

Feb. 15, 1966

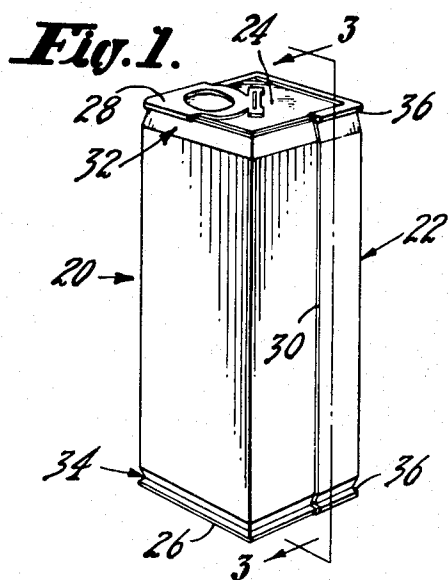
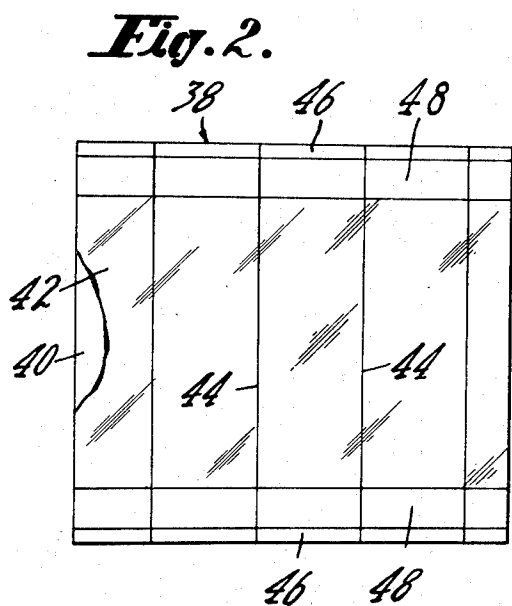
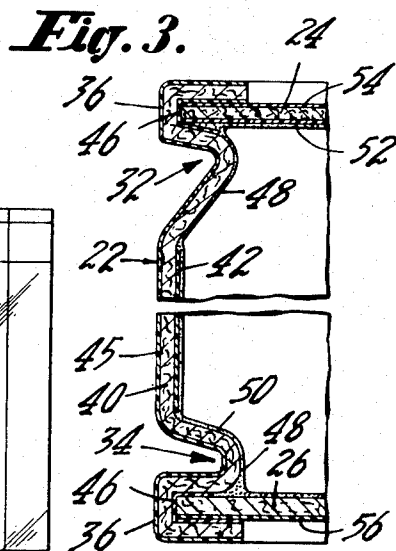
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3,234,858

METHOD OF CONSTRUCTING LIQUID-TIGHT FIBRE CONTAINERS

Filed Dec. 18, 1963

5 Sheets-Sheet 1



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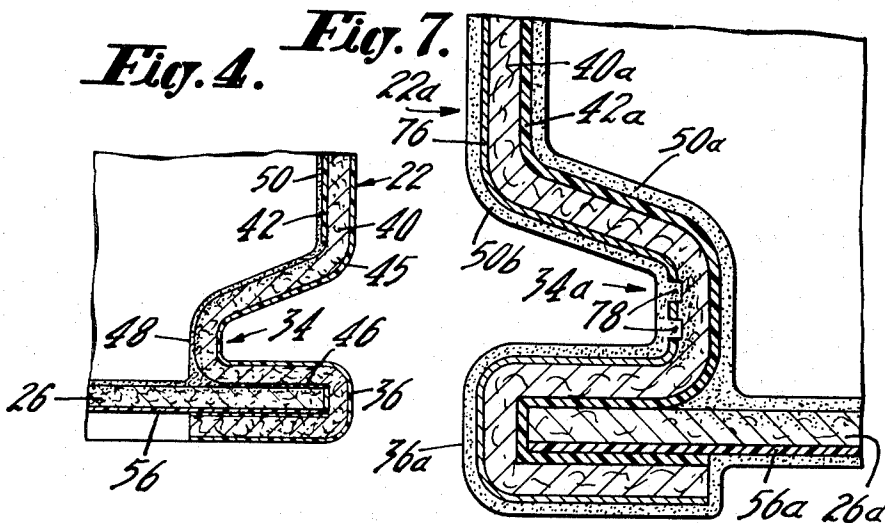
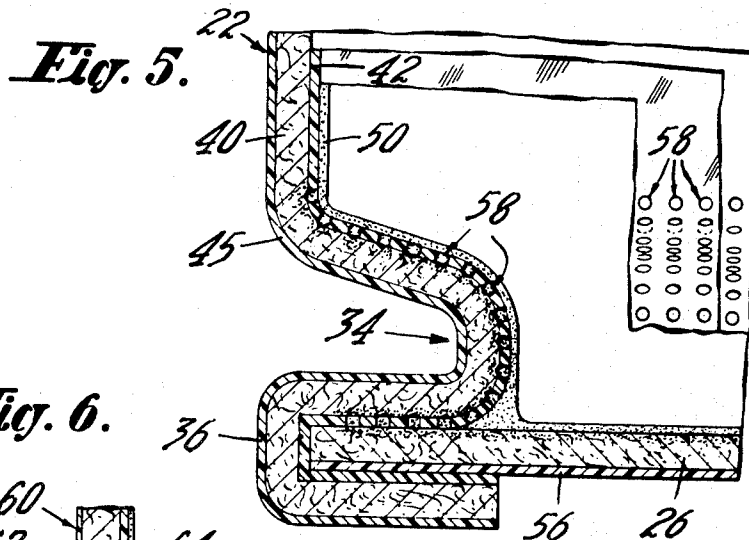
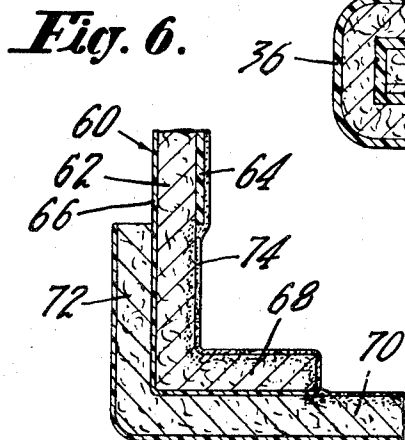
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METHOD OF CONSTRUCTING LIQUID-TIGHT FIBRE CONTAINERS

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5 Sheets-Sheet 2



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METHOD OF CONSTRUCTING LIQUID-TIGHT FIBRE CONTAINERS

Filed Dec. 18, 1963

5 Sheets-Sheet 3

Fig. 8.

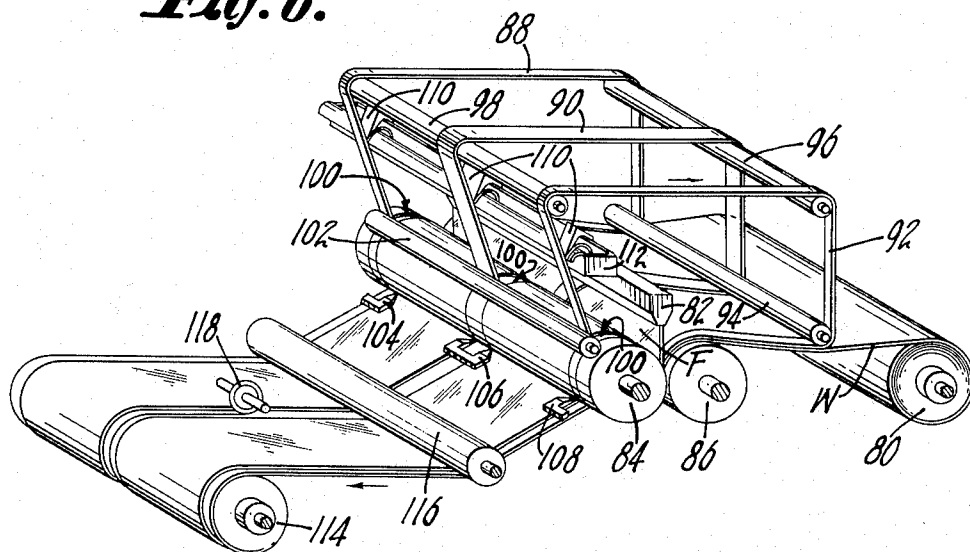


Fig. 9.

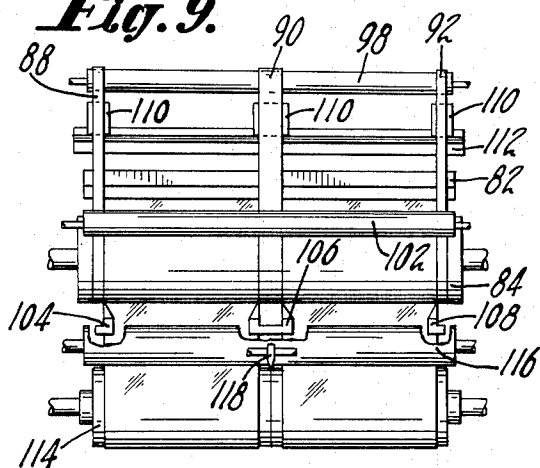
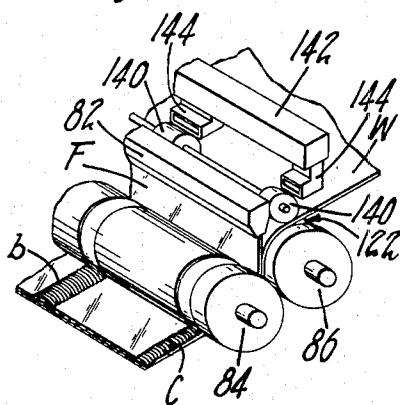


Fig. 12.



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METHOD OF CONSTRUCTING LIQUID-TIGHT FIBRE CONTAINERS

Filed Dec. 18, 1963

5 Sheets-Sheet 4

Fig. 13.

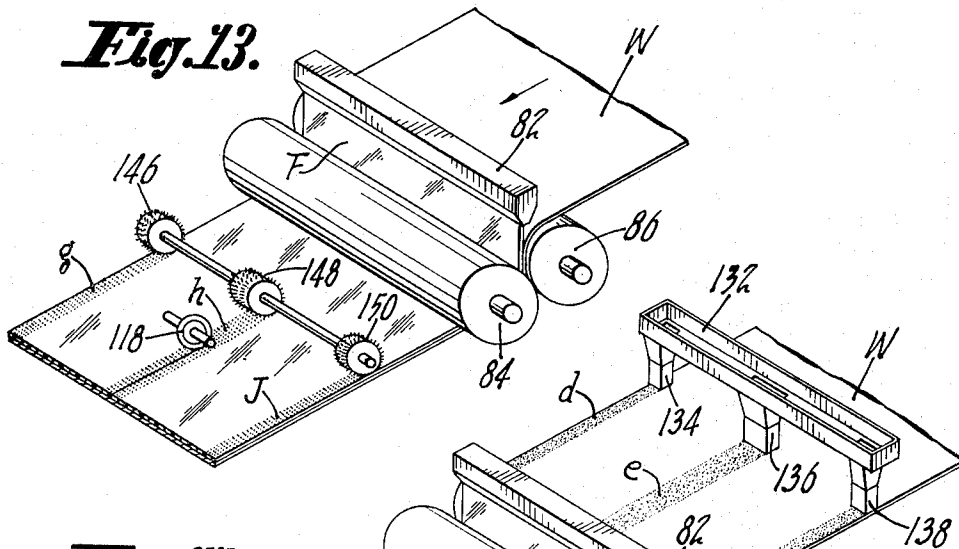


Fig. 11.

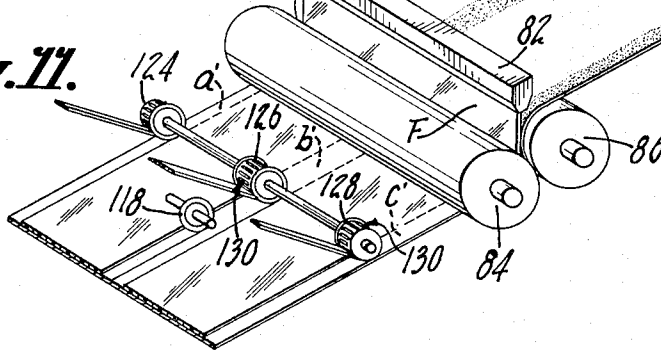
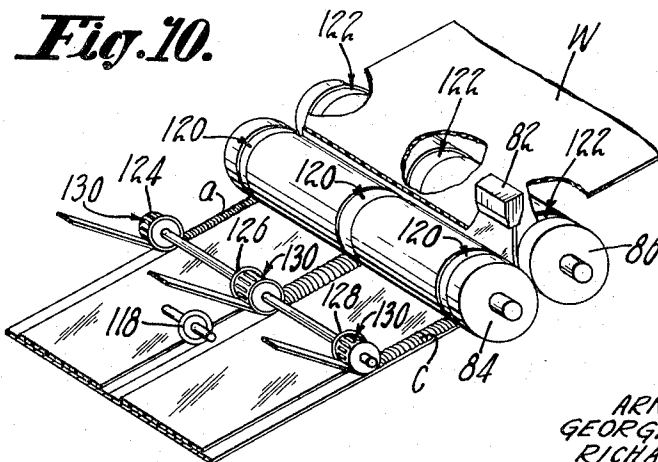


Fig. 10.



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3,234,858

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Filed Dec. 18, 1963

5 Sheets-Sheet 5

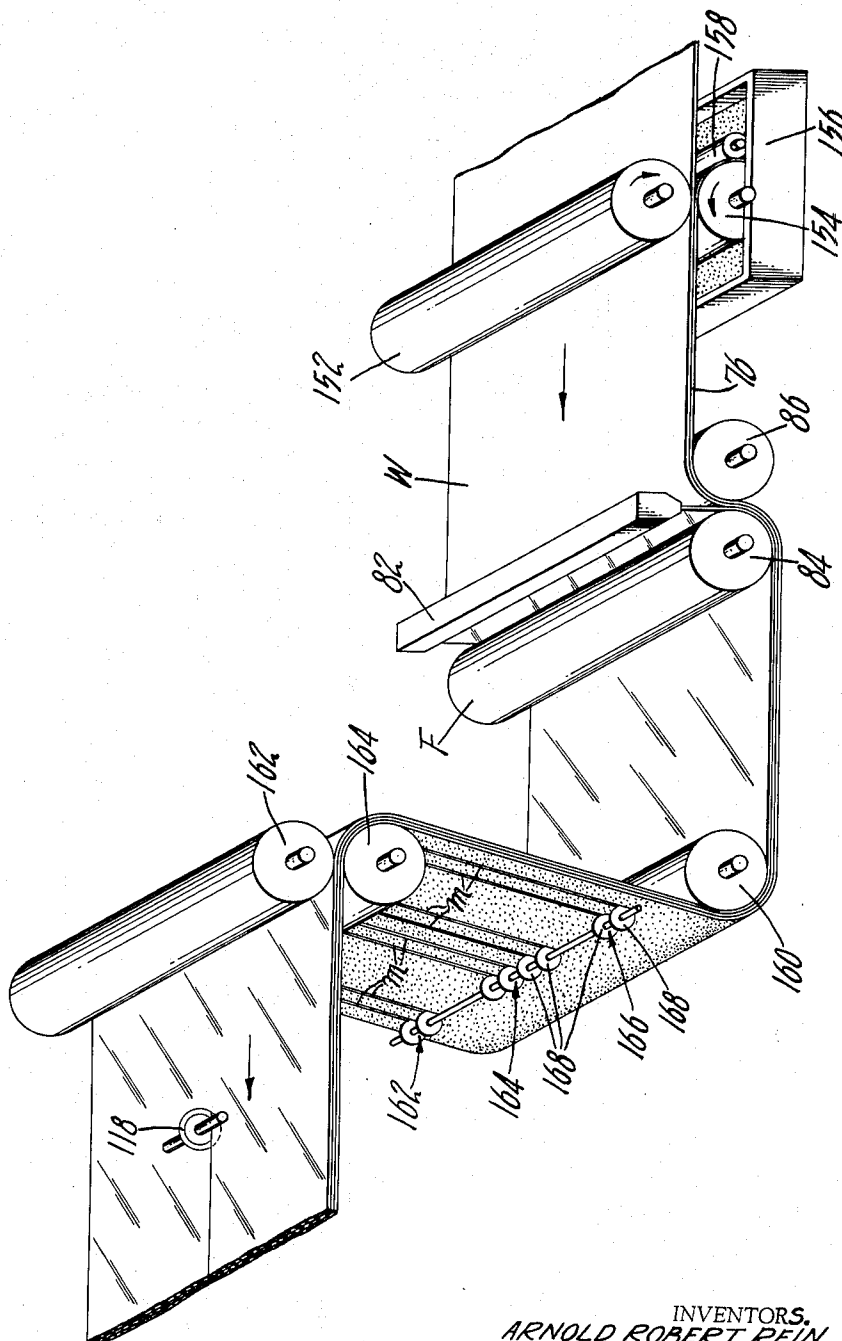


Fig. 14.

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METHOD OF CONSTRUCTING LIQUID-TIGHT FIBRE CONTAINERS

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Filed Dec. 18, 1963, Ser. No. 331,481

17 Claims. (Cl. 93-36)

This is a continuation-in-part of application Serial No. 241,727 filed December 3, 1962, now abandoned, in the names of A. R. Rein, G. O. Schroeder and R. L. Shappell for "Method of Constructing Liquid-Tight Fibre Containers."

This invention relates to the manufacture of liquid-tight containers and more particularly it relates to making 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 hav-

ing 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 holdout 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 method of making 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 method of making 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 method of making 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 method for producing 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 method of manufacturing 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 in manufacturing a container by producing a laminated blank comprising a paper or fibreboard backing layer and a wax impermeable inner and outer layer, at least one of which is

Referring to the drawings:

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

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;

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;

FIG. 8 is a perspective view of one form of apparatus suitable for producing a container of the embodiment illustrated in FIGS. 3 and 4;

FIG. 9 is a left end view of the apparatus illustrated in FIG. 8;

FIGS. 10–12 are fragmentary perspective views of other suitable forms of apparatus for producing a container of the embodiment illustrated in FIGS. 3 and 4;

FIG. 13 is a fragmentary perspective view of one form of apparatus suitable for producing a container of the type illustrated in FIG. 5; and

FIG. 14 is a fragmentary perspective view of one form of apparatus suitable for producing a container of the embodiment illustrated in FIG. 7.

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 E. Mothersall. Briefly described, this type of 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

15 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 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 is 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 40; 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 **59**, 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, pouncing 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 inches 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-imperious 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 turned flange 68 or is interrupted in the region thereof

to leave an area of exposed fibre 62. 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 22a, similar to container body 22, is necked-in at 34a and then folded over to secure an end closure 26a by means of an end seam 36a. The container body is comprised of a main fibre or paperboard layer 40a, an inner wax impermeable thermoplastic film 42a, and an outer wax impermeable layer or hold-out coating 76, shown greatly exaggerated in thickness for purposes of illustration. The inner film 42a 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, pounced 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 are shown in FIG. 7 extending through the hold-out coating 76 and into the underlying fibre 40a. These scored grooves completely encircle the container in the necked-in area 34a and, if desired, in the necked-in area 32a, 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 40a 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 50b as well as an inner wax coating 50a and this is generally accomplished by wax dipping the entire assembled container. When this is done, the wax from the outer coating 50b passes through the wax impermeable coating 76 and into the fibre 40a by means of the scored grooves 78. Capillary action distributes the wax throughout the fibre in the necked-in portion 34a thereby strengthening it and preventing sag or weakening. Additionally, the outer wax coating 50b covers the end of the body 22a, saturating the peripheral edge thereof, and also coats the end closure protective film 56a, thus providing a wax barrier at the edge of the interface between the body inner film 42a and the end closure film 56a to thereby prevent leakage at the end seam 36a. As shown in FIG. 7, the inner wax impermeable layer 42a is not interrupted, so all the wax impregnation occurs by the wax from the outer coating 50b penetrating into the fibre. However, it is within the scope of this invention to degrade or discontinue both the inner coating 42a, 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 50a and 50b. 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. Turning now to FIGS. 8-14, there are illustrated various

procedures by which container body blank 38 may be prepared to render its transverse marginal edges wax impregnable. In the form shown by FIGS. 8 and 9, a continuous web W of selected fibre container body stock is fed from a payoff roll 80 toward an extrusion coating station where a thin film F of thermoplastic, such as polyethylene, is deposited thereon in a well known manner. At this station, an extruder head 82 disposed above the path of the web and extending transversely the full width of the web extrudes film F in a molten state downwardly into contact with the web, whereafter the web and film pass through the nip of a chill roll 84 and backup roll 86 which coact to press the coating film firmly into the fibre web as it solidifies.

Web W may be of any desired width, but is here shown as having a width equal to the combined length of two body blanks 38 to be subsequently cut therefrom. To prevent adhesion of film F in those portions of the web which correspond to the top and bottom marginal ends of the blanks, there is provided three endless masking belts 88, 90 and 92 arranged in spaced parallel relation above the web and passing around guide rollers 94, 96 and 98 and chill roll 84. Guide roller 94 is appropriately positioned with respect to the moving web W so that the lower race portions of the three belts contact the moving web and remain in engaged conformity therewith through the nip of rolls 84, 86, being propelled by these rolls and engagement with web W and traveling therewith at the same linear speed.

Belts 88, 90 and 92 each have sufficient width and are disposed to track along the web to completely mask those portions of the web corresponding to the film-free margins 48, 48 of blank 38 as hereinbefore described. It will be seen that since web W is to be severed into the container length strips, the portion to be masked by center belt 90 is twice the width of the masked portions along the opposite borders of the web. For this reason, belt 90 may be twice as wide as the other two, or, alternately, all three belts may be of equal width but the outer two belts 88 and 92 may be caused to extend half their width beyond the edges of the web, the end result being the same.

In view of their function of masking select surfaces of web W to prevent adhesion of extruded film F thereto, belts 88, 90 and 92 should be as thin as possible, within the limits of durability, and of a material to which the extruded plastic film, in this case polyethylene, will not readily adhere. Belts of Teflon (poly-tetrafluoroethylene) in the order of .020 inch thick are satisfactory for this purpose, as well as fibre glass belts impregnated with Teflon, silicone rubber or the like.

Although these belts are extremely thin, it is preferred to relieve either or both the chill roll 84 and backup roll 86 with shallow, peripheral grooves 100 to avoid excessive crushing of the fibre web W and squeezing of film F as the two pass through the nip of these rolls. Preferably, chill roll 84 is relieved so that grooves 100 provide a convenient track to maintain belts 88, 90 and 92 in proper alignment in their parallel paths of travel over the moving web.

As the now laminated web emerges from the nip of rolls 84, 86, the masking belts diverge from the web, pass upwardly around chill roll 84 and under a tensioning roll 102 toward their return run. To enable the nonadhering portions of film F to break free of the main film and peel cleanly away from web W with the three masking belts, slitter elements 104, 106 and 108 are positioned as close as possible to the point of divergency of the laminated web from the masking belts. These elements may be in the form of a stylus or other fine pointed instrument to ensure a clean line of cleavage. The center slitter element 106, of course, is constructed to slit the film on both sides of belt 90, whereas elements 104 and 108 are single pointed to slit only along the inside edges of belts 88 and 92.

The severed strips of film are carried upwardly away from web W and, while the belts are being returned

around rollers 102 and 98, are stripped from the belts by scraper blades 110 held firmly thereagainst. Preferably, these strips of film are caught in a receptacle 112 supported below scraper blades 110 and subsequently returned to the supply end of extruder head 82 or otherwise salvaged.

Laminated web W continues on to a windup reel 114, passing beneath a tensioning roller 116 and a cutter wheel 118 which splits the web into two separate bodylength strips ready for blanking into body blanks 38.

FIGS. 10-12 represent alternate ways of removing the strip from the transverse margins of body 20 to render them wax impregnable. In the FIG. 10 embodiment, no masking belts are used, but both the chill roll 84 and backup roll 86 are relieved with peripheral grooves 120 and 122, respectively, which grooves are appropriately spaced to correspond to the desired film-free areas of the web and act in registry to relieve the pressure bonding of film F to web W as the two pass through the nip of rolls 84, 86. This leaves loosely adhered or slacked strips *a*, *b* and *c* of film on laminated web as it passes through the chill and backup rolls, which strips are thereafter slit and peeled away from the web by means of vacuumized slitter wheels 124, 126 and 128. Like the slitter elements in the preceding embodiment, the center slitter wheel 126 is constructed to cut through the film on both sides of slacked strip *b*, whereas the two outer wheels 124 and 128 make a line of cleavage only on the inside of strips *a* and *c*, respectively. Each cutter wheel is provided with vacuum ports 130 through which sufficient suction is maintained by suitable vacuumizing means (not shown) to peel the loosely adhered and severed strips *a*, *b* and *c* free from web W. These strips of film may then be recovered in a like or similar manner to that described in the previous embodiment.

The embodiment of FIG. 11 represents still another approach to preparing laminated fibre container body stock having film-free margins. In this embodiment, the web W has applied thereto registered parallel bands *d*, *e* and *f* of a release agent or adhesion-preventing material, which bands prevent bonding of film F to the web as the two pass through the nip of rolls 84, 86 and leave slacked or unbonded film strips *a'*, *b'* and *c'*, similar to those produced by the relieved rolls described in the preceding embodiment. Bands *d*, *e* and *f* may be any coating material capable of preventing the bond between film F and fibre web W, examples being carboxymethyl cellulose, methyl cellulose or similar types of release agents, and may be applied to the web ahead of the extrusion station in any convenient manner. An example is by means of a supply hopper 132 disposed above and transversely of the web preceding the extrusion station, which hopper is provided with three applicator nozzles 134, 136 and 138 for metering out onto the moving web the release material in predetermined width and depth to form bands *d*, *e* and *f*. Strip portions *a'*, *b'* and *c'* of film F may be readily severed and stripped away from web W by means of vacuumized slitter wheels as hereinbefore described.

FIG. 12 illustrates a modification to the FIG. 10 arrangement hereinbefore described. As shown, additional means preferably in the form of chill rolls 140 are provided to cool the select regions of web W corresponding to slack strips *a*, *b* and *c* preparatory to applying the film F to the web. These rolls 140 may be placed above and coact with back-up roll 86 so that the film-receiving surface of web W is chilled to reduce the adhesion of film F thereto in the specific areas desired. If preheaters (not shown) are used to thermally condition the web W prior to lamination, they may be constructed to omit heating the web along those longitudinal portions passing beneath chill rolls 140. Further, chill rolls 140 may be used in combination with the relieved grooves 120 and 122 in rolls 84 and 86, as shown, or may be used in lieu thereof, depending on operating conditions and results desired. In either case, the resulting laminated web has formed

thereon slack or loosely adhered strips which are readily slit and peeled away in the same manner as hereinabove described.

Chill rolls 140 may be cooled in any desired manner, such as by internal circulation or by an externally applied chilling medium. Solely for illustrative purposes, the embodiment shown in FIG. 12 includes a manifold 142 disposed transversely above web W, which manifold has a plurality of nozzles 144 positioned in alignment with chill rolls 140 for directing a cooling medium such as cold air jets against the rolls. Alternately, the rolls 140 may be omitted entirely and the nozzles 144 appropriately constructed to emit the air jets directly onto the desired surfaces of the web.

The embodiment illustrated in FIG. 13 represents a departure from the hereinbefore described procedures in that, rather than physically removing parallel strip portions of film F, it is first firmly bonded over the entire width of web W in the conventional manner and thereafter disrupted to provide wax-impregnable margins. This disruption may be done by passing the laminated web W beneath and in contact with three spaced pouncing rollers 146, 148 and 150 to form parallel lines of punctures *g*, *h* and *j* corresponding to the selected areas which are to be the wax-impregnable margins of the container blank 38. The size and incidence of the perforations (designated as 58 in FIG. 5) produced by rollers 146, 148 and 150 must be sufficient to enable ready migration of paraffin through the film into the fibre backing layer when the finally formed container is flushed. These perforations may be in the form of pin-holes, slits, or other forms of punctures capable of providing the desired amount of fibre exposure. The pouncing rollers are preferably constructed to limit the depth of perforations 58 through the thickness of the film F and not more than about .002 inch into the fibre web W.

In the preferred modification of FIG. 5, continuous strips of film 42 are left unperforated at the extreme marginal edges of the body blank, as hereinbefore suggested, to provide an adhesive band on those portions of the margins which make up the seamed joint of the finally formed container. In this case, the pouncing rollers may be appropriately constructed and positioned with respect to the web W to perforate narrow strips of the film slightly inwardly of the transverse edges of the blank while leaving the outermost margins intact. Where the web W is of sufficient width to form more than one body-length strip, as in the illustrated arrangement, the intermediate pouncing roller 148 will be split so as to leave a medial strip of unperforated film F which, when severed by slitter 118, forms two continuous marginal strips on two separate body-length strips.

FIG. 14 represents a modified embodiment of apparatus utilized to produce a container of the type illustrated in FIG. 7. In this instance, the film F remains uninterrupted, but a mineral hold-out coating 76, applied to the opposite surface of the web W, is selectively disrupted to provide wax impregnable margins. Generally, the hold-out coating is applied at the paper mill during the paper manufacturing process; however, if the paper of the web W does not have a "mill-applied" coating, the apparatus can apply it by feeding the web W between a pressure roll 152 and a coating roller 154 mounted in a reservoir 156 which contains liquid hold-out material, such as a polyacrylic emulsion as previously described. A doctor roll 158 mounted adjacent the coating roller 154 is adjustable to control the weight of the coating 76 which is applied to the surface of the web W. The film F is laminated to the opposite surface of the web W in the manner previously described and the laminated web is fed around an idler roller 160 and upward between two opposed feed rollers 162 and 164. As the web feeds around the idler roller 160, it passes over and in contact with three spaced splitter wheels 162, 164 and 166. Each of the outer splitter wheels 162 and 166 has a pair of

spaced cutting blades 168 for producing a pair of spaced parallel score lines *m* in the hold-out coating 76. These score lines *m* are located at the end joint areas of the container blanks and correspond to the score lines 78 shown in FIG. 7. The middle slitter wheel 164 has four spaced cutting blades 168 for producing two pairs of spaced parallel score lines *m*. The slitter 118 severs the web between the middle pairs of score lines *m* so that each body blank 38 will have a pair of score lines *m* at both its upper and lower margins.

Following the preparation of a laminated web W, either by the strip removal techniques of FIGS. 8-12 or the degradation technique of FIGS. 13 and 14, it is cut up into individual body-size blanks 16 in any desired manner. Thereafter, each blank is formed into tubular configuration and assembled to the top and bottom end closures. Where the finished container is of the general configuration illustrated in FIG. 1, erection and assembly may be carried out in any conventional manner, an example being that disclosed in United States Patent 2,201,177, issued May 21, 1940 to John M. Hothersall on Fiber Container Manufacture.

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 steps of the process described and their order of accomplishment without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the process hereinbefore described being merely a preferred embodiment thereof.

We claim:

1. A method of manufacturing a leakproof container comprising the steps of:

applying a wax impermeable coating to a fibre container body blank;

discontinuing said coating adjacent the one margin of said blank to leave said fibre exposed;

erecting said body blank into an open ended tubular container body wherein said one margin is located adjacent the lower open end of said body;

attaching upper and lower end closures to said body;

applying a wax coating over said wax impermeable layer to thus allow the wax from said wax coating to impregnate and rigidify the container at the exposed fibre areas.

2. A method as defined in claim 1 wherein said wax impermeable coating is discontinued by terminating it at the beginning of said upper and lower margins.

3. A method as defined in claim 1 wherein said wax impermeable coating is discontinued by degrading it at said upper and lower margins.

4. A method of manufacturing a liquidproof fibre container comprising the steps of:

applying a wax-impermeable coating to one surface of a fibre web;

severing said web into individual container body blanks having longitudinal side margins which will form the container body side seam and upper and lower margins which will form the upper and lower ends of the subsequently formed container body;

discontinuing said wax-impermeable coating at the upper and lower margins of the body blank to form an exposed fibre area;

forming the body blank into a tubular configuration; adhesively securing the longitudinal side margins in overlapping relation to form a side seam and thus create a tubular container body;

attaching upper and lower end closures respectively to said upper and lower ends of said container body, but leaving at least a portion of said exposed fibre areas unconfined and out of contact with said end closures; and

applying a wax coating onto said container over both said wax-impermeable coating and said exposed fibre area to thus allow said wax to locally impregnate

11

the fibre through said exposed fibre area and thereby render said container both rigid and liquidproof at its ends.

5 5. A method as defined in claim 4 wherein said wax impermeable coating is discontinued by scoring at least one groove at both the upper and lower body blank margin.

6. A method as defined in claim 5 but further characterized by applying a moisture-impervius layer on the uncoated surface of said body blank.

10 7. A method as defined in Claim 6 wherein the step of forming the body blank into tubular configuration is further characterized by disposing the wax-impermeable coated side exteriorly and the moisture-impervius layer interiorly of said tubular configuration.

15 8. A method as defined in claim 4 wherein the step of forming the body blank into tubular configuration includes disposing the wax-impermeable layer inwardly to form the interior of the subsequently formed container body.

20 9. A method as defined in claim 8 wherein said wax-impermeable coating is discontinued by forming therein a plurality of perforations of sufficient size and shape to permit ready migration of said wax into said fibre layer.

25 10. A method as defined in claim 8 wherein said wax-impermeable coating is discontinued by applying a masking band to said upper and lower margins prior to the application of said wax-impermeable coating and thereafter removing said band and the overlying strip of said wax-impermeable coating along a clean line of severance.

30 11. A method as defined in claim 8 wherein said wax-impermeable coating is applied by pressure bonding it to the entire surface of said body blank except for the upper and lower margins and wherein said wax-impermeable coating is discontinued by severing and peeling the unbonded portion of said coating away from said fibre blank.

40 12. A method as defined in claim 11 but further characterized by masking said body blank at the upper and lower margins to prevent said wax-impermeable coating from being pressure bonded to the blank at said upper and lower margins.

45 13. A method as defined in claim 12 wherein said masking step is accomplished by applying a strip of adhesion-preventing material at said upper and lower margins.

50 14. A method as defined in claim 12 wherein said masking step is accomplished by interposing a narrow belt of a material incompatible with said wax imper-

12

meable coating, between said body blank upper and lower margins and said wax-impermeable coating.

15. In the manufacture of liquidproof containers having a tubular fibre body and a thermoplastic liner laminated thereto and top and bottom end closure secured to said body in liquid-tight end seams, the method comprising the steps of:

extruding onto at least one surface of a web of fibre body stock a thin film of wax-impermeable and moisture-impervius thermoplastic material;

10 preventing adhesion of said film along at least one continuous narrow band on said web;

severing and peeling the film from said web at its unadhered continuous band portion to provide a strip of exposed fibre;

15 cutting the laminated web into body-size blanks with the exposed fibre strip forming a marginal edge of each blank;

20 folding each blank to form a tubular body with said film being disposed interiorly thereof and said exposed fibre strip extending about the interior wall contiguous an end of said body;

attaching end closures to each end of said body by means of end seams with at least a portion of said exposed fibre strip being unconfined in one of said seams; and

flushing the interior of said container with a wax layer to protectively coat its interior surfaces and to locally impregnate said fibre body in the region of at least one of its end seams to render it rigid and liquidtight.

16. A method as defined in claim 15 wherein the step of preventing film adhesion is accomplished by passing said web with said film thereon over a pressure surface having a relieved portion of predetermined width to firmly bond said film and web together except for a continuous band passing over said relieved portion.

17. A method as defined in claim 15 wherein the step of preventing film adhesion is accomplished by chilling the film-receiving surface of said web along a continuous band of predetermined width to reduce adhesion of said film along said band.

References Cited by the Examiner

UNITED STATES PATENTS

2,757,848 8/1956 Elam ----- 93—36 X

FRANK E. BAILEY, *Primary Examiner.*

50 BERNARD STICKNEY, *Examiner.*