

UNITED STATES PATENT OFFICE

2,080,755

YARNS AND FABRICS OF CELLULOSE DERIVATIVES AND METHOD OF MAKING SAME

William Whitehead, Cumberland, Md., assignor to Celanese Corporation of America, a corporation of Delaware

No Drawing. Application October 3, 1934, Serial No. 746,702

17 Claims. (Cl. 8—13)

This invention relates to the production of filaments, yarns, fabrics and other artificial materials containing organic derivatives of cellulose that have incorporated therein a lubricant that allows for the easy and ready processing of the same, and which lubricant in the finished fabric or article comprises one component of a weighting compound which, when reacted with another component, makes for a fabric that is delustered and weighted.

An object of this invention is the formation of artificial materials, such as fabrics, from filaments containing organic derivatives of cellulose and a lubricant, which lubricant in the finished product is changed, by reacting the same with another compound to an insoluble compound giving a delustered appearance to the product and lends weight thereto. Another object of the invention is the production of a weighted fabric of artificial material in which the insoluble weighting compound is formed in the material after one component of same has furnished the lubrication for the material during processing from filaments to a fabric. Other objects of the invention will appear from the following detailed description.

By this invention filaments, yarns and threads containing organic derivatives of cellulose are more readily processed as they are sufficiently lubricated to pass through guides, needles, etc., and they are sufficiently pliable to be flexed and bent into sharp angles as required in twisting, knitting, netting, knotting and the like. These filaments are sufficiently lubricated that for normal use they require no coating of an oily substance such as is ordinarily required in processing such yarns. Thus, there is eliminated from the production of fabrics the separate step of applying lubricants to yarn which lubricants are later to be removed in dyeing, scouring and the other finished processes.

By this invention a part of the weighting compound is introduced into the filaments by way of the spinning solution yet there is produced no harsh or cutting effect in the filaments, but, on the contrary, lubricated, pliable filaments are produced.

By employing my invention, it is possible to form weighted and delustered fabrics expeditiously in that only one element of the weighting substance is incorporated before formation of the threads and the same is formed into an article and to this element in the final weighting step there is coupled the other part of the weighting compound. By this method much

smaller molecules penetrate into the formed filaments resulting in a more even and thorough dispersion which produces a more desirable delustering and weighting than is obtained by a process wherein whole weighting compounds are incorporated into the filaments, or where numerous baths are employed to incorporate the various components of the weighting compound.

According to my invention, I form filaments containing organic derivatives of cellulose by the methods known in the art, which filaments contain a material having lubricating properties, such as an alkylolamine salt of a fatty acid that is neutral and non-injurious to material of the filaments, for example, tri-ethanolamine stearate. The alkylolamine salt of the fatty acid incorporated in the filaments lends to the filaments sufficient lubrication for processing and, after processing to the finished article, the filaments may then be treated with a soluble metallic salt that forms an insoluble salt or a slightly soluble salt with the fatty acid radical. In the treating bath of the soluble salt, small amounts of the ethanolamine salt of the fatty acid is removed from the filaments leaving microscopic pores therein which lends to the fabric a soft delustered appearance.

This invention is applicable to the preparation of fabrics and other articles formed from filaments containing organic derivatives of cellulose such as organic esters of cellulose and cellulose ethers. Examples of organic esters of cellulose are cellulose acetate, cellulose formate, cellulose butyrate and cellulose propionate, while examples of cellulose ethers are methyl cellulose, ethyl cellulose and benzyl cellulose.

The filaments may be formed by either the wet or dry methods of spinning filaments. For example, a solution of cellulose acetate dissolved in acetone may have added thereto from 1 to 8% of an ethanolamine salt of a fatty acid and the solution is extruded through suitable orifices into a solvent removal medium or into a cellulose derivative solidifying medium. The filaments thus formed may then be twisted or otherwise formed into yarns, threads, etc., or cut to suitable lengths as staple fiber and spun to yarns or threads in any suitable manner. These yarns and threads may then be woven, knitted, netted, knotted or otherwise processed to fabrics or other articles. This processing usually requires no lubricant to be added to yarns and threads as the ethanolamine salt of fatty acid in the filaments furnishes sufficient lubrication for the processing of the filaments.

However, where desired a coating of lubricant such as a vegetable, mineral or animal oil, such as tea seed oil, olive oil or mixtures of an oil and glycerine, glycol or their derivatives and the like may be used. In place of incorporating the alkylolamine salt of a fatty acid with the filaments by placing same in the solution from which the filaments are formed, it may be incorporated in formed filaments by applying a coating of same to the filaments in the presence of swelling agents.

Yarns and filaments may contain besides the organic derivative of cellulose and the ethanolamine salt of a fatty acid other effect materials such as dyes, lakes, fire retardants, plasticizers and pigments. These effect materials may be incorporated into the filaments by adding the same to the solution from which the filaments are formed or they may be added after the natal state of the filaments by applying the same as coatings to the filaments with or without the presence of solvents and/or softening agents.

Any suitable ethanolamine salt may be used as a lubricant to be incorporated in the yarn. For example, the mono-, di- or tri-ethanolamine, or derivatives thereof, salt of any suitable fatty acid may be employed. The fatty acid radical is preferably a stearate. However, other fatty acid radicals may be employed such as palmitate, oicete, etc. In place of or in conjunction with the ethanolamine salts, there may be used the fatty acid salts of butanolamine, propanolamine or derivatives of alkylamines such as dioxy propanolamine and diaminopropanol.

The quantity of alkylolamine salt of fatty acids employed will depend somewhat upon the amount of weighting required in the finished product, as well as the degree of lubrication required during processing. Such amount may be between 1 to 8% based on the weight of the organic derivatives of cellulose. In forming the fabric of filaments of cellulose acetate in which a normal amount of weighting is desired, it is preferable to use 2% on the weight of the cellulose acetate of tri-ethanolamine stearate. The fabric may be processed to contain, besides the filaments of organic derivatives of cellulose, fibers, filaments and/or yarns of other materials such as cotton, wool, flax, silk or artificial filaments.

After the fabric or other article is processed, the same may then be treated in an aqueous bath of a soluble metallic salt, the metallic ion of which when reacted with the fatty acid produces an insoluble or slightly soluble salt of a fatty acid. It is preferable to treat the fabric with the aqueous solution containing from 40 to 60% excess of the soluble salt required to precipitate the insoluble salt, and the treating bath is preferably from 20 to 40 times the weight of the fabric, with the temperature of from 20° to 75° C. The duration of treatment is dependent upon the type of organic derivative of cellulose employed and the salts undergoing double decomposition. However, when employing tri-ethanolamine stearate as the lubricating constituent and barium chloride as the precipitating constituent, while the filaments are of cellulose acetate, a period of about 1 hour is preferred. The soluble salt employed may be barium chloride, barium cyanide, calcium chloride, or other water soluble salts the metal ion of which forms a substantially insoluble salt with the fatty acids.

After precipitating the insoluble salt in the filaments, the fabric may be washed free of excess

reagents, dried and ironed in a normal manner. This fabric, upon examination, will be found to contain approximately 50% of the theoretical amount of insoluble salts added to the filaments. The remaining 50% was removed in the form of the alkylolamine salt of the fatty acid during the treatment with the soluble metallic salts. However, this removal of the alkylolamine salt from the filaments causes a substantial deluster thereof that may be prevented, however, by employing swelling agents in the precipitating bath. Examples of suitable swelling agents are an aqueous solution of acetic acid and/or formic acid.

As an illustration and not as a limitation the following example is given.

Example

A solution of cellulose acetate in acetone containing 2% on the weight of the cellulose acetate of triethanolamine stearate is extruded through suitable orifices into an evaporative atmosphere thereby forming filaments. The filaments are twisted into yarns and woven into a fabric. The fabric is then submerged in a treating bath containing 50% excess of $BaCl_2$ on the stoichiometric amount required to react with the triethanolamine stearate. The bath is preferably 30 times the weight of the fabric and maintained at about 70° C. during the treatment of 1 hour.

The fabric resulting from such treatment is found to contain an even dispersion of insoluble barium stearate equal to about 50% the theoretical amount added. The yarn in processing is lubricated and the final weighting step only requires one bath treatment.

It is to be understood that the foregoing detailed description is merely given by way of illustration and many alterations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. In a method of forming weighted articles containing artificial filaments the steps of incorporating an alkylolamine salt of a fatty acid in the artificial filaments, processing the filaments to an article and treating said article with a soluble metallic salt the metallic ion forming an insoluble salt with the fatty acid producing an insoluble salt in the artificial filaments.

2. In a method of forming weighted articles containing filaments of organic derivatives of cellulose the steps of incorporating an alkylolamine salt of a fatty acid into said filaments, processing the filaments to an article and treating said article with a soluble metallic salt the metallic ion forming an insoluble salt with the fatty acid producing an insoluble salt in the artificial filaments.

3. In a method of forming weighted articles containing filaments of cellulose acetate the steps of incorporating an alkylolamine salt of a fatty acid into said filaments, processing the filaments to an article and treating said article with a soluble metallic salt the metallic ion forming an insoluble salt with the fatty acid producing an insoluble salt in the artificial filaments.

4. In a method of forming weighted articles containing artificial filaments the steps of forming filaments containing an alkylolamine salt of a fatty acid, processing the filaments to an article and treating said article with a soluble metallic salt the metallic ion being capable of

forming a substantially insoluble salt with the fatty acid.

5. In a method of forming weighted articles containing organic derivatives of cellulose the steps of forming filaments from a solution of an organic derivative of cellulose containing an alkylolamine salt of a fatty acid, processing the filaments to an article and treating said article with a soluble metallic salt the metallic ion being capable of forming a substantially insoluble salt with the fatty acid.

6. In a method of forming weighted articles containing cellulose acetate the steps of forming filaments from a solution of cellulose acetate containing an alkylolamine salt of a fatty acid, processing the filaments to an article and treating said article with a soluble metallic salt the metallic ion being capable of forming a substantially insoluble salt with the fatty acid.

7. In a method of forming weighted fabrics of filaments containing organic derivatives of cellulose the steps of forming filaments from a solution of an organic derivative of cellulose containing an ethanolamine salt of a fatty acid, processing the filaments to a fabric and treating said fabric with a soluble salt of an alkali earth metal.

8. In a method of forming weighted fabrics of filaments containing cellulose acetate the steps of forming filaments from a solution of cellulose acetate containing an ethanolamine salt of a fatty acid, processing the filaments to a fabric and treating said fabric with a soluble salt of an alkali earth metal.

9. In a method of forming weighted fabrics of filaments containing an organic derivative of cellulose the steps of forming filaments from a solution of an organic derivative of cellulose containing triethanolamine stearate, processing the filaments to a fabric and treating said fabric with a soluble salt of a metal that forms substantially insoluble salt with stearic acid.

10. In a method of forming weighted fabrics of filaments containing cellulose acetate the steps of forming filaments from a solution of cellulose acetate containing triethanolamine stearate, processing the filaments to a fabric and treating said fabric with a soluble salt of a metal that forms substantially insoluble salt with a stearic acid.

11. In a method of forming weighted fabrics of filaments containing an organic derivative of cellulose the steps of forming filaments from a solution of an organic derivative of cellulose containing from 1 to 8% on the weight of the organic derivative of cellulose of triethanolamine stearate, processing the filaments to a fabric and treating said fabric in a bath containing a soluble salt of a metal that forms a substantially insoluble salt with stearic acid.

12. In a method of forming weighted fabrics of filaments containing cellulose acetate the steps of forming filaments from a solution of cellulose acetate containing from 1 to 8% on the weight of the cellulose acetate of triethanolamine stearate, processing the filaments to a fabric and treating said fabric in a bath containing a soluble salt of a metal that forms a substantially insoluble salt with stearic acid.

13. In a method of forming weighted fabrics of filaments containing an organic derivative of cellulose the steps of forming filaments from a solution of an organic derivative of cellulose containing triethanolamine stearate, processing the filaments to a fabric and treating said fabric in a heated bath containing a stoichiometric excess of a soluble salt of a metal that forms a substantially insoluble salt with stearic acid.

14. In a method of forming weighted fabrics of filaments containing cellulose acetate the steps of forming filaments from a solution of cellulose acetate containing triethanolamine stearate, processing the filaments to a fabric and treating said fabric in a heated bath containing a stoichiometric excess of a soluble salt of a metal that forms a substantially insoluble salt with stearic acid.

15. In a method of forming weighted fabrics of filaments containing an organic derivative of cellulose the steps of forming filaments from a solution of an organic derivative of cellulose containing about 2% on the weight of the organic derivative of cellulose of triethanolamine stearate, processing the filaments to a fabric and treating said fabric in an aqueous bath containing a stoichiometric excess of a soluble salt of a metal that forms a substantially insoluble salt with stearic acid.

16. In a method of forming weighted fabrics of filaments containing cellulose acetate the steps of forming filaments from a solution of cellulose acetate containing about 2% on the weight of the cellulose acetate of triethanolamine stearate, processing the filaments to a fabric and treating said fabric in an aqueous bath containing a stoichiometric excess of a soluble salt of a metal that forms a substantially insoluble salt with stearic acid.

17. A method of forming weighted fabrics of filaments some of which contain cellulose acetate which comprises forming filaments from a solution of cellulose acetate containing 2% on the weight of the cellulose acetate of triethanolamine stearate, processing the filaments to a fabric and treating, for one hour, said fabric in an aqueous bath, maintained at about 70° C., that contains about 50% stoichiometric excess of barium chloride.

WILLIAM WHITEHEAD. 60