given distance from an end of said container body,

(c) placing said closure within and across the end of said container body, said closure resting on said rib and having an upstanding rim portion contiguous with said liner, said closure rim portion having an upper rim portion bent inwardly away from said liner to form a crevice,

(d) curling inwardly a portion of said chime ring and container wall above said closure to enclose only the upper portions of said rim portion and said liner,

(e) further curling inwardly said chime ring and fibrous material to bend abruptly said upper rim portion of said closure and a portion of said liner inwardly at a given point adjacent the end of said flange to extend in a substantially straight line from said given point at an inclination which is no more than ninety degrees to the end of said chime ring inside said bead, said inclination being less than ninety degrees to the inner wall of said tubular wall below said rib approximately at a right angle to said wall.

12. The method of sealing a closure to the end of a container body having a central axis and a tubular wall of fibrous material including the steps of

(a) placing an external chime ring about the end of said container body, said chime ring having a flange overlying the edge of said container body,

(b) forming an internal transverse rib a given distance from an end of said container body,

(c) placing said closure within and across the end of said container body, said closure resting on said rib and having an upstanding rim portion contiguous with said liner, said closure rim portion having an upper rim portion bent inwardly at a point away from said liner to form a crevice,

(d) curling inwardly a portion of said chime ring and container wall above said closure until an edge of said chime ring flange contacts said closure rim portion proximate to the point where said upper rim portion bends inwardly,

(e) further curling inwardly said chime ring and fibrous material to abruptly bend said upper rim portion of said closure at a given point adjacent the end of said flange to extend in a substantially straight line from said given point at an inclination which is no more than ninety degrees to the end of said chime ring inside said bead, said inclination being less than ninety degrees to the inner wall of said tubular wall below said rib.

13. The method of claim 12 wherein step (b) is accomplished by radially acting on said container wall to produce a rib having an upper surface which is generally transverse to the central axis of said body.


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