

UNITED STATES PATENT OFFICE.

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PAPER PRODUCT AND METHOD OF MAKING SAME.

No Drawing.

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My invention relates to a new and useful paper product and to the method of making the same.

One object of my invention is to make a paper product which will be hard, durable, compact, water-proof and inexpensive to manufacture.

Another object is to make a paper product which will have a smooth, moisture repellent and highly polished surface.

A further object is to provide a new and useful method of preparing the above paper product.

Impregnated and laminated materials have been made by passing the manufactured paper through a bath of synthetic resin solutions and the like, and thereafter heating the sheets under pressure to give uniform and highly polished surfaces.

I have found that if a cellulose ester is added to the pulp or rag fibres during processing, that treatment under heat and pressure subsequent to the completion of the paper will give a product resembling that made by impregnation. My process gives a product in which the cellulose ester is intimately and uniformly dispersed throughout the fibres as well as upon the surface, resulting in a more water-proof and more durable product than has previously been possible by impregnation. A further advantage of my process resides in the elimination of one step in the process, to wit, that of impregnation.

The term "cellulose ester" embraces that class of compounds which are formed by the action of acids on cellulose, and includes the cellulose acetates and cellulose nitrates, but due to the non-inflammable nature of the former, I prefer to use that compound.

In carrying out my process, I add the solid ester to the pulp and rag fibres in the beater together with the filling, sizing and dyeing compounds. The action of the beater comminutes the cellulose ester and uniformly disperses it throughout the mass. The percentage of the cellulose compound added depends upon the properties desired in the finished product. A relatively low percentage, that is from 10 to 15% (based on the finished product), will give a paper product after treatment, as hereinafter described which will be somewhat flexible, while a product containing about 50% of the cellu-

lose ester will resemble vulcanized fibre and will be hard, compact and mechanically strong.

The paper is processed in the usual manner, since the presence of the ester has no effect on the materials entering into the paper nor on the mechanical operations. After the paper has left the Fourdrinier machine, it is ready to be vulcanized, that is to be subjected to heat and pressure. The single sheets, if they are of the desired thickness, are vulcanized per se, or a laminated product is built up by superimposing one sheet upon another until the requisite thickness is obtained. In either case, the heat and pressure step is accomplished in the same manner.

The sheets are placed between the heated platens of a suitable press whereby they are subjected to pressure such as one thousand pounds per square inch at a temperature of one hundred and twenty-five pounds of steam. This heat and pressure are maintained for a time sufficient to cause the cellulose ester to fuse throughout the fibrous mass and to flow completely over the surface, forming a continuous coating. If the platens are highly polished, there will result a smooth, uniform and highly polished coating of the ester on the surface of the fibrous material. The cellulose ester binds the sheets into a compact inseparable body.

The paper sheets containing the cellulose acetate after they leave the Fourdrinier machine may be parchmentized in the usual manner, in which case, for example, the sheets may be passed through a bath of 70-72° Baumé zinc chloride at a temperature of 100 to 125° F. whereupon the paper sheets will be changed to a vegetable parchment membrane and may be, if desired, superimposed to obtain the required thickness. The parchmentizing agent is freed from the membrane by leaching in a succession of water baths, called purging baths. The parchment membrane containing the cellulose acetate is dried then subjected to the heat and pressure treatment, hereinbefore described, whereupon the cellulose acetate will fuse throughout the product and render it more water-resistant and more durable.

Instead of treating the parchment membrane after purging by heat and pressure, I have found that satisfactory results are ob-

tained if the membrane taken from the purging bath is immersed in a solvent for the cellulose acetate, such as acetone, the solvent will enter the pores displacing the water and causing a film of the acetate to form throughout the product. Upon evaporation of the solvent, a water-resistant fibrous sheet homogeneously impregnated with cellulose acetate will result.

The above described materials are available for a wide variety of uses, such as a raw material from which machine elements such as gears, pulleys, or the like may be formed or machined, and also as an electrical insulator, especially in the construction of switchboards for radio apparatus, a material for making containers, or other structures which it is desirable shall be unaffected by moisture, oil or other liquids. It is also applicable for the surface veneering of wood or cardboard.

Considerable modification is possible in the processing of the paper and in the percentages of cellulose acetate used with no departure from the essential features of the invention.

I claim:

1. The process of making a paper product which comprises adding a cellulose ester to the paper and rag fibres prior to the Fourdrinier machine, processing the paper in the usual manner, parchmentizing the paper, and thereafter subjecting the sheet to heat and pressure to cause the cellulose ester to flow throughout the mass.

2. The process of making a paper product which comprises adding cellulose acetate to the paper and rag fibres prior to the Fourdrinier machine, processing the paper in the usual manner, parchmentizing the paper, and thereafter subjecting the sheet to heat and pressure to cause the cellulose acetate to flow throughout the mass.

3. The process of making a paper product which comprises adding a cellulose ester to the paper and rag fibres in the beater, processing the paper in the usual manner, parchmentizing the paper, superimposing the sheets to obtain the thickness desired, and thereafter heating the same under pressure to cause the cellulose ester to flow throughout the mass.

4. The process of making a paper product which comprises adding cellulose acetate to the paper and rag fibres prior to the Fourdrinier machine, processing the paper in the usual manner, parchmentizing the paper, superimposing the sheets to obtain the thick-

ness desired, and thereafter heating the same under pressure to cause the cellulose acetate to flow throughout the mass.

5. The process of making a paper product which comprises adding a cellulose ester to the paper and rag fibres prior to the Fourdrinier machine, processing the paper in the usual manner, parchmentizing the paper, leaching out the parchmentizing agent with water, and thereafter subjecting the parchmentized sheet to the action of a solvent for the cellulose ester whereupon the solvent displaces the water in the pores and causes a film of cellulose ester to form in the parchment membrane.

6. The process of making a paper product which comprises adding cellulose acetate to the paper and rag fibres prior to the Fourdrinier machine, processing the paper in the usual manner, parchmentizing the paper, leaching out the parchmentizing agent with water, and thereafter subjecting the parchmentized sheet to the action of a solvent for the cellulose acetate whereupon the solvent displaces the water in the pores and causes a film of the cellulose acetate to form in the parchment membrane.

7. The process of making a paper product which comprises adding a cellulose ester to the paper and rag fibres prior to the Fourdrinier machine, processing the paper in the usual manner, parchmentizing the paper, superimposing the sheets to obtain the thickness desired, and thereafter subjecting the parchmentized sheets to the action of a solvent for the cellulose ester whereupon the solvent displaces the water in the pores and causes a film of the cellulose ester to form in the parchment membrane.

8. The process of making a paper product which comprises adding cellulose acetate to the paper and rag fibres prior to the Fourdrinier machine, processing the paper in the usual manner, parchmentizing the paper, superimposing the sheets to obtain the thickness desired, and thereafter subjecting the parchmentized sheets to the action of a solvent for the cellulose acetate whereupon the solvent displaces the water in the pores and causes a film of the cellulose acetate to form in the parchment membrane.

9. A parchmentized paper product comprising a cellulose ester intimately dispersed throughout the paper and rag fibres.

10. A parchmentized paper product comprising cellulose acetate intimately dispersed throughout the paper and rag fibres.

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