

Oct. 17, 1939.

W. D. BOWLBY ET AL

2,176,166

COATED CONTAINER

Filed March 23, 1935

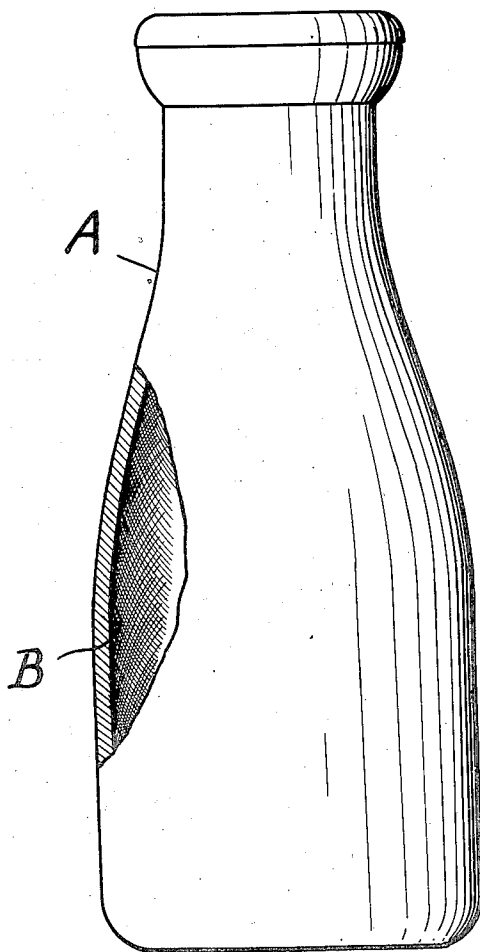


FIG. 1.

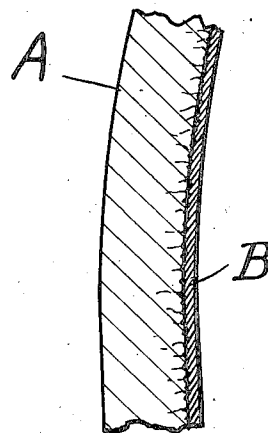


FIG. 2.

WITNESS:

R. P. Mitchell

INVENTORS

Walter D. Bowlby

Marcus L. Little

B

Brown & Harding

ATTORNEYS

UNITED STATES PATENT OFFICE

2,176,166

COATED CONTAINER

Walter D. Bowlby and Marcus L. Little, Wilmington, Del., assignors to Hercules Powder Company, Wilmington, Del., a corporation of Delaware

Application March 23, 1935, Serial No. 12,568

5 Claims. (Cl. 91-68)

This invention relates to an improvement in containers, and more particularly to containers formed from felted or molded fibrous material.

Containers in accordance with this invention will be adapted for the packaging of liquids and solids, and will be especially advantageous for the attractive packaging of liquids and solids of an oily or greasy character.

Heretofore containers, as boxes, flower pots, toys, bottles, etc. have been formed from felted, fibrous material, as cardboard, and also by molding a fibrous pulp under pressure. However, such containers have not proved satisfactory due to the fact that they are normally very porous and have heretofore required the use of excessive, uneconomical and numerous coatings and/or sizing material in order to render them attractive or adaptable for the packaging of liquids and various solids.

Now in accordance with this invention there is provided a container of any desired shape formed from felted or molded fibrous material and which, retaining its original porosity, is interiorly and/or exteriorly coated with a thin, continuous, non-porous, adherent, non-penetrating surface film of nitrocellulose. The film may consist of nitrocellulose alone or may include any of the usual ingredients of nitrocellulose lacquers.

Having now indicated in a general way the nature and purpose of this invention, we will proceed to a detailed description thereof with reference to the accompanying drawing in which a preferred embodiment of the invention is illustrated and in which:

Figure 1 is a view, partly broken away, of a bottle embodying this invention.

Figure 2 is an enlarged detail view.

In the drawing A indicates a bottle, for example, a milk-bottle, formed, for example, by molding a fibrous pulp under pressure. B indicates a thin, continuous, non-porous, non-penetrating film of nitrocellulose, with or without other ingredients, adhered to and forming a continuous coating throughout the interior of the bottle.

From an observation of the drawing, it will be noted that the film B is confined to the surface of the material forming the bottle and that the normal porosity of the material is retained, it being understood that the body of the material forming the bottle is unsized and that despite the high porosity thereof the film B does not penetrate into the body.

As will be understood, a film or coating of nitrocellulose similar to the film B may, if desired, be

applied to the exterior surface of the bottle A.

The film B may, as has been indicated, comprise nitrocellulose with or without additional ingredients adapted to give to it desired characteristics. Thus, for example, the film B may comprise nitrocellulose alone or together with any of the usual ingredients of nitrocellulose lacquers, such as a plasticizer, as, for example, dibutyl phthalate, tricresyl phosphate, castor oil, etc., a gum or resin, as, for example, glyceryl phthalate, ester gum, modified glycol terpinene maleate, etc., any desired pigment, dye, or decorative substance, etc.

For production of the film B a viscous nitrocellulose solution, or lacquer, emulsified in disperse phase in water will be used; and the viscosity of the solution or lacquer will be such, with respect to the material forming the bottle, that it will not penetrate into the body of the bottle.

With reference to the bottle A formed by molding a fibrous pulp and having a high degree of porosity, the nitrocellulose solution or lacquer will have a viscosity of 500 seconds or above, preferably about 2000 seconds, as determined by the A. S. T. M. method, i. e. the time required for a $\frac{1}{8}$ inch steel ball to fall through a ten inch column of the solution or lacquer contained in a one inch tube at 25° C. The non-volatile or solid constituents of the solution or lacquer, i. e. nitrocellulose or nitrocellulose and other non-volatile ingredients, as plasticizer, gum, resin, etc., will range from 20% to 50%, preferably 35%, so that the weight of non-volatiles deposited on the rough porous surface will be sufficiently thick to provide a continuous film of substantially 8 grams per quart bottle, and the viscosity of the emulsion will be 50 centipoises or more, preferably about 100 centipoises, so that the emulsion will have sufficient body to allow enough wet clingage, preferably 20 grams per quart bottle, to effect a final continuous dry film. Emulsions of lower viscosity may be used if it is desirable to put on more than one coating.

The nitrocellulose solution may be made up with use of a wide variety of solvents or solvent mixtures, including solvent and diluents. Thus, for example, the solvent may comprise octyl acetate, hexylacetate, butyl butyrate, butyl acetate, butyl propionate, amyl acetate, etc. or mixtures thereof. Where it is desirable to use a solvent mixture, any one of the above solvents, or mixtures thereof, may be admixed with a diluent such as, for example, xylol, high flash solvent naphtha, petroleum naphtha, toluol, butyl alcohol, amyl alcohol, or mixtures thereof.

Desired viscosity of the solution may be obtained for any desired solids concentration within the limits specified by use of a nitrocellulose of suitable viscosity characteristic. Thus, nitrocellulose having a viscosity of 0.125-400 seconds (Hercules) may be used.

The nitrocellulose solution will be emulsified in water on a ratio within the range 1:1 to 4:1 and emulsification may be effected in any suitable manner and with the use of any suitable emulsifying agent.

Thus, emulsification may be effected with the use of, for example, 0.1-5.0% of an emulsifying agent, such as a soap, as sodium oleate, ammonium linoleate, sodium resinate, ammonium oleate, etc., a sulphonated polymerized terpene, gelatin, Igepon A, Igepon T, a sulphonated oil, as sulphonated castor oil, etc., sodium, potassium, lithium, or the like, salts of the higher aliphatic sulphates, preferably containing eight or more carbon atoms, such as, for example, sodium oleyl sulphate, sodium lauryl sulphate, sodium stearyl sulphate, sodium myristyl sulphate, sodium cetyl sulphate, etc., a sodium salt of butyl or isopropyl naphthalene sulphonic acid, as sodium butyl naphthalene sulphonate, etc., oleo glycerol sulphate, methyl cellulose, the sodium salt of sulphuric ester of glycerinmonododecyl ether, the sodium salt of dodecylmercapto acetic acid, etc., or other compounds equivalent therefore, or mixtures thereof.

Emulsification of the solution may be effected, for example, by admixing the solution with water containing an emulsifying agent in solution and passing the mixture through a homogenizer.

The precise viscosity of the emulsion with reference to any given solution may be readily adjusted by the addition of a water-immiscible liquid, such as butyl acetate, hexyl acetate, toluol, etc., a hydrophilic material, as gelatin, methyl cellulose, gum, etc., sulphonated castor oil, glycol-bor-borate, etc., for increasing viscosity. Decrease in viscosity may be effected by the addition of small quantities of water.

As illustrative of nitrocellulose emulsions which will be adaptable for the provision of a film, such as the film B, on a porous container, such as the bottle A, formed by molding a fibrous pulp, for example, efficient emulsions may be made up on the following formulae:

FORMULA I

High solid content—Colorless film

	Parts
R. S. ½ sec. (Hercules) nitrocellulose (dry weight)-----	28.6
Alcohol (carried by nitrocellulose)-----	12.3
Softeners (phthalates, glycolates, citrates, etc.)-----	17.9
Butyl acetate-----	6.4
Benzol-----	6.4
Water container ¾% sodium lauryl sulfate-----	28.6

FORMULA II

Low solid content—25.0 per cent

	Parts
100 sec. (Hercules) nitrocellulose (dry weight)-----	10.0
Water retained in water wet nitrocellulose--	4.3
Castor oil (Baker's No. 15)-----	15.0
Butyl acetate-----	42.1
2% water solution of sodium resinate-----	28.6

FORMULA III

Medium solid content—35.7 per cent

	Parts
5 sec. (Hercules) nitrocellulose (dry weight)-----	14.3
Ethyl alcohol (carried by nitrocellulose)---	6.1
Castor oil (Baker's No. 15)-----	21.4
Butyl acetate-----	15.0
Toluol-----	14.3
¾% water solution of sodium lauryl sulfate--	28.0

FORMULA IV

High solid content—46.5 per cent

	Parts
R. S. ½ sec. (Hercules) nitrocellulose (dry weight)-----	17.9
Butyl alcohol (carried by nitrocellulose)---	7.7
Castor oil (Baker's No. 15) or modified glyceryl phthalate or mixtures thereof-----	28.6
Ethyl acetate-----	8.9
Toluol-----	8.9
¾% water solution of sodium lauryl sulfate--	28.0

The emulsions according to the above formulae may be readily produced by first preparing the nitrocellulose solutions indicated, then adding the solutions to water containing emulsifying agent in solution and finally homogenizing the mixture.

In effecting formation of the film B on the interior surface of the bottle A, any suitable procedure may be followed. Thus, any one of the above emulsions may be sprayed interiorly of the bottle or the bottle flushed in an inverted position, or the bottle may be partially filled with emulsion, manipulated to secure a coating throughout its interior and the surplus emulsion emptied or drained out. The coating may be dried by permitting the bottle to stand at room temperature, but is preferably dried by an injected forced draft of air at a temperature of 65° C.-70° C. The coating may be applied with use of an emulsion after molding but before the molded pulp has completely dried.

It will be appreciated that the above description of this invention, more particularly with reference to a molded pulp bottle, will be indicative of emulsions and procedure for the production of various shapes and forms of containers formed by molding pulp and formed from various other porous materials, as felted fibrous materials, it being clear that for the formation of the film on the surface of materials of various porosities, nitrocellulose emulsions of various viscosities and formed with solutions of various viscosities may be used, it being only necessary that the nitrocellulose solution and the emulsion have a viscosity such that the nitrocellulose solution will not penetrate the particular porous material of which any form of container is made and with reference to the emulsion so that it will not run off the surface.

The container in accordance with this invention, in the form of a bottle formed by molding a fibrous pulp, as more particularly described herein, will be found to be of especial advantage for use for containing lubricating oils, since the nitrocellulose film will render the interior of the container oil-proof despite the high porosity of the material of which it is formed. At the same time, the container will be inexpensive to produce, since only a minimum amount of nitrocellulose or lacquer will be required for the formation of the continuous, non-porous, non-penetrating nitrocellulose film on the surface of the molded fibrous

material, which being unsized will retain its original porosity.

What we claim and desire to protect by Letters Patent is:

1. A container formed from a highly porous fibrous material surface-coated directly with an adherent, non-porous film of nitrocellulose, said fibrous material retaining its normal porosity and said film being substantially non-penetrative of said porous fibrous material, said film being formed by the application of an aqueous emulsion of a viscous solution of nitrocellulose of the oil in water type.
2. A container formed from a porous fibrous material and interiorly surface-coated directly with an adherent, non-porous film of nitrocellulose, said fibrous material retaining its normal porosity and said film being substantially non-penetrative of said porous fibrous material, said film being formed by the application of an aqueous emulsion of a viscous solution of nitrocellulose of the oil in water type.
3. A container formed from a porous, felted fibrous material and interiorly surface-coated directly with an adherent continuous, non-porous film of nitrocellulose, said porous, felted fibrous material retaining its normal porosity and said

film being substantially non-penetrative of said porous, felted fibrous material, said film being formed by the application of an aqueous emulsion of a viscous solution of nitrocellulose of the oil in water type.

4. A container formed from a porous, molded fibrous material and interiorly surface-coated directly with an adherent, continuous, non-porous film of nitrocellulose, said porous, molded fibrous material retaining its normal porosity and said film being substantially non-penetrative of said porous, molded fibrous material, said film being formed by the application of an aqueous emulsion of a viscous solution of nitrocellulose of the oil in water type.

5. A bottle formed from a porous, molded fibrous material and interiorly surface-coated directly with an adherent, continuous, non-porous film of nitrocellulose, said porous, molded fibrous material retaining its normal porosity and said film being substantially non-penetrative of said porous, molded fibrous material, said film being formed by the application of an aqueous emulsion of a viscous solution of nitrocellulose of the oil in water type.

WALTER D. BOWLBY.
MARCUS L. LITTLE.