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## COMPOSITE STRUCTURES FOR CONTAINERS AND THE LIKE

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to a composite, layered structure for use in making containers. More particularly, the present invention is directed to  
5 single wrapped polycoated wax containers, for example, cups, which possess improved stiffness and resistance to liquid penetration.

The prior art is replete with various types of paper containing structures which are used as containers  
10 for storing various types of liquid and solid edible foods. The structures of the containers are generally varied in accordance with the food products which are to be stored and housed therein. Generally speaking, in conventional containers, sidewall paper is wrapped  
15 twice around with adhesive applied to its surface to form the vertical walls of the container. A bottom is inserted and then the double wrapped container is waxed to produce a finished product.

U.S. patent 3,696,987 is directed to a coated  
20 cup and method of manufacture wherein a saran latex interior coating is placed on a foam bead - type cup for the express purpose of making the cup more suitable for the packaging of yogurt and the like. In this patent, a microcrystalline wax is incorporated into the  
25 saran latex interior coating as an anti-blocking

BAD ORIGINAL



composition to preclude sticking of the cups when they are stacked together in a vertical, stacked configuration.

U.S. Patent 3,450,327 discloses a round nestable  
5 paper container having a high gloss exterior finish and an interior and bottom wax coated surface. More specifically, this patent includes a double wrap container utilizing wax on its interior and bottom and a blocking layer of polyvinyl alcohol or vinyl acetate disposed  
10 intermediate the layers of the double wrapped side wall. Of course, the double wrapped side wall containers are disadvantageous in that approximately twice as much of the paper blank material is utilized in a container because it is wrapped around the container twice. This,  
15 of course, substantially increases the overall expense of manufacture.

U.S. Patent 3,137,432 is directed to a container for liquids wherein a wax inter-layer is utilized adjacent to a wax impregnated fiber layer which is  
20 coated on its exterior surface thereof with a thermoplastic barrier and an adhesive layer, and then by additional fiber layer and a thermoplastic outer film. The thermoplastic layer has the dual function of providing the adhesive for bonding the fiber layer to the  
25 fiber board layer and also acts as a barrier beyond which the impregnating wax cannot pass.

U.S. Patent 3,137,431 discloses a blank for making a fiber container comprising covering films of polyethylene laminated to fiber sheet stock. The poly-  
30 ethylene coatings are inert and impermeable to both hot and cold comestibles.

U.S. Patent 1,986,887 discloses a receptacle for liquid material which utilizes as a composite therefor layers of wax, paper, rubber-latex and wax. An alter-  
35 native structure places latex coatings on both sides of the paper as can be seen from Figures 1 and 3 on the



face of the patent drawing. The patentee discusses the use of the container for a substance known as acidophilus milk and thus the container disclosed therein appears to be dealing with containers for storing food products with acidic characteristics. The Frieden Patent specifically states that the containers are suitable for the transportation and packaging of acid or alkaline liquids such as tomato juice, acidophilus milk, milk of magnesia or the like. However, it has been found that latexes and waxes which are provided on paper containers do not provide the necessary moisture proof barrier properties which are needed to effectively store liquid and solid food products in paper containers, particularly food products possessing acidic characteristics.

Accordingly, an object of the present invention is to provide a composite layered structure which can be used for making containers for solid and liquid food products which eliminate the problems of the prior art.

Another object of the present invention is to provide a container for housing and storing various food products which possesses an effective moisture barrier which inhibits the transfer of fluid, for example, water, from the food product to the environment.

A further object of the present invention is to provide a composite layered structure which can be used for containers which effectively inhibit the transfer of fluids from the food product through the wall of the container, thereby maintaining the flavor and consistency of the food product disposed in the container and in addition, substantially enhancing the shelf life thereof.

Still another object of the present invention is to provide a container made of a composite layered structure which is utilized for storing food products over an extended period of time without the container walls becoming soggy due to a loss of fluid from the contents of the container to the container walls.



Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and  
5 specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

10 Pursuant to the present invention, the above objects are achieved by providing a composite layered structure for use in making containers comprising a wax layer, a paper layer, a polycoat layer made of polymers of ethylenically unsaturated monomers, preferably poly-  
15 olefins, and a wax layer. Advantageously, commencing from the exterior of the container to the interior thereof, the layers are arranged in the order of a wax layer, a paper layer, a polycoat layer and a wax layer. The composite layered structure of the present invention  
20 is formed into a single wrapped, polycoated wax container for use in the storage of food products wherein the polycoating functions as a moisture barrier which inhibits the transfer of fluids, for example water, from the food product to the container. Thus the single  
25 wrapped container paper is polyethylene lined, wrapped once and heat sealed. The bottom of the container is then inserted and the composite structure is waxed to produce a finished product. The presence of the polycoat in the container structure reduces the molecular  
30 transfer of fluids, for example, water, from the product through the wall of the container, thereby retaining the flavor and consistency of the product stored in the container. Characteristically the prior art has attempted to use waxes and rubber latexes to inhibit the  
35 physical transfer of water from food products stored in containers to the container walls. However, all such attempts have failed to reduce the molecular transfer

of fluid from the product and accordingly, the products disposed in the containers not only deteriorate, with the loss of water, to form a hard cake, but also, the lost water is absorbed by the container walls which causes the container to become soggy. The composite layered structure of the present invention not only inhibits the physical transfer of fluid from the food product but also strongly retards the molecular transfer of fluid from the food product. Because this molecular transfer is very slow, the containers made from the composite layered structure of the present invention do not become soggy, which is due primarily to the presence of the polycoating in the composite layered structure. Advantageously, the composite layered structure of the present invention retains up to about 90% of the fluid within the food product which substantially enhances the shelf life of the food product when compared to the prior arts use of rubber latexes which do not provide effective barriers to moisture transfer.

As discussed hereinabove, the composite layered structure of the present invention comprises a polycoated paper which has been coated on both sides thereof with a wax layer. Thus, when the layered structure is formed into a container, both the interior and exterior surfaces thereof are comprised of waxed layers.

In one of the further features of the present invention it has been found the combination of the waxed layers with the polycoated paper is effective in producing a single wrapped cup which offers advantageous stiffness properties for handling and storing various food products. Thus, it has been found that single wrapped cups having a polycoat, e.g., a polyethylene lining which are waxes, produce a container with a stiffness factor equal to or greater than the present double wrapped cup. Also, the single wrapped cups of the present invention are effective in protecting

the food contents stored therein from bruising. In addition, the equipment used in making single wrapped cups is cheaper and less complicated.

Containers which are prepared from the composite  
5 layered structure as defined by the present invention  
can be utilized for effectively storing a multiplicity  
of food products, particularly those which possess  
acidic characteristics. For example, containers of the  
present invention can be used for storing all dairy  
10 products, for example, yogurt cottage cheese, sour  
cream, milk, and the like. The structure of the con-  
tainer of the present invention is particularly adaptable  
to the injection of yogurt into containers in which the  
yogurt is cultured in the container at a temperature of  
15 112°F. Thus, the containers of the present invention  
represent a much needed inventive contribution since  
yogurt and similar products of an acidic nature tend to  
react with adhesives and other materials found in the  
more conventional wrapped and waxed containers of the  
20 prior art in which the products stored therein have a  
limited shelf life and the container is undesirable  
from a cost standpoint.

The polycoating material which is applied to the  
paper when making the composite layered structure of  
25 the present invention comprises polymers of ethylenically  
unsaturated monomers, such as for example, high density  
and low density polyethylene, olefinic copolymers con-  
taining a polyolefin as one of the components thereof,  
for example, ethylene-propylene copolymers, ethylene-  
30 vinyl acetate copolymers, and the like, polyvinyl  
chloride, polyvinylidene chloride and the like. The  
preferred polycoating is polyethylene. Advantageously,  
the polycoating has a thickness of up to about one mil  
preferably 1/4 to 3/4 mil. The polycoat can be applied  
35 to the paper to form the polycoated paper used in the

present invention by any of the method known in the prior art. In fact, preconstructed paper board which already contains the polycoat is utilized by the applicants for treatment in accordance with the present invention.

The waxes which can be utilized in the composite layered structure of the present invention are nontoxic waxes which are commonly utilized in making container structures for storing food products. A representative paraffin wax blend which can be used in the present invention is supplied by Mobil Oil Corporation and has the following properties: A clear appearance in the liquid form; a viscosity at 210°F SUS of 39.0; a needle penetration at 77°F (ASTM D1321) of 12; a melting point, ASTM D87 of 133°F; a color, ASTM D156 of + 14; a congealing point, ASTM D938 of 135°F; an oil content, ASTM D721 of D.2%; a minimum truck temperature of 170°F; a maximum truck temperature of 200°F; a refractive index @ 100°F of 1.4238; and a cloud point of 168°F. Advantagously, a fully waxed two-piece cup has a satin finish which exhibits no blocking below 122°F. The recommended storage temperature is about 185°F. Obviously, there are many waxes which can be used in the present invention and thus the specific wax referred to hereinabove is given merely as being exemplary.

The following examples should be considered as being exemplary of the present invention.

#### EXAMPLE 1

Two-piece single wrap polycoated cups were hand dipped in wax and the stiffness of the cups were measured both before and after the wax applications with the following results:

Weight/1,000 cups	18.6 lbs.	27.6 lbs.
Wax (lbs.)/1,000 cups		9.0 lbs.
Cup Stiffness	217 grams	335 grams

## EXAMPLE 2

5 A waxed, two-piece, single wrapped polycoated cup made in Example 1 was filled with corn oil and placed in the laboratory refrigerator for 26 days. The cup stiffness prior to and at the conclusion of the test was 320 grams. Thus, the corn oil test for the 26  
10 day period revealed no deterioration in stiffness or discolor of the cup sample.

## EXAMPLE 3

A sample cup made as in Example 1 was filled with lactic acid (full strength) and placed in the  
15 laboratory refrigerator for 26 days. The container stiffness prior to and at the conclusion of the test was 330 grams. Thus, the lactic acid test for the 26 day period showed no deterioration in stiffness or discolor of the cup sample.

## 20 EXAMPLE 4

A sample cup as in Example 1 was filled with Yoplait Yogurt (natural) and placed in the laboratory refrigerator for 26 days. The container stiffness prior to and at the conclusion of the test was 350  
25 grams. Thus, the yogurt test for the 26 day period showed no deterioration in stiffness or discolor of the cup sample.

EXAMPLE 5

A sample cup made as in Example 1 was filled with Yoplait Blueberry Yogurt (natural) and placed in the laboratory refrigerator for 26 days. The container  
 5 stiffness prior to and at the conclusion of the test was 350 grams. Thus, the yogurt test for the 26 day period showed no deterioration in stiffness or the discolor of the cup sample.

EXAMPLE 6

10 In the example the stiffness of single wrapped cups of the present invention was compared with the double wrapped cups of the prior art.

	<u>Single Wrapped Cup</u>	<u>Double Wrapped Cup</u>	<u>Double Wrapped Cup</u>
15	(P-508)	(F8TN3)	(8FC)
Wt. of 1 cup	12.91 grams	16.75 grams	15.66 grams
Wt. of 1000 cups	28.50 lbs.	36.9 lbs.	34.5 lbs.
20 Stiffness	335 grams	320 grams	350 grams

As can be readily observed from the above data, the stiffness of the single wrapped cup of the present invention compares favorably in stiffness to the double-wrapped cups known in the art. The stiffness measurement  
 25 in grams in made utilizing a stiffness gauge. As suggested above, the wax can be applied to the poly-coated paper container by dipping, spray-spinning or any other acceptable method. For example, in the  
 30 spray-spinning technique, the container, e.g., a cup, can be heated, sprayed at an air temperature of about 55°F with wax heated to a temperature of, for example,



about 180° to 190°F and then rotated to remove the excess wax from the surface of the cup.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.



WHAT IS CLAIMED IS:

1. A composite layered structure for use in making containers for storing edible food products which comprise

a paper board coated on one surface thereof with a polycoat selected from the group consisting of polyolefins, copolymers containing a polyolefin as one of the constituents thereof, polyvinyl chloride and polyvinylidene chloride, and

a wax layer provided on both surfaces of the polycoated paper board to form said wax-paper-polycoat-wax composite structure.

2. The composite layered structure of claim 1 wherein the polyolefin is high and low density polyethylene.

3. The composite layered structure of claim 1 wherein the polycoat has a thickness of about 1/4 to 3/4 mil.

4. A polycoated wax container having a single wrapped construction and possessing improved stiffness and resistance to liquid penetration, wherein said single wrapped construction has a composite layered structure comprising

a paper board coated on one surface thereof with a polycoat selected from the group consisting of polyolefins, copolymers containing a polyolefin as one of the constituents thereof, polyvinyl chloride and polyvinylidene chloride, and

a wax layer provided on both surfaces of the polycoated paper board to form said wax-paper-polycoat-wax composite structure.



5. The container of claim 4 wherein the polyolefin is high and low density polyethylene.
6. The container of claim 4 wherein the polycoat has a thickness of about 1/4 to 3/4 mil.
7. A sealed polycoated wax container of claim 4 containing an edible food product.



# INTERNATIONAL SEARCH REPORT

International Application No PCT/US81/01728

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>3</sup>				
According to International Patent Classification (IPC) or to both National Classification and IPC				
U.S. 428/35 IPC, B65D 85/72; B32B 9/06, 27/10				
<b>II. FIELDS SEARCHED</b>				
Minimum Documentation Searched <sup>4</sup>				
Classification System	Classification Symbols			
U.S.	428/35, 336, 486, 513, 514			
Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched <sup>5</sup>				
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup>				
Category <sup>*</sup>	Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>		
X	US,A, 1,986,887, Published 08 January 1935, See col. 2, lines 6-46, Frieden	1-7		
X	US,A, 4,117,199, Published 26 September 1978 See col. 2, lines 8-21, Gotoh et al.	1-7		
<p><sup>*</sup> Special categories of cited documents: <sup>16</sup></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> <p>"A" document defining the general state of the art</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document cited for special reason other than those referred to in the other categories</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> </td> <td style="width: 50%; border: none;"> <p>"P" document published prior to the international filing date but on or after the priority date claimed</p> <p>"T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance</p> </td> </tr> </table>			<p>"A" document defining the general state of the art</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document cited for special reason other than those referred to in the other categories</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p>	<p>"P" document published prior to the international filing date but on or after the priority date claimed</p> <p>"T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance</p>
<p>"A" document defining the general state of the art</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document cited for special reason other than those referred to in the other categories</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p>	<p>"P" document published prior to the international filing date but on or after the priority date claimed</p> <p>"T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance</p>			
<b>IV. CERTIFICATION</b>				
Date of the Actual Completion of the International Search <sup>1</sup>	Date of Mailing of this International Search Report <sup>2</sup>			
07 April 1982	14 APR 1982			
International Searching Authority <sup>1</sup>	Signature of Authorized Officer <sup>20</sup>			
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