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3,178,087

CONTAINER

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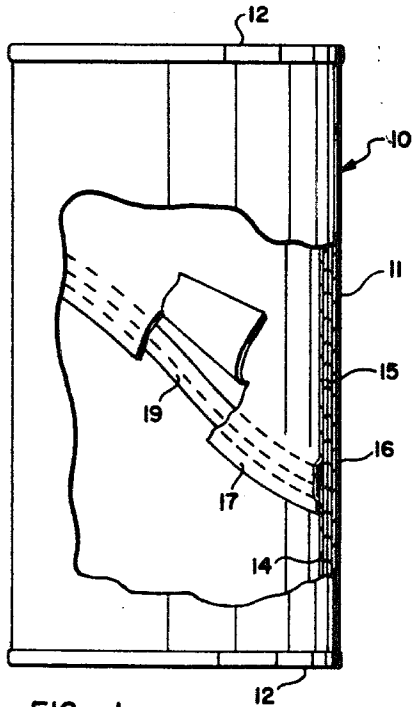
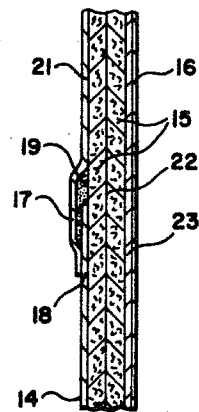


FIG. - 1

FIG. - 3

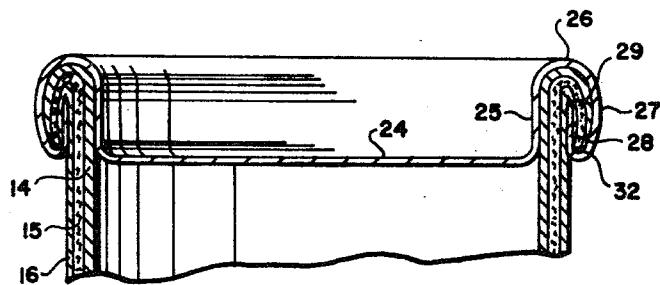
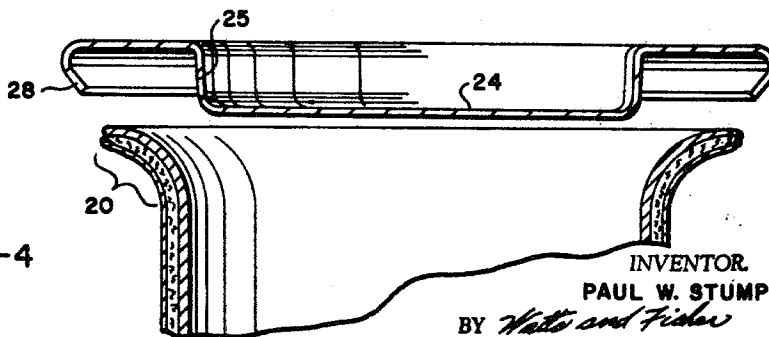


FIG. - 4



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1

3,178,087
CONTAINER

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This invention relates to fluid containers and more particularly to wound composition containers for fluids.

Until very recently it has been the practice to package fluids in either metal or glass containers. In U.S. patent application Serial Number 83,353, filed February 10, 1961, now Patent No. 3,091,034, entitled "Fluid Container" there is a disclosure for a container suitable for detergents and other basic liquids. In spite of the advance over the art taught in this prior application, many other substances such as motor oil, frozen concentrated fruit juices, coffee, paint and a variety of other products which are either acidic or require vacuum or pressure packing have been packaged almost exclusively in all-metal cans and occasionally glass. The use of glass and all-metal cans with fluids having acidic properties is primarily because fiber containers have not had the ability to withstand attack by acidic liquids. These fluids have a "searching" property, and tend to seep through the walls of prior fiber containers. Packing of such products as coffee in metal or glass has been the custom primarily because no fluid-tight fiber container capable of withstanding the pressures involved has existed.

Metal is relatively acid resistant and prior to this invention, the only practical non-breakable container material for acidic products. Moreover, as modern metal cans are not affected by moisture the all-metal can is practically exclusively used for packaging frozen liquid products. The strength and durability of the all-metal container also add to its popularity, because of its non-breakable nature and its suitability for pressure and vacuum packing.

Although the all-metal can has the above desirable features it has several disadvantages when compared to composition fiber containers. The initial cost of the all-metal can is higher. It is also heavier so that bulk shipment of cans whether full or empty is more difficult and expensive. Moreover, the all-metal can is not readily disposable. Thus, when practical, a composition fiber is usually used in preference to an all-metal can.

Metallic foil has become increasingly common as a material in the construction of composition fiber containers. In comparison to plastic film, metallic foil has many superior characteristics. The metallic foil is inherently much stronger and provides a stronger composite container wall. The metallic foil also has the same liquid impervious and acid resistant qualities as the metal in the common all-metal can.

Although these desirable characteristics of the metallic foil are well known it has found only limited application in the composition container industry. Its use in composition containers has been restricted to labels, strengthening plies, or as a liner material for non-liquid products where the container does not have to be fluid-tight. Prior to the invention, the chief reasons limiting metallic foil to non-fluid tight applications were; (1) the "wicking" action of the seam adhering together the overlapping edges of metallic foil, (2) seepage through the wall and joints by the "searching" fluids and (3) the difficulty of forming a composition container which is moisture-proof at all times.

Prior to this invention, there was not available a composition metallic foil and fiber container which could be used to package substantially all of the products now in all-metal cans. The invention provides such a fiber and

2

metallic foil container. The container of the invention is lighter than an all-metal can, simple and inexpensive to manufacture, as well as easy to dispose of after use. Moreover, the construction of the container can be especially tailored to the specifications of each product to be packaged.

The container of the invention is fluid tight and especially suitable for packaging coffee, nuts and other products where it is necessary to retain their freshness indefinitely. It has the acid resistant qualities of the all-metal can. It is especially constructed to withstand rough handling and may be used for packaging frozen products.

More particularly, the container construction is that of an inner liner of raw, untreated metallic foil spirally wound with its edges in an overlapping relation. The overlapping edges are bonded such that the inner liner is effectively a continuous metal sleeve. Reinforcing layers of heavy kraft paper are wound around the metallic foil liner and bonded by an adhesive to the metallic foil. Heat is used to drive substantially all moisture from the kraft paper so that the kraft paper is at its strongest structurally. Finally, an outer ply of metallic foil is wound around the kraft paper and suitably adhered thereto to absolutely seal the container wall from moisture.

The ends of the container are flared outwardly. The end caps are positioned in place and their outermost edges are rolled to form a double seam with the flared ends of the container. The resultant container is fluid-tight with great wall strength and moisture resistant qualities.

Accordingly an object of this invention is to provide a new and improved fiber and metallic foil container which is fluid tight.

Another object of this invention is to provide a multi-ply fiber and foil container having substantially the fluid tight, wall strength and moisture-proof qualities of an equivalent all-metal can.

A further object of this invention is to provide a new and improved fiber and metallic foil container which may be used to package frozen products.

Still another object of this invention is to provide a multi-ply container having a continuous inner metallic foil liner which is entirely liquid impervious.

An additional object of this invention is to provide a multi-ply fiber and metallic foil container which is suitable for packaging liquids and products having an acidic content.

Yet another object of this invention is to provide a fiber and metallic foil container wherein the container ends are not exposed to the moisture from a jet of cleaning fluid before the end enclosures are secured thereto.

A still further object of this invention is to provide a fiber and metallic foil container having metallic end enclosures which are rigidly secured to the container by means of a double seam.

A more specific object of this invention is to provide a composition fiber container with a metallic foil liner having its overlapping edges double sealed, to each other, and to the reinforcing plies of structural material.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims taken in conjunction with the accompanying drawings in which:

FIGURE 1 is an elevational view with a section of the wall removed to show the internal seam of the container of the invention.

FIGURE 2 is an enlarged cross-sectional view of the wall of the container of the invention taken at the overlapping helical seam of the liner ply.

FIGURE 3 is an enlarged cross-sectional view of the top of the can showing the details of the construction by which the end enclosures are fastened to the can.

FIGURE 4 is an enlarged cross-sectional view showing the top of the container of the invention prior to securing an end enclosure thereto.

Referring now to the drawing which illustrates the preferred embodiment of the invention, a container is indicated generally in FIGURE 1 by the reference character 10. The container 10 comprises a cylindrically contoured central tube 11 and end enclosure caps 12 rigidly secured to the tube ends.

The exact composition of materials in tube 11 of the invention will vary for each product to be packaged. The preferred embodiment of tube 11 illustrated in the drawing is especially suitable for packaging frozen concentrated fruit juices or motor oil. As shown in cross-section in FIGURE 2 the tube 11 has a relatively heavy liner ply 14 of raw untreated aluminum foil, several reinforcing plies 15 of heavy kraft paper and a label ply 16 of kraft paper backed aluminum foil. The thickness of the different plies of materials are exaggerated in FIGURE 2 to facilitate an understanding of the invention.

To form the liner 14 raw untreated aluminum foil is spirally wound on a container-forming mandrel with its edges 17, 18 in an overlapping relation. The overlapping edges or portions 17, 18 define a helical seam extending from one end of the tube 11 to the other. A "hot melt" adhesive 19 is applied between the overlapping edges 17, 18 to bond or weld them together. The "hot melt" adhesive 19 is applied at temperatures up to 500°. At this high temperature the oil slick which normally covers the raw untreated aluminum foil is penetrated by the adhesive to form a metal-to-metal bond between the overlapping edges 17, 18. The practically indestructible metal-to-metal bond formed by the "hot melt" adhesive effectively makes the inner liner a continuous metal sleeve, the wall of which is liquid impervious.

The thickness of the aluminum foil will vary according to the specific application for which the container is to be used. A minimum thickness would be approximately 0.001 inch below which the pin hole effect is prevalent. Because of the pin holes aluminum foil less than 0.001 inch thick is no longer liquid impervious, but must be treated and a liquid impervious coating applied.

The term "hot melt" adhesive generally refers to a dry, thermoplastic adhesive which is automatically supplied to an applicator in a continuous ribbon-like form. The adhesive is heated to very high temperatures by the applicator immediately prior to applying it between the overlapping edges 17, 18 of the aluminum foil liner. The hot melt adhesive 19 may be any moisture and acid resistant thermoplastic adhesive suitable for bonding aluminum foil to aluminum foil. In the invention polyethylene is used as one base resin in the adhesive 19.

The several plies or layers of heavy kraft paper 15 are spirally wound around the inner liner of aluminum foil 14 with the edges of each layer in an abutting relation. The number of layers or plies of kraft paper will be determined by the rigidity and strength desired for the container wall. A suitable adhesive 21 is applied to the inner side of the first layer of kraft paper as it is being wound around the liner of aluminum foil 14 to bond the first layer of kraft paper to the aluminum foil. The adhesive 21 is of the emulsion latex type having preferably a resin base of polyvinyl acetate. A layer of hot animal glue 22 or other suitable adhesive is applied between the layers of kraft paper to glue them together.

A double seal is provided by the hot melt adhesive 19 at the helical seam of liner 14. As shown in FIGURE 2 the hot melt adhesive 19 which forms the metal to metal bond of the overlapping edges 17, 18 of the aluminum foil liner also extends beyond the outside overlapping edge 18 and adheres a portion of the inside overlapping edge 17 to the kraft paper inner ply 15. The double seal assures that the container is fluid tight. In FIGURE 1, a portion of the inside overlapping edge 17 has been torn back to expose the adhesive 19.

The label ply of kraft paper backed aluminum foil 16 is spirally wound around the outermost ply of kraft paper with its edges in an overlapping relation. A suitable adhesive is applied to the kraft paper backing 23 as the aluminum foil label 16 is being wound around the outermost ply of kraft paper to adhere the aluminum foil to the kraft paper. The outer ply of aluminum foil 16 may be suitably printed with informative indicia describing the product it contains.

During storage of the kraft paper prior to being used to manufacture containers, the kraft paper has a tendency to pick up moisture from its storage place. Such moisture laden kraft paper when made into a container tube will form a wall structure that is mushy.

During the manufacture of the container of the invention the heat from the hot melt adhesive 19 and the animal glue serves to drive the moisture from the kraft paper. Once the moisture is driven from the kraft paper the liner and label plies of aluminum foil in the finished tube seal the kraft paper wall so that it can no longer pick up moisture. With virtually all of the moisture driven from the kraft paper it is at its strongest and provides a very rigid and durable wall.

Before each container is filled with a particular product, for example, concentrated orange juice, it is steam cleaned. In the ordinary composition container a spray from a jet of cleaning steam striking the edge of a paper ply will drive moisture into it. The moisture absorbed by such a paper edge will be transmitted throughout such paper ply by an osmotic or "wicking" action resulting in a soft, mushy container wall. In the container of this invention, as shown in FIGURE 4, the tube end is outwardly swedged to form a circumferential flare 20. The flare 20 preferably forms a 75° angle with the container tube body but in some applications the angle may be as much as 90°. Swedging or flaring the tube end in this manner turns the ends out so that only the aluminum foil of the liner 14 is presented to the spray from an axial jet of cleaning steam and the edge of the kraft paper 15 is shielded. Swedging also crimps the very end of the tube to seal off all but a very small cross-sectional area of the end of the kraft paper ply.

The circumferential flare 20 formed by swedging the tube ends has additional functions. First, it enables the end enclosure caps to be easily positioned on and secured to the tube ends. Second, the large circumferential flare permits a larger end enclosure to be used. Such a larger cap is easily removed by the home-maker's can opener or lid remover. Third it facilitates the formation of a firm fluid tight seal between an end cap and the tube.

The end enclosure caps 12, are rigidly secured to the ends of the tube 11 by a special crimp to form a double seam. To illustrate the double seam the top end of the container and the cap 12 are shown in cross-section in FIGURE 3.

Each cap 12 comprises a central disc portion 24 extending transversely across the tube opening. An inner substantially cylindrical axially extending portion 25 circumscribes the central portion 24 and is sized to fit snugly within the open circular end of the tube 11. A rolled portion 26 connects the inner cylindrical portion 25 to an outer substantially cylindrical portion 27. The outer cylindrical portion 25 and a folded under portion 28 form a "cap hook." The cap hook grips an opposite "tube hook" portion 29 of the container tube end to form the inside seam of the double seam. The outer cylindrical portion 27 compresses the container wall against the inner cylindrical portion 25 to form the second seam of the double seam.

For some products it is desirable to place an annular quantity of an elastomeric sealing compound 32 between the tube ends and the end enclosures 12 in the manner described in the previously referenced copending case. The sealing compound 32 assures a perfectly sealed container

and prevents a "wicking" action by the intermediate kraft paper plies 15.

Although the specification describes the invention in detail it is believed to comprise essentially a fiber and metallic foil container having a continuous and liquid impervious metal sleeve liner at least one reinforcing ply wound around the liner, and a moisture-proof ply sealing the container wall from moisture. The invention also contemplates that the container ends be flared and metallic end enclosures be secured thereto by a double seam connection. Finally, the invention provides a method of manufacturing the above container including a step of driving the moisture from the reinforcing ply.

What is claimed is:

1. A container comprising:
 - (a) a cylindrically contoured tube;
 - (b) a pair of suitable end enclosures secured to the respective tube ends;
 - (c) said tube comprising:
 - (i) a liner ply of metallic foil wound with its edges in an overlapping relation, said metallic foil being free of pinholes;
 - (ii) a hot melt adhesive bonding the overlapping edges together to form a fluid tight bond such that said liner ply is a continuous metal sleeve with a bonded seam extending from one closure to another, said liner ply being liquid impervious and acid resistant; and,
 - (iii) at least one ply of a relatively stiff material wound around said liner ply, said hot melt adhesive extending outwardly of said overlapping edges and bonding said stiff ply to the liner ply to provide a rigid and durable container wall.
2. The device of claim 1 wherein said metallic foil is raw, untreated aluminum foil free of pinholes.
3. The device of claim 1 wherein said hot melt adhesive is a polyethylene base, hot melt, thermoplastic adhesive.
4. A container having a central tube and a pair of end enclosures secured to the tube, said tube comprising:
 - (a) a liner ply of metallic foil wound with its edges in an overlapping relation;
 - (b) at least one ply of relatively stiff fibrous material wound around said liner ply;
 - (c) a hot-melt thermoplastic adhesive bonding the overlapping edges of said metallic foil in a fluid tight bond extending from one closure to the other such that the liner ply is a continuous metal sleeve;
 - (d) said hot-melt adhesive extending beyond the overlapping edge outermost of the container to bond a portion of said liner ply to said ply of fibrous material;
 - (e) the innermost overlapping edge extending beyond said hot-melt adhesive and in metal-to-metal contact with a portion of the liner ply; and,
 - (f) an outer ply of moisture-proof material wound around said ply of fibrous material to provide a moisture-proof container wall.
5. A container comprising:
 - (a) a cylindrically contoured tube;
 - (b) end enclosures secured to the tube ends, said tube comprising a liner ply of raw, untreated aluminum foil spirally wound with its edges in an overlapping relation;
 - (c) a hot melt adhesive bonding the overlapping edges to form a continuous fluid tight bond extending from one closure to the other such that said liner is a fluid impervious continuous metal sleeve;
 - (d) at least one ply of kraft paper spirally wound around said liner of aluminum foil and bonded to the liner by the hot melt adhesive;

(e) said aluminum foil liner, the bond of the overlapping edges of the liner and the intermediate ply of kraft paper adhered to the aluminum foil liner cooperatively forming a fluid-tight container wall of high strength and durability;

(f) an outer ply of metallic foil spirally wound around said intermediate ply of kraft paper; and,

(g) said outer ply and said liner ply sealing said tube against moisture.

6. A method of manufacturing a composition fiber and metallic foil tube comprising:

(a) winding an innermost ply of liquid impervious material;

(b) winding an intermediate layer of material which is moisture absorbent around said innermost ply;

(c) winding an outer fluid impervious ply around the intermediate layer; and,

(d) crimping said inner and outer plies at one end of the tube together to substantially seal off the intermediate layer at said one end by swedging at least said one end of the tube to outwardly flare such end of the tube such that an annular end portion of the innermost liquid impervious ply lies substantially in a plane normal to the axis of the tube.

7. The method of claim 6 including the step of cleaning the container with a longitudinal spray of cleaning fluid blown through the container from outside said one end.

8. A container comprising:

(a) a cylindrically contoured tube;

(b) said tube having a multi-ply construction wherein each succeeding ply is wound around the previous ply and is suitably adhered thereto, the tube including:

(i) an innermost ply of liquid impervious material;

(ii) an intermediate ply of moisture absorbent material;

(iii) an outer ply of moisture-proof material;

(iv) one end of the tube being swedged and turned outwardly to form a circumferential flared end portion;

(v) a section of the flared end portion of the tube being tapered toward the end such that the end of the intermediate ply is substantially covered by the inner and outer plies; and,

(vi) said end portion being flared sufficiently that a portion of the liquid impervious innermost ply is substantially in a plane normal to the axis of the tube whereby to provide a tube in which spray cleaning will not wet the intermediate ply.

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