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METHOD OF FORMING A RESIN COATED, PAPERBOARD PRODUCT AND RESULTANT ARTICLE

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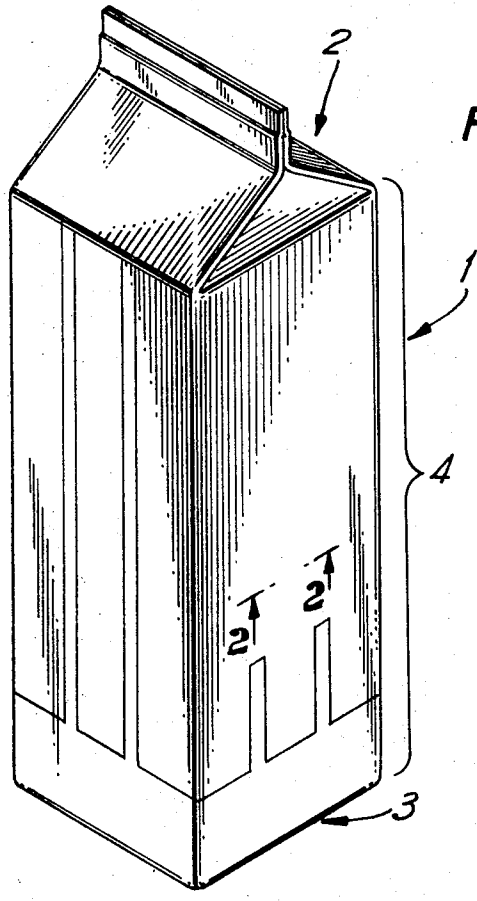


FIG. 1

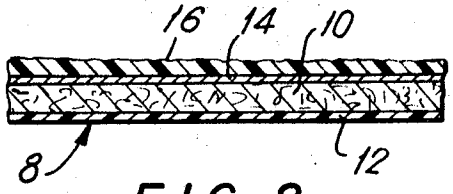


FIG. 2

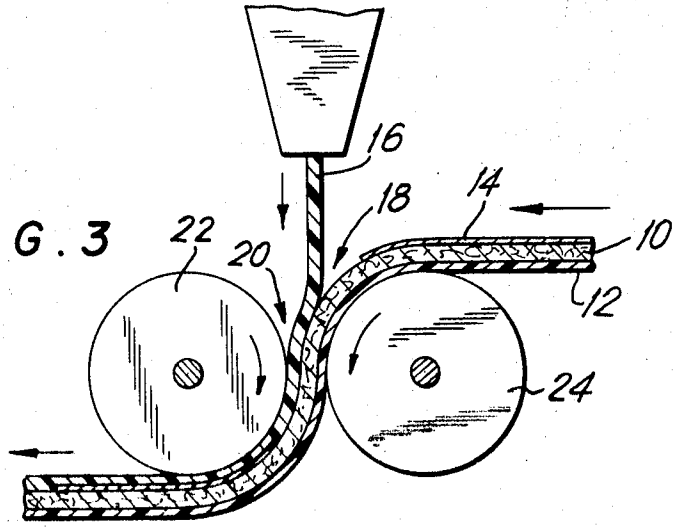
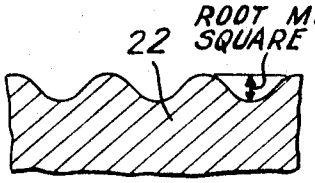


FIG. 3

FIG. 4



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METHOD OF FORMING A RESIN COATED, PAPERBOARD PRODUCT AND RESULTANT ARTICLE

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ABSTRACT OF THE DISCLOSURE

A flexible fibrous sheet material, preferably paperboard is coated with a suitable liquid impervious coating such as polyethylene and the coating is cast by a chill roll having a surface which imparts a uniformly low friction character and a commercially acceptable gloss surface to the coating. Containers made from such sheet material are first printed and then coated with such liquid impervious coating to provide a printed container with a uniform coefficient of friction.

BACKGROUND OF THE INVENTION

The present invention relates to a flexible fibrous sheet material such as paperboard, coated with a liquid impervious material for use in making containers for packaging liquids. The present invention will be described in particular reference to packaging milk or other liquids such as juice and the like. However, it is to be understood that containers constructed according to the present invention have utility in packaging a variety of other products.

Containers for packaging liquids may be made by using paperboard having on both sides a protective coating in order to make the container wall liquid impervious.

According to current practice, the protective coating is polyethylene and the coating has a smooth glossy finish which is overprinted with ink to give the usual message regarding the identification of the product in the container. Usually, the printing includes decorative art work to enhance the appearance of the container.

Since ink and polyethylene have different friction qualities, containers made according to such current practice have surface areas with different coefficients of friction. The glossy liquid impervious coating has a relatively high coefficient of friction and the surface printed with ink has a relatively low coefficient of friction. This difference in friction characteristics affects the machinability of the container. The container surface area having the gloss coating will tend to drag along guide surfaces in passing through a container handling machine, while the container area printed with ink will pass relatively easily along machine guide surfaces. Consequently, container handling machine may need adjustment, depending upon the manner in which the container is printed. Such adjustments add to the complexity of machine operation.

Containers being printed on the outer surface as described above are susceptible to scuffing or smearing of the ink surface during handling of the container. The ink surface may be scuffed in transporting from a paper converter to a dairy where the container is formed, filled and sealed. In addition, the container ink surface is susceptible to smearing in the event the ink is softened by exposure to heat or water during handling.

SUMMARY OF THE INVENTION

The present invention overcomes these difficulties and provides a paperboard coated with a liquid impervious layer such as polyethylene which is particularly suitable for use in making containers for packaging milk or other liquids. According to the present invention, a web or sheet of paperboard is printed with the usual message appearing on containers. Thereafter, both surfaces of the paperboard are coated with polyethylene. The outer coating of polyethylene is then cast against a specially prepared chill roll which has a casting surface which imparts to such outer coating, the desirable slip and gloss characteristics. In this manner, a container made according to the present invention has the desired slip and ink protective characteristics.

OBJECTS OF THE INVENTION

Accordingly, an object of the present investion is to provide a fibrous sheet coated with a liquid impervious material for use in making containers for liquids.

Another object of the present invention is to provide a container fabricated from polyethylene coated paperboard wherein the outer coating of polyethylene has desirable slip and gloss characteristics.

Another object of the present invention is to provide a container including printed paperboard coated with an impervious material such as medium density polyethylene to make the paperboard liquid impervious, and to protect the ink surface.

Another object of the present invention is to provide a container material having an outer polyethylene coating cast against a chill roll which has been buffed from a relatively low root mean square to a lower root mean square.

Other and further objects of the present invention will be apparent upon an understanding of the specification or will be indicated in the claims and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

DESCRIPTION OF THE DRAWING

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings forming a part of the specification wherein;

FIG. 1 is a perspective view of a typical container made from a paperboard material according to the present invention;

FIG. 2 is a section view taken along line 2—2 of FIG. 1 illustrating the wall construction of the container;

FIG. 3 is a schematic diagram indicating the techniques for manufacturing coated paperboard material according to the present invention; and

FIG. 4 is an exaggerated section view showing the surface contour of the chill roll shown in FIG. 3.

Referring to the drawings, FIG. 1 illustrates a container **1** having a top closure **2**, a bottom closure **3**, and an intermediate body portion **4**. Normally, a paper converting company fabricates container blanks which are side seamed and shipped in flat condition to a dairy or other packing company. Machinery in the dairy forms the bottom closure **3**, fills the container, and then closes and seals the top closure **2** of the container.

Typically, the container is printed with ink to identify the contents of the container and to give other information of interest to the consumer. If desired, the container may be decorated with suitable art work to provide a pleasing appearance.

Referring to FIG. 2, the wall construction of container material **8** according to the present invention may include a paperboard layer **10**, an inner protective layer of polyethylene **12**, printed matter **14**, and an outer layer of polyethylene **16** having a surface finished in a manner about to be described.

In the apparatus shown schematically in FIG. 3, the printed and one side coated paperboard is passed to an extrusion station **18** for adding the outer layer of poly-

ethylene **16**. Immediately after extruding, the outer coating of polyethylene passes into a nip **20** defined by a chill roll **22** and a support roll **24**. The chill roll **22** has a surface prepared according to the present invention. In the finished construction, the outer surface of the polyethylene **18** preferably has a polyethylene to metal coefficient of friction of about 0.40 or lower to provide for good machinability. While the coefficient of friction is lowered to improve machinability, the gloss characteristic of the outer layer is maintained at commercially acceptable levels. It has been determined that a good gloss reading for commercial containers is about 45% reflected light measured by a light meter at a 75° reading. The gloss index is light meter reading indicating the percent of light reflected from the surface of the outer layer to a meter positioned approximately 75° from a line perpendicular to the surface. This gloss index reading may be obtained by using a Hunter Gloss Meter.

It has been determined that the desired slip and gloss characteristics can be imparted to the outer surface of the container by providing the chill roll **22** with a matte or undulating surface having a final root mean square depth of between 10 and 25 microinches. Referring to FIG. 4, the root mean square surface depth is a value given in microinches indicating the depth or distance between low points and high points in root mean square average of the matte surface of the chill roll **22**.

A chill roll provided with a root mean square surface depth of 10 to 25 microinches and when used in conjunction with a medium density polyethylene, produces a carton surface having a coefficient of friction from approximately 0.16 to 0.34 and a gloss index of 45.8% to 54%.

The following examples illustrate the principles of the present invention:

EXAMPLE I

A chill roll having a matte surface with an initial 35 to 40 microinch root mean square surface depth was subjected to 48 buffing passes using a canvas buffing wheel and rouge. A medium density Alathon 4350 polyethylene (Du Pont) was used for the outside coating. The chill roll prepared as above imparted to the polyethylene surface a 53.8% gloss index and an initial coefficient of friction of 0.28 and a final coefficient of friction of 0.26. The resulting container by reason of its low coefficient of friction possessed good machinability as well as a commercially acceptable gloss characteristic. The final root mean square surface depth of the chill roll was approximately 15 microinches.

EXAMPLE II

In another example, a chill roll with an initial matte surface of 60 to 70 microinches root mean square surface depth was given 48 buffing passes using a canvas buffing wheel and rouge, to a final root mean square surface depth of 25 microinches. A container coated with medium density Alathon 4350 polyethylene, exhibited a gloss index of 45.8% and an initial coefficient of friction of 0.34 and a final coefficient of friction of 0.33. This container exhibited satisfactory gloss and slip characteristics.

EXAMPLE III

A chill roll having an initial root mean square surface depth of 20 to 25 microinches was buffed with a canvas buffing wheel and rouge to a final root mean square of 10–11 microinches. In using a medium density polyethylene, identified as DHD6390 (Union Carbide Corporation), a container was produced having a gloss index of 54% and an initial coefficient in the range between 0.16 and 0.30 and a final coefficient in the range between 0.18 and 0.37.

EXAMPLE IV

The same roll as in Example III was used but the polyethylene was changed to a medium density polyethylene No. NA400 (U.S.I. Corporation). This produced an initial coefficient of friction of 0.46 and a final coefficient of 0.49 with a 54% gloss index.

The present invention reduces the coefficient of friction to a uniformity low level to improve the machinability of containers made from shet material prepared according to the present invention. As exemplified above, the buffing technique according to the principles of the present invention involves reducing the initial root mean square surface depth of the matte surface very substantially, and in fact by at least approximately 50 percent, giving a highly buffed, smoothed, matte surface having, in these examples, a final root mean square surface depth of 10 to 25 microinches. By following the buffing technique described above, it has been determined that a good slip characteristic may be retained while the gloss is being restored to the coated container surface.

Applicant has provided a new and useful method of making containers as well as a new and useful product resulting from the method. The containers produced according to the present invention have an outer surface coated with polyethylene for protecting the ink, for giving uniform coefficient of friction to the surface and for retaining the gloss character of the coating so to enhance the appearance of the container.

What is claimed is:

1. A method for forming a container wall, having a paperboard substrate and an outer coating, with high slip and high gloss characteristics, comprising the steps of:

providing a paperboard substrate with a layer of a thermoplastic material heated to an elevated temperature at which the thermoplastic material is soft; and

pressing said layer of soft, heated thermoplastic material against a chill roll having a highly buffed, smoothed matte surface with a root mean square surface depth of 10 to 25 microinches;

said highly buffed, smoothed matte surface having been obtained by very substantially reducing the initial root mean square surface depth of the matte finish on said chill roll, using a canvas buffing wheel and rouge, to give a final root mean square surface depth of 10 to 25 microinches.

2. A method for forming a container wall, as recited in claim **1**, wherein said paperboard substrate is provided with said heated thermoplastic layer by extruding said thermoplastic layer on to said paperboard substrate immediately before pressing said thermoplastic layer against said chill roll.

3. A method for forming a container wall, as recited in claim **1**, wherein the initial root mean square surface depth of the matte finish on said chill roll is 20 to 70 microinches.

4. A method for forming a container wall as recited in claim **1** wherein the thermoplastic material is polyethylene.

5. A multi-ply container wall construction, having a paperboard substrate, formed in accordance with the method of claim **1**.

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117—10, 15, 65.2, 119.6, 155; 156—196