PETROLEUM WAX COMPOSITIONS

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This invention relates to petroleum wax compositions. More particularly, this invention relates to paraffin wax compositions containing minor amounts of a cellulose triester.

In the paperboard container industry a substantial amount of paraffin wax is used to coat containers and make them moisture impervious. Such containers are widely used to package liquids. Typically, milk, buttermilk, and fruit juices are packaged in wax coated paperboard containers. Also, frozen food requiring liquid tight containers such as berries and sliced fruits packaged with sugar or heavy syrup are commonly sold in waxed cylindrical or cup cartonettes because they are easily filled and the wax coating makes them leak-proof.

As the wax coated paperboard container industry has expanded, manufacturers of wax have continually directed their research efforts toward the development of superior and less expensive coating compositions. Even with development of better wax coating compositions, however, one problem has continued to plague the industry. This is the problem of ensuring that all surfaces of a container are properly coated with wax because uncovered areas absorb liquid causing the container to soften and bulge. It has been particularly difficult in the past to insure proper coating of paper containers on the inside wall along the seam because the cut edge of the seam acts as a blotter for liquids contained within the carton and pulls wax away from the side leaving uncovered areas. As liquid leaks through the paperboard either during storage or during subsequent transportation and handling, the liquid container weakens and bulges particularly along the aforementioned seam with the result that it does not satisfactorily withstand the impact forces and stress concentrations of normal use. In the past in order to insure a completely covered surface and prevent bulging, it has been necessary to apply heavy coatings of wax which not only are more expensive but also are prone to flake and contaminate the liquid contents of the container.

Several materials have been suggested as wax modifiers to overcome the tendency of the base wax to cover improperly at the internal seam on the side walls of a container when coatings of conventional thicknesses are applied. Most of these modifiers, however, must be used at levels which impart increased viscosity to the wax and therefore create additional problems.

According to the present invention it has been found that addition of a minor amount of a cellulose triester to a paraffin base wax containing polyolefins provides an improved wax coating composition capable of completely covering a paperboard container even at the troublesome internal side seam, therefore eliminating side seam bulge. The novel composition of this invention is effective when applied as a coating of conventional thickness and does not adversely affect the wax viscosity so as to unduly increase the amount of wax adhering to the container surfaces during coating operations.

The paraffin base waxes which are suitable for use in the practice of this invention include those known to ones skilled in the art. Typically, these are the paraffin waxes having a melting range of about 120° F. to about 150° F., with those paraffin waxes melting between about 127° F. and 137° F. being preferred. Polyolefins which are suitable for addition to the paraffin base wax are those dispersible in the wax. Optimal, these include low density, low molecular weight polyolefins having molecular weight in the range from about 500 to about 4000. Preferably, the low density, low molecular weight polyolefins have molecular weight ranging from about 1000 to about 3000. Typically, polyolefins which may be added to the paraffin waxes include polyethylene, polypropylene, polyolefin copolymers and polyolefin polymer blends having molecular weight within the above ranges. Polyolefin additives may be prepared and added to the petroleum wax by a variety of methods well known to those skilled in the art. For example, in a typical preparation a paraffin base wax was melted and the polyolefin was added as a powder and the mixture was heated with stirring to about 150 to 200° F. The polyolefins may be present broadly in an amount from about 0.05 to about 20 percent by weight with concentrations in the range of about 0.1 to about 1 percent by weight being preferred.

The cellulose triesters employed in the practice of this invention may be obtained by esterification of cellulose with saturated aliphatic monocarboxylic acids. The cellulose used may be derived from any one of several sources known to those skilled in the art. For example, cellulose derived from wood pulp or cotton cellulose, e.g., as alpha cellulose, chemical cotton, or sodium cellulose may be used. In a particular preparation commercially available cellulose acetate, having an ASTM viscosity of 25 and an acetyl content of 40 percent, was hydrolyzed with ammonium hydroxide to free cellulose which could be recovered for use in the esterification reaction.

Broadly, the cellulose triesters suitable for use in the practice of this invention are those triesters of cellulose having acid groups derived from the saturated aliphatic monocarboxylic acids containing from 4 to 22 carbon atoms per molecule or mixtures thereof. Preferably, the acid groups of the cellulose triesters are derived from saturated aliphatic monocarboxylic acids containing from 8 to 16 carbon atoms per molecule or mixtures thereof.

It is likely that the cellulose triester will contain mixtures of acid groups because it is difficult to separate many of the fatty acids employed in the practice of this invention, especially those which are preferred, since they are closely situated members in a homologous series and quite often exist as mixtures of acids. For example, lauric acid normally is used as a mixture of acids obtained from coconut oil or as a coconut oil mixture from which capric, caprylic and capric acids have been removed by distillation.

It is important that the cellulose triester employed be soluble in the paraffin base wax. When the triester contains the acid groups described above, the necessary solubility is provided and this solubility does not critically depend upon size of the particular cellulose molecule involved. This is so because a cellulose molecule is composed of many glucose units each of which contains three hydroxyl units. When a glucose unit is esterified to contain the acid groups described above, the necessary solubility of that particular glucose unit for the paraffin base wax is provided. With each esterified glucose unit providing its own solubility, it is easy to see that the number of glucose units per cellulose molecule does not critically affect solubility.

The cellulose triesters are prepared by esterification of cellulose with either the acid or acyl halides of the saturated aliphatic monocarboxylic acids mentioned above or mixtures thereof. Typically, cellulose triesters such as cellulose tricartrate, cellulose trihexadecanoate, cellulose tri-laurate, cellulose trimyristate, and cellulose tripalmitate will be used as paraffin wax additives in the practice of this invention. Broadly, the cellulose triester may be incorporated in a physical mixture with the paraffin wax.
in an amount from about 0.1 to about 15 percent by weight. Preferably, the cellulose triester will be incorporated in a physical mixture with the paraffin wax in an amount from about 0.25 to about 1 percent by weight.

By way of illustration the preparation of cellulose trioleate for use according to this invention as an additive to a paraffin base wax is set out as follows: 40.3 grams of cellulose prepared from cellulose acetate according to the method illustrated above was dried and added to 83 milliliters pyridine and 323 grams of dioxane; the mixture was heated with stirring to approximately 100° C. Then 1.95 grams of lauroyl chloride was added, and the mixture was stirred for 24 hours. Acetone and toluene were then added to dilute the viscous mixture which was then poured into methanol in order to precipitate cellulose trioleate. The precipitate was purified by repeated filtering, water washing and drying.

Typically, cellulose triesters are added to the paraffin base wax by heating the wax to a temperature above its melting point and adding the ester with stirring. Other methods to those skilled in the art may be employed for the purpose of adding cellulose triesters to the paraffin base waxes.

To demonstrate the effectiveness of cellulose triesters as paraffin wax additives, the following comparison was made. A typically paperboard milk container made from type "C" paper stocks was coated first with a paraffin base wax having a melting point of about 130° F, which contained approximately 0.5 percent by weight low density polyethylene having a molecular weight of about 2000.

Completeness of coverage by the wax coating was determined by filling the inside of the container with a dye solution containing methylene blue and noting the amount of absorbed dye after a storage period. A dye stain was observed in the area along the inside seam of the container. This is an indication of serious trouble because of the blotter action of the uncovered cut edge of the seam. When a similar milk container was coated with the same paraffin base wax to which 0.6 percent by weight cellulose trioleate had been added, exposure of the inside of the container to the methylene blue dye solution resulted in no dye stain along the internal side seam. Coating of all other areas on the container walls was observed to be normal. This indicates that the container was completely covered by the wax coating.

It can be seen, therefore, that the paraffin wax coating composition containing the cellulose triester is more effective for the coating of paper containers than the wax which did not contain the additive.

We claim:

1. A composition of matter consisting essentially of: a paraffin wax having a melting point from about 120° F. to about 150° F. containing a low density, low molecular weight polyolefin present in an amount from about 0.05 to about 20 percent by weight and from about 0.1 to about 15 percent by weight of a cellulose triester wherein the acid portion of said triester is derived from the group consisting of saturated aliphatic monocarboxylic acids having from 4 to 22 carbon atoms per molecule and mixtures thereof.

2. The composition of claim 1 wherein said cellulose triester is present in an amount from about 0.25 to about 1 percent by weight.

3. A composition of matter consisting essentially of: about 98.9 percent by weight of a paraffin wax; about 0.5 percent by weight polyethylene having a molecular weight of about 2000; and about 0.6 percent by weight cellulose trioleate.

4. The composition of claim 1 wherein said polyolefin is polyethylene having a molecular weight in the range of from about 500 to about 4000.

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