Patented Nov. 25, 1941 2,263,575

UNITED STATES PATENT OFFICE

2,263,575

METHOD OF COATING PAPER AND PRODUCT THEREOF

William M. Glenn, Aurora, Ill., assignor to Glenn Davidson

No Drawing. Application August 25, 1938, Serial No. 226,705

11 Claims. (Cl. 91—68)

In coating papers such as are employed for printing usages, etc., it has been customary to prepare the paper by a simple coating of casein and clay. Casein while having certain advantages, is under the disadvantage of tending to be very irregular in quality as a raw material and correspondingly presenting considerable difficulties to the coated paper manufacturer. Efforts to employ another material such as oilseed proteinous material have been handicapped by the difficulty that the coated product made with such material is weaker than the casein-coated product, and its applicability has been thereby under a serious disadvantage, notwithstanding other attractive features, such as uniformity of material, low cost, etc. I have now found however that oilseed proteinous material, that is oilseed flour or isolated protein, or in fact such material as may be desired, may be applied in such manner and relation as to provide a product having surprising strength, as well as desirable finish and appearance.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative however, of but a few of the various ways in which the principle of the invention may be employed.

The paper to be coated may be any usual or preferred grade, and in accordance with my invention I apply to this, as a pre-treatment or sizing, a deflocculating and a binder material. Preferably, the deflocculating material is an alkaline material or agent. This pre-treatment very fundamentally affects the adhesion of the subsequently-applied mineral-containing coating material which forms the finishing surfacing. There is reason for believing that the deflocculating agent determines a particularly uniform distribution of the mineral particles as applied in the finish-coating, or at least prevents aggregation such as otherwise tends to occur. Irrespective of any theories in attempt to explain the results obtained, I content myself however with merely stating the facts as to the surprising increase in strength and firmness of the coated product. The binder material involved as sizing agent may be with particular advantage tapioca, and in some cases other starch, etc. The alkaline agent may be sodium carbonate, caustic soda, sodium aluminate, trisodium phosphate, sodium pyrophosphate, alkali metal silicates or water glass, sodium orthosilicate, sodium metasilicate, sodium borate, amines, as ethylene diamine, morpholine, triethanol amine, etc. As an illustrative example: Two pounds of anhydrous sodium carbonate are added to a solution of four pounds of tapioca in one hundred pounds of water, with stirring until the sodium carbonate is completely dissolved. This material is applied to the surface of the paper by any suitable coating applicator means, such as to deposit approximately four-tenths of a pound of tapioca and two-tenths of a pound of sodium carbonate, dry weight basis, per side of the sheet per ream of five hundred sheets each measuring twenty-five by thirty-eight inches and weighing for instance forty-five pounds. That is, an amount of sodium carbonate and tapioca as indicated, to about thirty-two hundred and fifty square feet of paper surface. A finish coat of mineral-containing material, preferably a suspension of clay in oilseed proteinous material is applied. If the finish coating is put on by spray or roll type of coating device, the tapioca coating need not be dried, but if the finish coating be applied by means of a brush type of coating machine it is advisable to dry the tapioca coating lest the brushing disturb it too much. The paper product with the tapioca sizing and the finish coating of oilseed proteinous material and clay or like mineral filler is remarkably strong, the adhesion of the finished coat and the tensile strength of the sheet being out of proportion to what would be expected from the paper. As indicated, oilseed material, such as the flour particularly, or the isolated protein, of soya bean, peanut, and like oilseed materials as available from the residues of oil pressing or extraction may be thus used. As indicated also, I have found that as the affinity-promoting sizing there may be applied other starch, such as corn starch, which may be made up to a five per cent solution and treated with ten per cent caustic soda on the basis of the starch or with soda ash, trisodium phosphate, sodium aluminate, etc., as in the case of tapioca, and applied in similar amount as the tapioca, also rubber latex in five per cent solution applied in similar amount as the tapioca, also synthetic urea-formaldehyde resin or acrylic acid resin using desirably ten to fifteen per cent solutions and applying one to four pounds, dry resin basis, per side per ream of paper, also mahogany soap emulsions using five per cent suspensions and applied at about the same rate as tapioca, also locust gum, gum tragacanth and the like, in analogous strength and rate of application as with tapioca. I have found somewhat less

desirable results as comparable with the foregoing, where using dextrine in 20–40 per cent solutions, applying five to ten pounds per side per ream, or water glass at the same rate, or gum arabic at the same rate, or barium fatty acid soaps using a five per cent suspension and applying one to two pounds per side per ream, or casein using a five per cent solution and applying one to two pounds per side per ream. And thus, while such latter sizing coats may be applied in some cases, I prefer the first-named materials for particularly high grade usages. In general, a particularly active agent such as tapioca can be applied at one-fourth to three or more pounds per side per ream depending upon the extent of effect wanted. The deflocculating agents used may vary from 5%–150% of the tapioca used.

The method of preparing clay or mineral surfacing material may vary depending upon the precise character of product desired, and in the case for instance of a white coated paper for the printing trades may be for example one hundred pounds of clay per twelve pounds of soya bean flour or equivalent, the mixture being made up into a suspension by any suitable procedure, for instance by stirring one hundred pounds of soya bean flour to smooth suspension in four hundred pounds of water containing two pounds of pine oil, then heating the mixture to 140–150° F., and adding five and one-half pounds of caustic soda dissolved in twenty-five pounds of water. This temperature is maintained for about fifteen to twenty minutes, then sixty-five pounds of cold water is added and the mixture is allowed to cool if not to be used at once, or it may be added directly while still warm, to a clay slip prepared by dissolving two and one-half ounces of caustic soda and 12 oz. 40 Bé. water glass in forty pounds of water containing one pound of pine oil, and to this solution one hundred pounds of dry paper-coating clay is added and the mixture is stirred until free from lumps. To this clay slip there is then added sixty pounds of the soya mixture (corresponding approximately to twelve pounds dry soya flour) prepared as foregoing. The mixture of size and clay after being thoroughly stirred is ready to be applied as in coating.

This application is a continuation, in part and as to common subject matter, of my application Serial No. 197,879, filed March 24, 1938.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a process of coating paper, applying to the paper a solution of sodium carbonate and tapioca to deposit at the rate of two-tenths pound of sodium carbonate and four-tenths pound of tapioca, dry basis, to about thirty-two hundred and fifty square feet of paper surface, and subsequently applying thereon an aqueous oilseed flour and clay suspension containing about twelve pounds of oilseed flour per each one hundred pounds of clay.

2. In a process of coating paper, applying to the paper a solution of sodium carbonate and tapioca to deposit at the rate of two-tenths pound of sodium carbonate and four-tenths pound of tapioca, dry basis, to about thirty-two hundred and fifty square feet of paper surface, and subsequently applying thereon an aqueous oilseed flour and clay suspension.

3. In a process of coating paper, applying to the paper an alkaline agent and tapioca to deposit at the rate of two-tenths pound of tapioca, dry basis, to about sixty-five hundred square feet of paper surface, and subsequently applying thereon an aqueous oilseed flour and clay suspension.

4. In a process of coating paper, applying to the paper an alkaline agent and starch, and subsequently applying thereon an aqueous oilseed flour and mineral suspension.

5. In a process of coating paper, applying to the paper a deflocculating agent for paper-coating pigment and starch, and subsequently applying thereon an aqueous oilseed flour and mineral suspension.

6. As a new article of manufacture, paper having sodium carbonate and tapioca on the cellulose, and a superposed finish-surfacing of clay and oilseed proteinous medium.

7. As a new article of manufacture, paper having tapioca and alkaline material on the cellulose, and a finish-surfacing of clay and oilseed proteinous medium.

8. In a process of coating paper, surfacing the paper with an alkaline adhesive sizing, and subsequently applying to such surface a mineral suspension in oil seed proteinous material.

9. As a new article of manufacture, paper having a sizing of alkaline tapioca and a superposed finish-coating thereon of a mineral suspension in oilseed proteinous material.

10. As a new article of manufacture, paper having a sizing of alkaline starch and a superposed finish-coating thereon of a mineral suspension in oilseed proteinous material.

11. As a new article of manufacture, paper having a sizing of an alkaline adhesive sizing and a superposed finish-coating thereon of a mineral suspension in oilseed proteinous material.

WILLIAM M. GLENN.