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ARTICLES FROM CELLULOSE DERIVATIVES
OF THE HIGHER FATTY ACIDS

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This invention is based on the observation that cellulose derivatives containing radicles of higher fatty acids under mechanical pressure and at an elevated temperature lying below that at which the said cellulose derivatives become fluid pass into transparent masses of great toughness and pliability which no longer show fibrous structure. In this state they may be moulded to any desired shape and articles may be manufactured from them without employing a solvent.

The cellulose derivatives in question, soluble or not in organic solvents or water, are characterized by the content in their molecule of radicles of higher fatty acids comprising fatty acids, saturated as well as unsaturated, with more than eight carbon atoms. These cellulose derivatives may contain besides radicles of a higher fatty acid radicles of other organic acids; partly the cellulose may be etherified.

Additional materials of any kind, for instance filling, coloring and other additional products known in the manufacture of cellulose derivative plastics may be incorporated with the cellulose derivatives of the higher fatty acids which are to be moulded, for example other cellulose derivatives, cellulose, cork, woodmeal, organic dyestuffs, inorganic pigments, finely ground minerals, like gypsum or heavy-spar, paraffin, wax, tar and asphalt products, natural and artificial resins, higher fatty acids, acid derivatives, aryl phosphoric acid esters and the like.

The temperatures and pressures to be used in the moulding operation depend on the kind of cellulose derivative, the kind and proportion of added material, the desired properties of the finished material and the apparatus used. They may be varied within wide limits.

By the new process shaped masses of any kind may be formed such as rods, tubes, sheets of any desired thickness, for example films, slabs, plates, insulating bodies.

In order to impart enhanced strength to the products there may be pressed into them during moulding operation a reinforcing material such as any filament, threads, wires, tissues.

The cellulose derivatives and compositions made from them may be for instance instead of linseed oil, linseed oil varnish or linseed oil worked up into floorcloth, washable carpets, washable cloth and the like. The products are completely waterproof, free from pores and stable to the action of alkali lye.

In an analogous manner waterproof paper and cardboard is obtainable, suitable for instance as an insulating material. For example the process

may be carried out in mixing cellulose pulp with a cellulose derivative of the mentioned kind, working up the mixture to paper in the usual manner and treating the paper thus obtained between heated cylinders of a calender or pressing it into a heated mould.

The cellulose derivatives mentioned above which contain radicles of different acids are obtainable for instance by esterifying a cellulose material successively with different acidulating agents. They also can be obtained by treating a cellulose material with a mixture of different acidulating agents, for instance prepared from the acid of cocoa-nut oil, which is available on the market as a by-product from the manufacture of edible fats and constitutes a mixture of chiefly lauric, myristic and stearic acid and little quantities of capric, caproic and caprylic acid.

The following examples illustrate the invention without limiting it.

Example 1.—Cellulose laurate, which is insoluble in organic solvents and contains from 50 to 85 per cent. of combined lauric acid, is comminuted in a mill so as to produce small pieces. The comminuted mass is applied to a jute band and pressed in a calender or in a hydraulic press at a pressure of 50 to 300 atmospheres at about 120° C. There is obtained a completely transparent sheet of high resistance, which is suitable as a floor-cloth. Colored cellulose laurate may be used or some coloring agent or other materials, such as woodmeal or ground cork, may be added to the cellulose laurate. The jute support can be omitted if so desired. Rods and other shaped objects can be made in an analogous manner.

Example 2.—Elaidic acid ester of cellulose, which is insoluble in organic solvents, is finely ground and pressed as described in Example 1 to form a thin layer on a support of strong paper. The ester may be colored before the pressing operation or may be printed with a pattern after the pressing. The press mould can itself be patterned. A completely water-proof, washable carpet is obtained.

Example 3.—A finely ground cellulose ester of the acid from cocoa-nut oil, for example the tri-ester, is pressed into the form of a thin sheet on a cotton fabric at 100–150° C. There is obtained a washable cloth of surprising softness, density and resistance to water. It may be bent without breaking.

Example 4.—A cellulose acetate-stearate containing about 50 per cent. of combined stearic acid is pressed at 120° C. The plate obtained is

transparent and has a high bending elasticity and resistance to tearing.

Example 5.—An ethyl-cellulose laurate is pressed at 120° C. under 3 atmospheres pressure. There is obtained a transparent, very elastic product.

Example 6.—Ethyl-cellulose and four times its weight of a fatty acid ester are intimately mixed and the mixture is pressed at 120° C. under 20 atmospheres pressure. The translucent mass thus made has advantageous mechanical properties.

Example 7.—100 parts by weight of cellulose pulp are mixed in the pulping-engine with 3 parts by weight of insoluble cellulose dilaurate. The paper resulting from this mixture is led under the pressure of 50 atmospheres through 2 cylinders heated at 110 to 120° C. Under the working conditions set forth in the foregoing examples and comprising pressing cellulose derivatives of higher fatty acids at a temperature below the fluidity point, the said cellulose esters are colloided or gelatinized, that is, they are transformed into transparent masses of great toughness and pliability and show no longer any structure of the cellulose derivative used as starting material. In the claims following hereafter, the term "gelatinizing" is intended to denote this structural transformation of the cellulose esters.

What we claim is:

1. The process which comprises moulding and gelatinizing an unformed and heterogeneous mass containing as a substantial constituent a fibrous cellulose derivative the hydroxyl groups of which are at least partly esterified by means of a higher fatty acid, by subjecting the said cellulose derivative to mechanical pressure at an elevated temperature lying below the fluidity point of the said cellulose derivative.

2. The process which comprises moulding and gelatinizing an unformed and heterogeneous mass containing as a substantial constituent a fibrous cellulose derivative the hydroxyl groups of which are partly esterified by means of a higher fatty acid and partly by means of a different organic acid, by subjecting the said cellulose derivative to mechanical pressure at an elevated temperature lying below the fluidity point of the said cellulose derivative.

3. The process which comprises moulding and gelatinizing an unformed and heterogeneous mass containing as a substantial constituent a fibrous cellulose derivative the hydroxyl groups of which are at least partly esterified by means of a higher fatty acid, by subjecting the said cellulose derivative to mechanical pressure at a temperature of about 100–150° C.

4. The process which comprises moulding and gelatinizing an unformed and heterogeneous mass containing as a substantial constituent a fibrous cellulose derivative the hydroxyl groups of which are partly esterified by means of a higher fatty acid and partly by means of a different organic acid, by subjecting the said cellulose derivative to mechanical pressure at a temperature of about 100–150° C.

5. The process which comprises moulding and gelatinizing an unformed and heterogeneous mass containing as a substantial constituent a fibrous cellulose derivative the hydroxyl groups of which are partly esterified by means of stearic acid, by subjecting the said cellulose derivative to mechanical pressure at an elevated temperature lying below the fluidity point of the said cellulose derivative.

6. The process which comprises moulding and gelatinizing an unformed and heterogeneous mass containing as a substantial constituent a fibrous cellulose derivative the hydroxyl groups of which are partly esterified by means of stearic acid and partly by means of a different organic acid, by subjecting the said cellulose derivative to mechanical pressure at an elevated temperature lying below the fluidity point of the said cellulose derivative.

7. The process which comprises moulding and gelatinizing an unformed and heterogeneous mass containing as a substantial constituent a fibrous cellulose derivative the hydroxyl groups of which are partly esterified by means of stearic acid and partly by means of acetic acid, by subjecting the said cellulose derivative to mechanical pressure at a temperature of about 120° C.

8. As an article of manufacture a material consisting substantially of a molded homogeneous and gelatinized derivative of cellulose, in which derivative at least part of the hydroxyl groups of said cellulose is esterified by radicals of a higher fatty acid.

9. As an article of manufacture a material consisting substantially of a molded homogeneous and gelatinized derivative of cellulose, in which derivative part of the hydroxyl groups of said cellulose is esterified by radicals of a higher fatty acid, and part by the radicals of a different organic acid.

10. As an article of manufacture a material consisting of a moulded homogeneous and gelatinized cellulose derivative the hydroxyl groups of which are at least partly esterified by means of a higher fatty acid.

11. As an article of manufacture a material consisting of a moulded homogeneous and gelatinized cellulose derivative the hydroxyl groups of which are partly esterified by means of a higher fatty acid and partly by means of a different organic acid.

12. As an article of manufacture a material consisting of a moulded homogeneous and gelatinized cellulose derivative the hydroxyl groups of which are at least partly esterified by means of stearic acid.

13. As an article of manufacture a material consisting of a moulded homogeneous and gelatinized cellulose derivative the hydroxyl groups of which are partly esterified by means of stearic acid and partly by means of acetic acid.

14. As an article of manufacture a material consisting of a molded homogeneous and gelatinized cellulose derivative the hydroxyl groups of which are at least partly esterified by means of a higher fatty acid, said cellulose derivative being insoluble in volatile organic solvents.

15. As an article of manufacture a material consisting of a molded homogeneous and gelatinized cellulose derivative the hydroxyl groups of which are at least partly esterified by means of cocoa-nut oil acids.

16. As an article of manufacture a material consisting of a molded homogeneous and gelatinized cellulose tri-ester of cocoa-nut oil acids.

17. As an article of manufacture a material consisting of a molded homogeneous and gelatinized cellulose dilaurate.

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