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**PAPER-COATING COMPOSITION CONTAINING MODIFIED DIALDEHYDE POLYSACCHARIDE-MODIFIED POLYSACCHARIDE-REACTION PRODUCT**

James Huey Curtis, Elkhart, Ind., assignor to Miles Laboratories, Inc., Elkhart, Ind., a corporation of Indiana

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**ABSTRACT OF THE DISCLOSURE**

An improved paper coating composition wherein the binder comprises a combination of (A) about 0-90 weight percent protein and (B) about 10-100 weight percent of a modified dialdehyde polysaccharide-modified polysaccharide reaction product, said weight percent being based on the total combined weight of the protein and the modified reaction product.

This invention relates to compositions useful for coating paper. More particularly, it relates to improved binders for inclusion in compositions useful for coating paper to be employed in offset printing processes. Coated paper to be used in offset printing must have a coating which is highly resistant to wet-rub abrasion since the offset printing process exposes the coated paper to high humidity conditions. Such humidity conditions tend to soften the coating and can cause loss of portions of the coating if it is not strongly bonded to the paper substrate.

Cellulosic papers coated with clay are commonly employed in the printing industry. The clay coating composition employs binders, such as starch or protein, to bind the clay particles to each other and to the paper substrate. It is also known that starch-protein mixtures are deemed to be unsuitable as binders since the starch and protein are considered to be incompatible. The clay-binder mixture must be properly insolubilized in order to form the desired binding action. Formaldehyde is an insolubilizing agent which is commonly used in the art. The use of formaldehyde, however, has attendant disadvantages. It presents a health hazard since its toxic vapors irritate the eyes and mucous membranes. It is also volatile and a large excess is generally required in order to achieve desired insolubilization conditions.

It is therefore an object of the present invention to eliminate the use of formaldehyde as an insolubilizing agent for paper coating compositions.

It is also an object of the present invention to replace at least some, if not all, of the expensive protein binder in the coating compositions with a less expensive binder and still retain the desired overall coating characteristics.

It is additionally an object of the present invention to produce a compatible starch-protein mixture suitable as a binder for clay coatings.

In accordance with the present invention, an improved paper coating composition is provided wherein the binder comprises a combination of (A) about 0-90 weight percent protein and (B) about 10-100 weight percent of a modified dialdehyde polysaccharide-modified polysaccharide reaction product, said weight percents being based on the total combined weight of the protein and the modified reaction product. The modified reaction product (B) employed in this composition is the product of reaction of about 9-20 weight percent of a modified dialdehyde polysaccharide and about 80-91 weight percent of a modified polysaccharide, said weight percents being based on the

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total weight of the modified reaction product. The modified dialdehyde polysaccharide employed in this reaction product is selected from the class consisting of (1) the reaction product of about 70-85 parts by weight dialdehyde polysaccharide and about 15-30 parts by weight of a condensation product of dicyandiamide and formaldehyde and (2) the reaction product of about 70-85 parts by weight dialdehyde polysaccharide, about 7.5-15 parts by weight carboxylated polysaccharide and about 7.5-15 parts by weight of a condensation product of dicyandiamide and formaldehyde. The modified polysaccharide employed in this reaction product is selected from the class consisting of hydroxyethylated polysaccharides, carboxylated polysaccharides, acetylated polysaccharides and enzyme converted polysaccharides.

Preferably, the above-described binder contains about 60-90 weight percent protein (A) and about 10-40 weight percent reaction product (B) based on the total combined weight of protein (A) and reaction product (B). The binder preferably contains as the modified dialdehyde polysaccharide component of reaction product (B) the reaction product of about 70-85 parts by weight dialdehyde polysaccharide and about 15-30 parts by weight of a condensation product of dicyandiamide and formaldehyde. The binder also preferably contains hydroxyethylated polysaccharide as the modified polysaccharide component of reaction product (B). The binder most preferably contains a reaction product (B) consisting of about 20 weight percent of the reaction product of about 70 parts by weight dialdehyde polysaccharide and about 30 parts by weight of a condensation product of dicyandiamide and formaldehyde and about 80 weight percent hydroxyethylated polysaccharide.

The binder of the present invention can also contain other well-known constituents, such as a butadiene-styrene latex. Such latex, calculated as the dry weight of the solid matter suspended in an aqueous medium, is conveniently employed in an amount of about 10 to 50 weight percent based on the total weight of the binder.

The dialdehyde polysaccharide useful as starting materials in the present invention are well known in the art. Such materials are frequently referred to as periodate oxidized polysaccharides because of their preparation by the well known oxidation of polysaccharides with periodic acid. This preparation can be illustrated by the conversion of a polysaccharide, such as starch, to dialdehyde starch or periodate oxidized starch using periodic acid in accordance with the following equation:

