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METHOD OF MAKING PAPER CONTAINERS GREASEPROOF

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1

The invention relates to paper containers and particularly to flexible paper containers adapted to be used for the packaging and retailing of oils, lubricants, turpentine, kerosene, gasoline, and similar liquid hydrocarbons. The invention also relates to methods for the manufacture of these containers which hereafter will be termed "grease-proof" containers.

Paper, as a manufacturing material for containers, has in recent years rapidly gained in importance.

The manufacture of paraffine coated paper containers for the retailing of milk clearly characterizes this development. Paraffine coated paper containers are for obvious reasons not usable for the commercial handling and the transportation of oils, lubricants, turpentine and similar non-aqueous liquids.

In the past wooden containers and barrels have been frequently used for these purposes after being coated with a glue solution at an elevated temperature, which coating would be dried before the containers were used.

This proofing method cannot be applied to paper containers which as such do not possess sufficient rigidity and stability to withstand deformation; the brittle glue coating is bound to crack and to burst, if the paper container is subjected to the inevitable bending stresses occurring during the use and transportation, whereby leakage of the contents will result.

The wooden barrels are nowadays being replaced by steel drums, which however have the great disadvantage that they cannot be discarded at will and have to be stored for return to the delivery firms.

The solution of the problem which underlies this invention is aggravated by the necessity to effect from the applied coating an evaporation of the water through the paper walls up to a point where equilibrium is attained with the humidity of the surrounding atmosphere.

It is, therefore, the primary object of the invention to produce a coating for paper containers which renders the safe packaging and retailing of oils, lubricants, turpentine, kerosene, gasoline and similar liquid hydrocarbons possible.

It is a further object of the invention to produce a flexible grease-proof paper container which will remain unhurt and from which the coating will not crack or burst off when the container is subjected to inevitable rough handling and resulting bending and impact stresses.

It is another object of the invention to manufacture an inexpensive flexible, grease-proof

2

paper container which can be discarded and burned after use.

It is also an object of the invention to produce a paper container having a grease-proof coating which for a certain period after the application of the coating preserves sufficient gas porosity to permit through its walls the establishment of a humidity equilibrium between the coating and the surrounding atmosphere.

It is a further object of the invention to devise a grease proof paper container which may be manufactured without difficulty and without or with but minor changes of the working appliances in existing automatic paper container manufacturing and filling installations.

It is a further object of the invention to manufacture grease proof flexible paper containers where an aqueous grease proofing liquid is used for the production of the coating and the drying of the coatings is effected through the container walls and not from the free surface of the coating.

It is also an object of the invention to produce grease proof flexible paper containers where the grease proofing liquid is applied to the container walls at an elevated temperature and the coating is jellied by chilling under avoidance of drying.

It is a further object of the invention to produce grease proof paper containers where the solidification of the applied coating is effected by contact with the cold container filling and the container is sealed before the drying of the coating is completed.

It is also an object of the invention to manufacture grease proof paper containers which can be heat- and pressure-sealed at the top and where the sealing will be effected after time of filling or after the container has been allowed to stand.

With these objects in view the invention is based on the discovery that paper containers can be effectively grease-proofed if a coating is applied to the same which contains a plasticizer in admixture to a glue solution.

Multi-wall paper containers have been rendered grease-proof by either lacquering the same inside or outside or by inserting an oil insoluble adhesive between the multiple paper sheets in order to unite the same and hold them together.

The invention does not relate to multi-sheet containers, but to paper containers which after being coated retain sufficient porosity to permit, by water evaporation through the wall, the establishment of a humidity equilibrium between the coating and the surrounding atmosphere.

A conditioner may be preferably added to the

plasticizer containing a glue solution; if a conditioner is used which is adapted to function as a plasticizer, the latter may be entirely replaced by the conditioner.

Glycerine is preferably used as a plasticizer, but other substances which are compatible with glue jellies, such as ethylene glycol, treacle, glucose, may be employed as plasticizers for the purposes of the invention.

The conditioner may be taken from the hexahydric alcohols carrying, for instance, 80% or more polyhydric alcohol; the commercial sorbitol syrups have been found to be of excellent service; however, other substances, such as for instance butylene glycol, iditol or erythritol may be successfully employed as conditioners for the control of the residual moisture in the coating and to impart thereto increased mechanical strength and flexibility.

The glycerine used as a plasticizer should be free from common salt; indeed almost any distilled glycerine having a concentration of 80% or more will serve.

Glues which will yield a solution of low viscosity are preferred for making the instant grease proofing liquid.

An example of a usable glue would be a low grade hide glue which by the standard test of the National Association of Glue Manufacturers would show a jelly strength of 135 grams on the Bloom jellometer.

The presence of a bactericide and of a fungicide is desirable; for instance, zinc sulfate equal to about one percent of the glue may be preferably used.

In accordance with a preferred embodiment of the invention a small percentage of hexamethylenetetramine, for instance one fourth of 1% of the dry weight of the glue may be added.

The acidity of the paper used for the manufacture of the containers will in contact with the applied coating react with the hexamethylene tetramine setting formaldehyde free and thereby producing a tanning of the glue, that is, insolubilize the coating and thereby render it water resistant in the course of a few days. Paper will have a pH below 6 when made with ordinary rosin-alum size customarily used in the making of paper. This paper may well be used for the purposes of the invention.

A container or package made of originally porous paper after being grease-proofed in the presence of hexamethylenetetramine according to the invention will be fully impervious to rainfall.

The ranges of the individual components forming the grease proofing coating of this invention may vary considerably and lie, for instance, between 5 to 30 parts by weight of glue, 18 to 60 parts by weight of a plasticizer or a mixture of a plasticizer and a conditioner or of a conditioner only if the latter acts as a plasticizer, and 15 to 40 parts by weight of water.

The composition of the coating is given below:

Glue, 5 to 30 parts by weight
 Plasticizer, 10 to 35 parts by weight
 Conditioner, 8 to 25 parts by weight
 Hexamethylenetetramine, $\frac{1}{6}$ to $\frac{1}{2}$ per cent of the glue
 Water, 15 to 40 parts by weight

The amounts of water, of conditioner, plasticizer used will be chosen depending on the jelly strength of the glue used, i. e. a high grade glue requires more water and conditioner, etc., to give

the desired viscosity of the coating solution at a given temperature, for instance 150° F. Likewise, a variation in composition is possible according to whether a thick or a thin coating or a change of physical properties is desired.

As a preferred example the grease proofing composition forming this invention may be constituted, as follows:

Glue (135 Bloom strength), 10 parts by weight
 Glycerine, 18 parts by weight
 Sorbitol syrup, 12 parts by weight
 Hexamethylenetetramine, .03 parts by weight
 Water, 20 parts by weight

For actual application the grease proofing composition is heated to about 150° F., poured into the single layer paper container while hot and evenly applied to the inner wall surface as a comparatively thin layer; excess coating composition is removed.

Oil, lubricant, kerosene, gasoline and the like, is introduced into the container at a temperature of preferably between 40–50° F. On contact with the filled-in oil or the like a rapid congealing action of the coating results under avoidance of drying. The container is sealed, and an evaporation and humidity exchange takes place between the drying coating and the surrounding atmosphere, until equilibrium is reached.

The drying has, therefore, been effected through the container wall, but not from the free surface of the coating.

The instant method of rendering a paper container grease proof and capable of holding oils, lubricants, turpentine, gasoline and similar hydrocarbons is particularly adapted to be used with existent automatic paper container manufacturing and filling installations.

I claim:

1. In a method of grease-proofing containers to be used for the transport of liquid hydrocarbons, such as gasoline, oils, lubricants and consisting of a single-layer porous paper having a pH of less than 6, the steps of applying to the inside wall of the containers a coating of an aqueous solution of a low viscosity glue and of a quantity of hexamethylene tetramine equal to about 0.2 to 0.5 per cent of the dry weight of the glue hereupon directly filling the container with the liquid hydrocarbon of a sufficiently low temperature to thereby congeal the coating and sealing the same whereupon the coating is hardened by the formaldehyde set free from the hexamethylene tetramine by contact with the acid in the container wall and dried by cooperation of its moisture content through the porous container wall.

2. In a method of grease-proofing containers to be used for the transport of liquid hydrocarbons, such as gasoline, oils, lubricants and consisting of a single-layer porous paper having a pH of less than 6, the steps of applying to the inside wall of the containers a coating of an aqueous solution heated to about 150° F. of a low viscosity glue and of a quantity of hexamethylene tetramine equal to about 0.2 to 0.5 per cent of the dry weight of the glue hereupon directly filling the container with the liquid hydrocarbon coated to about 40 to 50° F., thereby congealing the coating and sealing the same whereupon the coating is hardened by the formaldehyde set free from the hexamethylene tetramine by contact with the acid in the container wall and dried by evaporation of its

moisture contents through the porous container wall.

3. In a method of grease-proofing containers to be used for the transport of cold liquid hydrocarbons, such as gasoline, oils, lubricants and consisting of a single-layer porous paper having a pH of less than 6, the steps of applying to the inside wall of the containers a heated coating of an aqueous solution of a low viscosity glue, glycerin and sorbitol syrup and of a quantity of hexamethylene tetramine equal to about 0.2 to 0.5 per cent of the dry weight of the glue, thereby congealing the coating by directly filling the container with the cold liquid hydrocarbon and sealing the same whereupon the coating is hardened by the formaldehyde set free from the hexamethylene tetramine by contact with the acid in the container wall and dried by evaporation of its moisture content through the porous container wall.

4. In a method of grease-proofing containers to be used for the transport of cold liquid hydrocarbons, such as gasoline, oils, lubricants and consisting of a single-layer porous paper having a pH of less than 6, the steps of applying to the inside wall of the containers a coating of a heated aqueous solution containing in about 20 parts by weight of water about 10 parts by weight of a low viscosity glue, about 18 parts by weight of glycerine, about 12 parts by weight of sorbitol syrup, about 0.03 parts by weight of hexamethylene tetramine, hereupon directly filling the container with the cold liquid hydrocarbon, thereby congealing the coating and sealing the same whereupon the coating is hardened by the formaldehyde set free from the hexamethylene tetramine by contact with the acid in the container wall and dried by evaporation of its moisture content through the porous container wall.

5. In a method of grease-proofing containers to be used for the transport of cold liquid hydro-

carbons, such as gasoline, oils, lubricants and consisting of a single-layer porous paper having a pH of less than 6, the steps of applying to the inside wall of the containers a coating of an aqueous solution containing in 15 to 40 parts by weight of water, 5 to 30 parts by weight of a low viscosity glue, 10 to 35 parts by weight of glycerin, 25 to 28 parts by weight of sorbitol syrup, 0.03 parts by weight of hexamethylene tetramine, hereupon directly filling the container with the cold liquid hydrocarbon, thereby congealing the coating and sealing the same whereupon the coating is hardened by the formaldehyde set free from the hexamethylene tetramine by contact with the acid in the container wall and dried by evaporation of its moisture content through the porous container wall.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,192,765	Durkee	July 25, 1916
1,417,708	Wright	May 30, 1922
2,164,494	Brown	July 4, 1939
2,164,495	Brown	July 4, 1939
2,414,274	Sass et al.	Jan. 14, 1947

FOREIGN PATENTS

Number	Country	Date
495,352	Great Britain	Nov. 11, 1938

OTHER REFERENCES

Condensed Chemical Dictionary, 3rd edition, p. 687, Reinhold Publishing Co., 1942. (Copy in Div. 64.)