

UNITED STATES PATENT OFFICE

2,314,820

IMPREGNATED PAPER

Sumner C. Fairbanks, Passaic, N. J., assignor to
The Hamersley Manufacturing Company, Gar-
field, N. J., a corporation of New Jersey

No Drawing. Application September 9, 1939,
Serial No. 294,095

3 Claims. (Cl. 117—155)

My present invention relates generally to paper manufacture, and has particular reference to impregnated paper.

The principal object of the invention is to provide a paper which is not only waterproof, but which has greatly enhanced wet strength and wet-rub properties.

The waterproofing of paper, by impregnation with a water-proof material, is well known. But such waterproofing of paper, strangely enough, does not adequately guard the paper against the weakening effect of water. Thus, when an ordinary wax-impregnated paper is soaked for ten minutes in water at about 70° F., tests show that only about 5 to 16% of the initial bursting strength of the paper is retained.

My present invention is predicated upon the discovery that certain resinous waterproof materials, when impregnated into the paper in limited amounts, will serve not only to render the paper waterproof (in the ordinary sense of the word) but will also greatly increase the wet strength of the paper.

The two materials which I have found to be suitable for the present purpose are each of rubber-like character. One is a polymerized butene, or polybutene, having a specific gravity of about 0.90 and a molecular weight of approximately seventy-five thousand. This material is available on the market, today, in the United States, as a substitute for rubber, under the trade mark "Vis-tanex," and in Germany under the name of "Oppanol." The other material is a condensation derivative of rubber, obtained by treating rubber in solution with chlorostannic acid or a halide of an amphoteric metal such as tin chloride or iron chloride. This material is available on the market, today, in the United States, under the trade mark "Pliolite."

Each of these materials is of tough, resinous character, incapable of being impregnated, directly, into the paper. I have found, however, that each of these materials may be incorporated into the paper by forming a dispersion of the material in a suitable non-volatile liquid or liquefiable carrier medium. For this purpose I prefer to employ a waterproof meltable or liquid material of the class which includes paraffin and petrolatum, or equivalents thereof.

In carrying out my invention, any absorbent paper may be employed. Sizing may or may not be present in the paper, as desired, but a grease-proof paper cannot be used, because absorbency is essential, since the desired effect can only be achieved by causing the impregnating material to

penetrate thoroughly into the fibres of the paper, filling in all the interstices between the fibres within the body of the paper. It is therefore to be understood that the term "impregnated," as used herein and in the appended claims, is intended to signify a thorough incorporation of the material into and between the fibres of the paper, as distinguished from a mere surface coating. As a matter of fact, absorbent paper treated in accordance with the present invention has no outer coating at all, and the treated paper looks and feels like ordinary untreated paper.

In carrying out my invention, a mixture is first produced, in which the resinous material is incorporated with the carrier medium. The mixture is heated to a molten state, and the paper is caused to be impregnated with it and subsequently allowed to cool. In forming the mixture of materials, about 10 to 50 parts of the rubber-like material are associated with about 90 to 50 parts of the carrier medium, and the formulas that are preferred are those in which the resinous material is present in relatively small amounts. The impregnation is carried out in any suitable manner which incorporates into the paper an amount of impregnating material no greater than about 10% of the weight of the paper.

By way of example, one satisfactory procedure is as follows:

Equal parts of paraffin (melting point about 120–140° F.), and a resinous cyclized rubber derivative formed by the chemical treatment of crepe rubber with stannic chloride or chlorostannic acid ("Pliolite") are first associated with one another. The paraffin may, for example, be melted in a steam-jacketed double agitator dough mixer, and the resin, in powdered form, is poured in. A fairly smooth dough is rapidly formed, and after the steam is turned off the mechanical action rapidly completes the dispersion of the resin in the wax. The batch is then reheated and the desired quantity of additional paraffin is added, until the proportions are about 10 parts of resin to 90 parts of wax.

This mixture is then placed in a vat or compartment which is maintained at about 200° F. An applicator roll is partially immersed in the molten mixture and is in rolling contact with one of a pair of rollers through which the paper passes. This serves to apply the molten material to one surface of the paper and the amount which is applied to the paper is controllable by adjusting the pressure between the rollers. This adjustment is carefully made so that the amount of impregnating material is no more than about

10% of the weight of the paper, preferably as little as 7 or 8%.

The coated paper is then caused to pass over a series of rollers which are maintained at a temperature of about 250° F. by means of live steam. This maintains the paper and the impregnating material in a condition under which the process of impregnation continues to a thorough extent. The impregnated paper is then wound on a roll, while it is still hot, and is then allowed to cool.

Where "Vistanex" is used, the process is substantially the same, except that the "Vistanex" may be brought into complete dispersion in the wax by placing both materials in a steam-jacketed Banbury-type mill, and continuing the milling until a thorough intermixture is effected.

In either case, it is equally feasible to incorporate the rubber-like material in any other suitable non-volatile carrier medium, such as white mineral oil, petrolatum, either pasty or liquid, or the like.

The finished paper can hardly be distinguished from a paper which is unimpregnated, because there may be in the paper as little as 1 to 5%, by weight, of the resinous waterproof material, and because there is no outer coating on the paper. Nevertheless, the paper has highly desirable qualities. It is not only at least as waterproof as the best available waterproof paper now on the market, but its wet strength is substantially increased, as well as its wet-rub properties. For example, a paper treated in accordance with the present invention, impregnated with a mixture of about 15% of resin and 85% paraffin, the mixture being present in an amount only about 7% of the weight of the paper, can be soaked for ten minutes in water at 70° F. and still retain at least 35% of its bursting strength. The reason for this, I believe, is that the impregnation of the paper, with the materials and in the manner herein described, materially prevents water in liquid phase from passing into and through the paper, and thus prevents the water from gaining access to, and weakening, the bond between the fibres.

This makes the paper highly advantageous for use in the packing of meats, in the wrapping of ice cream, as spacer sheets for wet materials, or any other of the general purposes to which waterproof paper is applied, particularly where strength is desired. The paper has an attractive appearance, the impregnation material is non-crystalline, undiscernible, and non-toxic, and the paper has desirable qualities of toughness and flexibility.

In general, it will be understood that changes in the details, herein described for the purpose of explaining the nature of my invention, may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims. It is therefore intended that these details be interpreted as illustrative, and not in a limiting sense.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. Paper of enhanced wet strength and wet-rub properties, whose fibres are thoroughly impregnated with a waterproof mixture consisting essentially of a carrier medium selected from the class which consists of paraffin and petrolatum, and a condensation derivative of rubber obtained by treating rubber in solution with chlorostannic acid or a halide of an amphoteric metal, said impregnating mixture being present in the paper in an amount no greater than about ten percent of the weight of the paper.

2. Paper impregnated as set forth in claim 1, the impregnating mixture being present in an amount which is about one to five per cent of the weight of the paper.

3. Paper impregnated as set forth in claim 1, the impregnating mixture being a solvent-free dispersion of ten to fifty parts of rubber derivative in ninety to fifty parts of the carrier medium.

SUMNER C. FAIRBANKS.