Sept. 21, 1965 T. E. DOBBINS ET AL 3,207,410

FIBRE CONTAINER CONSTRUCTION

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Fig. 1.

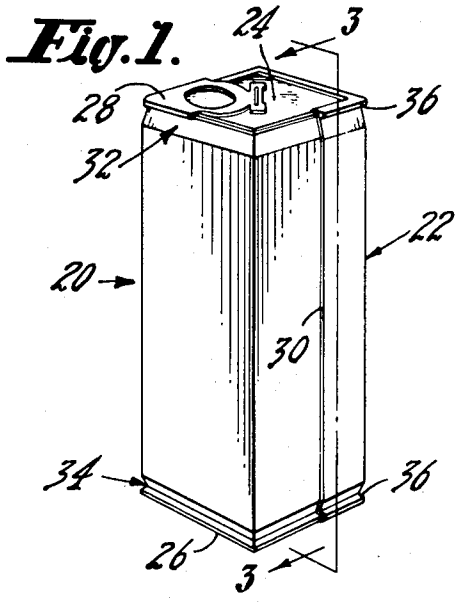


Fig. 2.

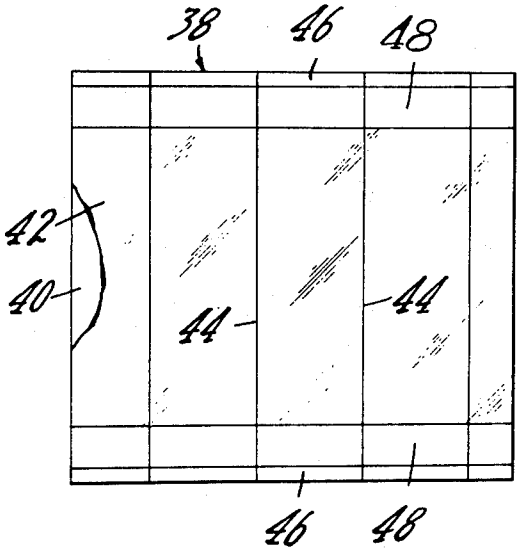
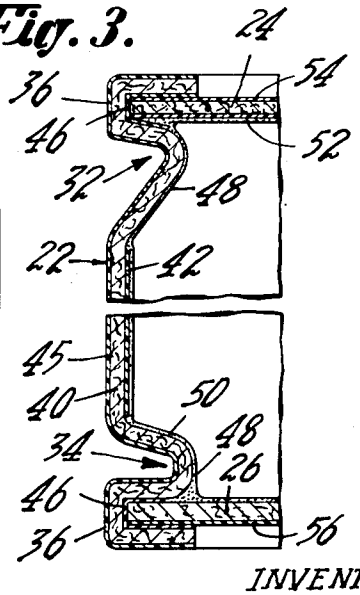


Fig. 3.



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Fig. 4.

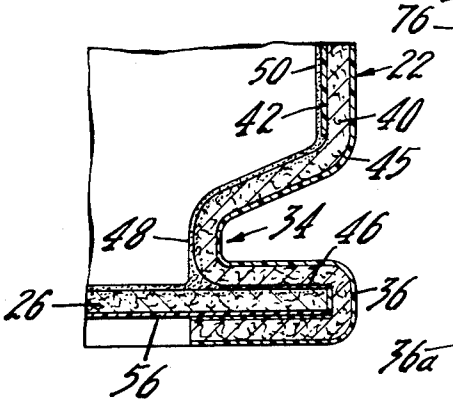


Fig. 7.

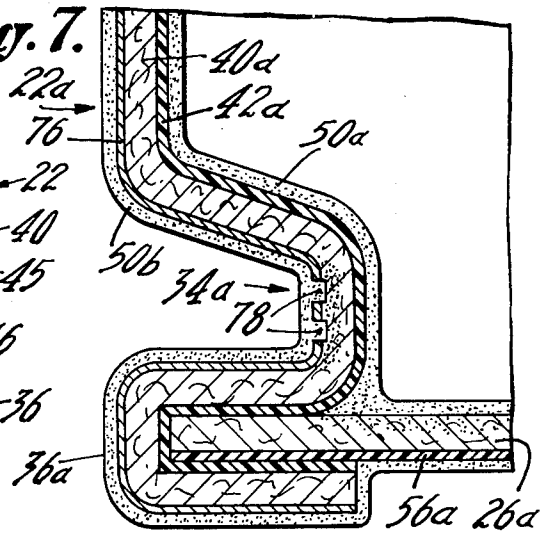


Fig. 5.

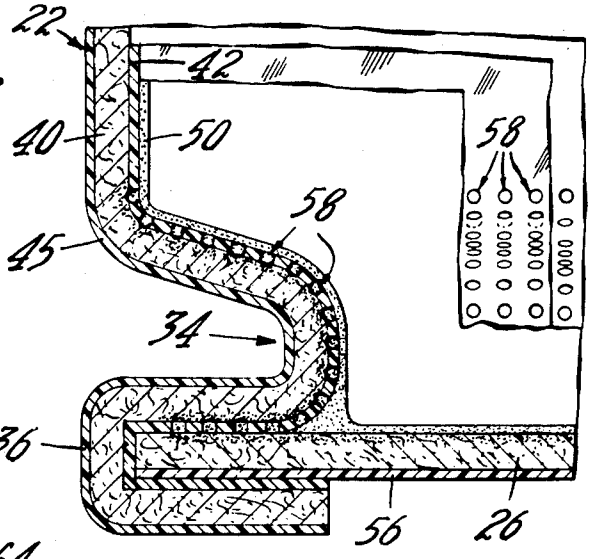
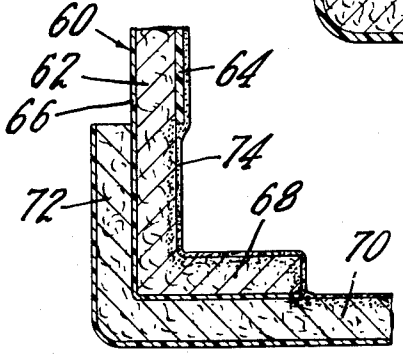


Fig. 6.



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3,207,410

FIBRE CONTAINER CONSTRUCTION

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Filed Sept. 11, 1963, Ser. No. 308,250
18 Claims. (Cl. 229—3.1)

This is a continuation-in-part of application Serial No. 241,823 filed December 3, 1962 in the names of T. E. Dobbins and D. C. Foord for "Fibre Container," now abandoned.

This invention relates to the manufacture of liquid-tight containers and more particularly it relates to a container construction having improved liquid barrier and strength characteristics.

Because of their relatively low cost, liquidproof fibre containers have become quite popular for marketing such products as milk, fruit juices, non-carbonated beverages, and similar liquids. The structural requirements for containers of this type are rather rigid in that they must be liquid-tight to prevent leakage, durable to withstand a great deal of handling between the time of manufacture and actual use, and, where the product contained therein is a comestible for human consumption, they must also maintain the product in a sterile and uncontaminated condition.

While these requirements have been fairly well maintained by the well known waxed fibre or paperboard type of container, container manufacturers continue to seek ways of improving container strength, particularly abuse resistance, of reducing the amount of wax utilized in coating the containers and thereby reducing the unit cost of such containers, and of providing a container construction having greater attractiveness and market appeal. It has been found that the amount of wax utilized in coating the containers can be materially reduced by laminating or coating the fibre container stock with a wax-proof coating layer which prevents the wax from penetrating or impregnating the fibre stock.

One satisfactory lamination technique which prevents the aforesaid wax penetration of the container fibre stock and also prevents liquid or vapor moisture from saturating and weakening the fibre involves coating both the inner and outer container fibre stock surfaces with a film of moisture-impervious plastic, such as polyethylene and then wax flushing the interior of the container to further protect against seam leakage. This lamination technique not only prevents both wax and moisture saturation of the fibre container stock but also provides a container having no exterior wax coating and thus offering an attractive package having a high degree of market appeal.

Another satisfactory lamination technique which prevents wax penetration of the container fibre stock involves use of a mineral hold-out coating on the exterior container surfaces and a polyethylene film on the interior container surfaces. The hold-out coating prevents wax saturation but does not protect against moisture penetration and saturation. However, when the entire container is wax dipped, the outer wax coating prevents moisture penetration and the inner wax coating protects against seam leakage. This lamination technique protects against moisture and wax saturation of the container fibre stock and also provides a container wherein the unit cost can be reduced by elimination of the outer polyethylene coating.

While lamination of fibre stock by either of the aforementioned techniques produces a container material having the desirable properties of preventing wax and/or moisture penetration and saturation, containers made

from these materials still encounter certain difficulties, foremost among these being end weakness and seam leakage. When the container material is fabricated into a tubular body and end closures are applied to form a liquid-tight container, the body portions at the corners and adjacent the end seams are naturally subjected to severe working stresses during assembly. Often such working will cause the plastic films or the hold-out coating on the fibre wall to fracture or crack and, in such instances, even subsequent wax coatings are not completely satisfactory to prevent weakness and leakage at these areas, since the film or coating is still imperforate enough to prevent sufficient wax penetration of the fibre with its accompanying strengthening effects.

The problem becomes even more acute during handling and shipping of such containers. Since the containers are filled with liquid contents and subsequently handled and shipped, the liquid contents act as a hydraulic head causing severe jouncing and abuse of the lower body and end seam areas in particular. Often this abuse is severe enough to flake off the inner wax coating and to fracture the inner fibre plastic coating thus allowing the liquid contents to seep into the fibre and cause leakage which causes the container to weaken or sag or to flake off the outer wax coating and fracture the outer plastic film or hold-out coating thus allowing ambient moisture to seep into the fibre.

It thus becomes apparent that, while it is possible to manufacture containers having coatings suitable for preventing wax impregnation of the fibre stock and thus having the benefits of decreased unit cost and more attractive appearance due to the elimination of the mottled effect often caused by wax impregnation, such benefits are achieved only through the sacrifice of the beneficial strengthening effects of wax impregnation and accordingly, such containers are more prone to leakage at the worked areas and the weakness and sagging concomitant with such leakage.

It is therefore an object of this invention to provide a liquidproof container of laminated stock having an improved construction in the worked areas of the container particularly the body.

Another object of this invention is to provide a liquid-tight laminated container having end areas of improved strength and resistance to abuse and softening.

A further object of this invention is to provide a laminated container which prevents wax impregnation of the container stock in all but selected areas.

Still another object of this invention is to provide a liquid-tight moistureproof laminated fibre container having a wax impregnated end seam and necked-in construction.

Yet a further object of this invention is to provide a leakproof fibre container having a selectively interrupted inner and/or outer coating layer which permits selective wax impregnation of the fibre.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

The foregoing objects are attained by manufacturing a container from a laminated blank comprising a paper or fibre-board backing layer and a wax impermeable inner and outer layer, at least one of which is selectively interrupted or terminated at those portions or areas of the blank which are worked in the formation of the container such as the score lines at which the corners are formed and the necked-in portions of the container. Thus, when the container is assembled and given a wax coating, the wax penetrates or impregnates the fibre backing layer at those areas where the wax impermeable layer

is interrupted or terminated, thereby strengthening those vulnerable corner, necked-in and end seam areas and protecting them against weakening from liquid seepage into the fibre. The term 'discontinuous" or "discontinuity" as used herein is considered to be generic to the concept of interrupting, terminating or otherwise degrading the wax impermeable coating.

Referring to the drawings:

FIG. 1 is a perspective view of a container constructed in accordance with the present invention;

FIG. 2 is a plan view of one form of body blank used in construction of the container illustrated in FIG. 1;

FIG. 3 is a fragmentary enlarged sectional view taken substantially along line 3—3 of FIG. 1 and illustrating one embodiment of the present invention;

FIG. 4 is a greatly enlarged fragmentary sectional view illustrating in detail the bottom end seam construction of FIG. 3;

FIG. 5 is a greatly enlarged fragmentary sectional view, similar to FIG. 4, and illustrating a modification of the embodiment of FIGS. 3 and 4;

FIG. 6 is a greatly enlarged fragmentary view of the bottom end seam of a modified form of container and illustrating how the embodiment of the invention illustrated in FIGS. 3–5 can be applied to different forms of containers; and

FIG. 7 is a greatly enlarged fragmentary sectional view of the bottom end seam of a container similar to that shown in FIG. 1 and illustrating an alternate embodiment of the present invention.

The configuration of the container illustrated in FIG. 1 is a well known type being of the general character of the container disclosed in U.S. Patent No. 2,085,979 issued to John M. Hothersall. Briefly described, this container, generally designated **20**, comprises an elongated tubular body, generally designated **22**, preferably of square or rectangular cross-section, top and bottom end closures **24** and **26** respectively secured to the tubular body, and a hinged plug closure element **28** closing a pouring opening in the top end **24**. The body **22** is formed from a single blank which is folded with its opposite ends overlapping to form a side seam **30**. The top and bottom margins of the body are necked-in as generally designated at **32** and **34** respectively and are then folded over the edges of the end closures **24** and **26** to form reinforced end seams **36, 36**.

FIG. 2 illustrates a body blank generally designated **38** and constructed in accordance with one embodiment of the present invention. The blank **38** comprises a main layer **40** of ordinary fibre or paperboard stock, approximately 0.012 to 0.022 inch thick, and a thin film **42** of thermoplastic resin material, preferably polyethylene having a thickness of approximately 0.0005 to 0.003 inch, coated to that surface of the main layer **40** which will be on the interior of the finally formed container. Appropriately spaced parallel fold lines **44** are formed in the blank to define therebetween, those portions of the blank **38** which will define the side walls of the body **22** when the container is erected. The blank **38** may be made in any desired manner, but the preferred practice is by the well known technique of extrusion coating a continuous fibre web which is then cut into individual body size blanks. In most instances it is desirable to have an exterior moisture-impervious coating for the container and one such coating can be a thin polyethylene film **45**, similar to the film **42**, but laminated to the opposite surface of the main fibre layer **40** and thus forming an exterior coating when the container is erected.

When a blank such as **38** is erected into a container and assembled with the end closures, the resultant container will have a cross-sectional configuration as shown in FIG. 3 and in greater detail in FIG. 4.

Remembering that the basic concept of the present invention is to provide for selective wax impregnation of the fibre, e.g. wax impregnation of the fibre layer in the necked-in areas **32** and **34** and in the end seam areas **36, 36**, it is thus essential that the wax impermeable layer be terminated or interrupted at those areas of the container. In the embodiment illustrated in FIGS. **2–6**, the wax impermeable layer is the thermoplastic film **42** which is laminated to the blank **38** on the surface which is to form the interior of the container. In this particular embodiment of the invention, the modification illustrating the wax impermeable layer terminated at the end areas is shown in FIGS. 2–4 and the modification illustrating the wax impermeable layer interrupted at the end areas in shown in FIG. 5.

Referring now to the modification of FIGS. 2–4, it can be seen that the wax impermeable layer or thermoplastic film **42** terminates short of the top and bottom ends of the blank. Strips **46, 46** of adhesive, preferably of the hot tack variety, are applied at the extreme top and bottom edges of the blank which correspond to the folded-over portions of the end seams to provide the means of securing the end closures **24** and **26** to the body **22**. Between the terminal ends of the thermoplastic film **42** and the adhesive strips **46**, film-free margins **48, 48** are formed. These margins **48, 48** define regions of exposed fibre from the main layer **40** and when the container is assembled, these margins form the interior surfaces of the necked-in portions **32** and **34**.

When the container is assembled, the interior thereof is flushed or otherwise coated to receive a thin wax coating **50**, as shown in FIGS. 3 and 4. Since most of the interior of the container is covered by the wax impervious layer **42**, the wax coating **50** cannot penetrate into the fibre; however, in the film-free areas **48, 48** at the necked-in portions **32** and **34** adjacent the end seams **36, 36**, the wax can freely penetrate or saturate the fibre layer **40**. This wax impregnation of the fibre in the vulnerable necked-in and end seam areas is sufficient to strengthen and rigidify the heavily-worked fibre in these areas and thereby overcome the problems of sag and low abuse resistance which otherwise occur if the fibre remains dry. As can be seen in FIG. 4, the wax which impregnates the fibre is transferred by capillary action, completely throughout the necked-in portions, into the folded-over end seam areas, and even to a point slightly above the terminal edge of the wax impervious layer **42**, thereby assuring strengthened end seam and necked-in areas.

The wax coating **50** need not be very heavy, thus lowering unit cost in terms of quantity of wax used and flushing time, and the wax itself can be paraffin or microcrystalline or amorphous wax, or a mixture of the two, which is compatible with the plastic film **42**. As the wax is applied as a coating **50**, it builds up in a small fillet at the bottom end due to the tendency to drain down before solidifying, and it thus penetrates well into those portions of the body **22** and bottom end **26** which are concealed in the seam **36**, thus providing a liquidproof end seam of improved strength.

As seen in FIG. 3, the top end construction differs slightly from the bottom end construction to the extent that the upper necked-in portion **32** is not deformed into full engaging contact with the inner marginal edges of the top closure **24** while the lower necked-in portion **34** contacts the inner marginal edges of the bottom closure **26**. Furthermore, the top end closure **24** is ordinarily coated on both the interior and exterior surfaces with protective films **52** and **54**, respectively, whereas the bottom end closure **26** is ordinarily of heavier stock and is coated on its exterior surface only with a protective film **56**, the interior wax coating **50** providing the protective barrier on its interior surface. The upper film-free area **48** not only provides for the desired impregnation of the necked-in portion, as at the bottom end, but also enables the wax coating **50** to migrate fully between the non-engaging surfaces of the neck-in **32** and the top end closure **24** and extend fully into the top end seam **36** thereby saturating the peripheral edge of the top closure **24**.

This provides a container having strengthened necked-in portions and liquidproof end seams at both ends of the container. However, as was aforementioned, the bottom neck-in and end seam receive the greatest abuse during handling and shipping since the liquid container contents act as a hydraulic head which is constantly jiggling and jouncing and applying pressure to the lower end areas. Thus, in some instances, it may be desirable to restrict the use of the present invention only to the bottom end of the container.

In the modification shown in FIG. 5, the container construction is similar to that previously described except that the wax impervious film **42** is not terminated at the necked-in areas. Instead, the film is deliberately interrupted or disrupted by knurling, jouncing or other similar operation to form marginal bands of perforations **58** extending over the necked-in portions and the folded-over end seam portions. The perforations **58** may be pinholes, slits or other types of punctures randomly spaced along the transverse margins of the body blank where the film-free areas **48**, **48** were located in the modification of FIG. 2. The perforations **58** should be of sufficient size to permit ready migration of the wax from the interior wax coating **50** through the plastic film **42** and into the fibre layer **40** to enhance the fibre with the beneficial properties previously described. In forming the perforations **58**, a certain amount of disruption of the underlying fibre will occur but this should be kept to a minimum, preferably no greater than 0.002 inch penetration, to avoid impairing the strength of the fibre layer **40**. While it is possible to terminate the plastic film **42** short of the edges of the blank and to utilize separate strips of adhesive such as **46**, **46** of FIG. 2, it is preferable in this modification to extend the plastic film **42** completely to the edge of the blank and to leave the extreme outer edges of the film undisrupted by the perforations **58**. In this way, an unperforated band of plastic film is provided at the extreme edges to act as the adhesive for securing the end closures to the container.

While it is preferred that the embodiment previously described be employed with containers having a necked-in portion, such as those shown in FIGS. 1 and 3, it is by no means limited to such a construction and to illustrate this, FIG. 6 shows the embodiment applied to a different form of container wherein a container body **60** is formed from a laminated blank having a main fibre layer **62** to which is laminated an interior wax impermeable thermoplastic film **64** and, if desired, an exterior moisture-impervious thermoplastic film **66**. The body **60** is turned at right angles into an inwardly extending flange **68**, and a cup-shaped end closure **70** having an upstanding flange **72** is fitted over the body in telescoped relation. The inner wax impermeable film **64** is terminated short of the inturned flange **68** or is interrupted in the region thereof to leave an area of exposed fibre **66**. Thus, when the finally formed container is interiorly flushed to receive a wax coating **74**, the wax impregnates this area of exposed fibre, as shown, and provides an end seam construction of improved abuse and softening resistance.

An alternate embodiment of the invention is shown in FIG. 7 wherein a container body **22***a*, similar to container body **22**, is necked-in at **34***a* and then folded-over to secure an end closure **26***a* by means of an end seam **36***a*. The container body is comprised of a main fibre or paperboard layer **40***a*, an inner wax impermeable thermoplastic film **42***a*, and an outer wax impermeable layer or hold-out coating **76**, shown greatly exaggerated in thickness for purposes of illustration. The inner film **42***a* is similar to the film **42**, preferably polyethylene, and is generally applied by extrusion coating. Its marginal end portions can serve as the adhesive for securing the end closures, as was described in connection with film **42** in FIG. 5. The outer hold-out coating **76** is a mineral coating which can vary extensively in composition provided it has two specific properties; namely, it must be wax impermeable to the point that wax cannot penetrate through it and it must be frangible in that it must be inflexible enough to fracture when scored, as will be presently described. One suitable coating composition is comprised mainly of clay pigment with a protein binder, although the binder can also be a polyacrylic or polyvinyl acetate emulsion. Starch alginate or starch-carboxy methyl cellulose coatings are also acceptable. These coatings can be applied by trailing blade techniques or other suitable coating procedures.

The hold-out coating **76** can be scored, scuffed, jounced or otherwise fractured or mechanically degraded in the necked-in areas to create fractures through which a subsequently applied wax coating can penetrate the fibre. As an illustration, a pair of scored grooves **78** and shown in FIG. 7 extending through the hold-out coating **76** and into the underlying fibre **40***a*. These scored grooves completely encircle the container in the necked-in area **34***a* and, if desired, in the necked-in area **32***a*, not shown. As was the case with the perforations **58** of FIG. 5, it is desirable that the scored grooves **78** do not extend deeply into the fibre layer **40***a* lest they weaken it.

Since the hold-out coating **76** is wax impermeable but not liquid impervious, and since wax penetration is desired through the fractured areas of the hold-out coating, it is necessary to apply an outer wax coating **50***b* as well as an inner wax coating **50***a* and this is generally accomplished by wax dipping the entire assembled container. When this is done, the wax from the outer coating **50***b* passes through the wax impermeable coating **76** and into the fibre **40***a* by means of the scored grooves **78**. Capillary action distributes the wax throughout the fibre in the necked-in portion **34***a* thereby strengthening it and preventing sag or weakening. Additionally, the outer wax coating **50***b* covers the end of the body **22***a*, saturating the peripheral edge thereof, and also costs the end closure protective film **56***a*, thus providing a wax barrier at the edge of the interface between the body inner film **42***a* and the end closure film **56** to thereby prevent leakage at the end seam **36***a*. As shown in FIG. 7, the inner wax impermeable layer **42***a* is not interrupted, so all the wax impregnation occurs by the wax from the outer coating **50***b* penetrating into the fibre. However, it is within the scope of this invention to degrade or discontinue both the inner coating **42***a*, such as is shown in FIGS. 2–5, and the outer coating **76**, such as is shown in FIG. 7, to thereby achieve wax penetration by both the inner and outer wax coatings **50***a* and **50***b*. But in actual practice this has not proved to be necessary since satisfactory results have been achieved by wax penetration from one side only and the results have been somewhat the same whether the penetration is from the inside out, as shown in FIGS. 3–5, or from the outside in, as shown in FIG. 7.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in the form, construction and arrangement of parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

We claim:

1. A leakproof container for liquid products comprising:

a tubular laminated container body;

a top end closure; and

a bottom end closure;

said top and bottom end closures being secured to said container body by liquid-tight end joints at opposite ends of said container body;

said laminated container body including a main layer of fibre, a wax impermeable coating adhered to said fibre layer, and a wax coating superimposed upon said wax impermeable coating;

said wax impermeable coating being discontinuous adjacent at least one of said end joints to expose said fibre layer to said wax coating to permit wax from said coating to impregnate and rigidify said fibre layer.

2. A leakproof container as defined in claim 1 wherein said wax impermeable layer is a thermoplastic film.

3. A leakproof container as defined in claim 2 wherein said thermoplastic film is rendered discontinuous adjacent said end joint by terminating a predetermined distance therefrom.

4. A leakproof container as defined in claim 2 wherein said thermoplastic film is rendered discontinuous adjacent said end joint by perforations formed within said film.

5. A leakproof container as defined in claim 1 wherein said wax impermeable layer is a frangible mineral hold-out coating.

6. A leakproof container as defined in claim 5 wherein said hold-out coating is rendered discontinuous adjacent said end joint by selective fracturing thereof.

7. A leakproof container of improved construction comprising:

a tubular laminated container body; and

top and bottom end closure secured to opposite ends of said container body in interfolded end seams;

said laminated container body including a fibre layer, a wax impermeable layer superimposed on one surface of said fibre layer, and a wax coating superimposed on said wax impermeable layer;

said wax impermeable coating being discontinuous adjacent at least one of said interfolded end seams to permit wax from said wax coating to enter the folds of said end seam to strengthen the seam and render it leakproof.

8. A leakproof container as defined in claim 7 wherein a moisture impervious layer is adhered to the other surface of said fibre layer.

9. A leakproof container as defined in claim 8 wherein the wax impermeable layer is a mineral hold-out coating and the moisture impervious layer is a thin thermoplastic film.

10. A leakproof container as defined in claim 8 wherein both the wax impermeable layer and the moisture impervious layer are both thin thermoplastic films.

11. A laminated fibre container of improved construction comprising:

a tubular container body of laminated construction and having an upper and lower end;

said container body having necked-in portions adjacent its upper and lower ends;

a top end closure; and

a bottom end closure;

said top and bottom end closures being secured respectively to the upper and lower ends of said container body by interfolded end seams;

said interfolded end seams being formed between said container body and said end closures immediately adjacent said necked-in portions;

said container body laminated construction including a main fibre layer, a wax impermeable coating adhered to said fibre layer, and a wax coating superimposed on said wax impermeable coating;

said wax impermeable coating being discontinuous at said necked-in portions to expose the fibre layer therebeneath to said wax coating to permit the wax from said coating to penetrate into said fibre thus strengthening and rigidifying said necked-in portions and strengthening and sealing said interfolded end seams to prevent leakage.

12. A laminated fibre container as defined in claim 11 wherein said wax impermeable layer is a thermoplastic film.

13. A laminated fibre container as defined in claim 12 wherein said thermoplastic film is rendered discontinuous at said necked-in portions by terminating a predetermined distance therefrom.

14. A laminated fibre container as defined in claim 12, wherein said thermoplastic film is rendered discontinuous at said necked-in portions by perforations formed within said film.

15. A laminated fibre container as defined in claim 11 wherein said wax impermeable coating is adhered to said fibre layer on the surface forming the interior of said container.

16. A laminated fibre container as defined in claim 11 wherein said wax impermeable coating is a frangible hold-out coating.

17. A laminated fibre container as defined in claim 16 wherein said hold-out coating is rendered discontinuous at said necked-in portions by selectively fractured areas formed within said hold-out coating.

18. A laminated fibre container as defined in claim 17 wherein said hold-out coating is adhered to said fibre layer on the surface forming the exterior of said container.

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