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METHOD FOR SIZING TEXTILE FABRIC

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This invention relates to a method for sizing textile fabric and to the product thereof, and more particularly relates to a method for sizing textile fabric by means of a thermoplastic film-forming composition resistant to hydrolysis by alkaline washing solutions.

The object of this invention is to produce a permanently sized textile fabric suitable for articles of wearing apparel customarily starched, which after pressing with a hot iron, is transformed into a stiffer material having an apparently heavier body and, generally, a starched appearance.

A further object of this invention is to provide a sized textile fabric from which the sizing material is not removed by repeated laundering, which needs only to be pressed with a hot iron to produce a stiff, yet pliable, starch-like finish, and which is porous so as to allow the passage of water and moisture.

A further object of this invention is to provide a pliable, yet firmly-set textile fabric in which tears and rips proceed with greater difficulty than in the untreated material, and in which adjacent threads are not strained or loosed when the material is torn.

The product in accordance with this invention comprises a textile fabric which contains a solid, thermoplastic, film-forming material which is substantially inert to the action of aqueous alkaline solutions throughout the individual threads thereof, and bonding adjacent threads together, but not forming a continuous coating on the individual threads or filling the interstices between the individual threads. This product will be found to be permanently sized and of a starched appearance which is retained after many washing and ironing operations, even when the washing is carried out in strong alkaline solutions.

The method in accordance with this invention comprises impregnating a textile fabric with an aqueous emulsion of a solution of a solid, thermoplastic, film-forming material substantially inert to the action of aqueous alkaline washing solutions in a volatile substantially water-immiscible solvent, removing the excess emulsion from the cloth, evaporating the water and the volatile solvent from the impregnated fabric and then pressing the fabric at a temperature at which at

least incipient fusion of the thermoplastic composition occurs, such as, for example, in the case of an ethyl cellulose composition, a temperature within the range of about 180° F. to about 360° F. and preferably a temperature of about 240° F. to about 360° F., and more preferably a temperature of about 320° F. to about 360° F.

In following my method the excess emulsion may be conveniently removed from the cloth by passing the cloth between padded rolls. The amount of emulsion remaining in the cloth after the excess has been removed, will desirably be such that the amount of dry thermoplastic composition remaining in the fabric at the end of my procedure will be sufficient to impregnate the individual threads of the fabric and to substantially bond the threads together where directly adjacent, but insufficient to fill the interstices between the threads or to form a continuous coating over the surface of the textile. The amount of the dry thermoplastic composition remaining in the fabric will ordinarily be within the range of about 5% to about 40% by weight of the untreated cloth.

The aqueous emulsion used in accordance with my invention will comprise an emulsion of a solution of a solid thermoplastic, film-forming material substantially inert to the action of alkaline washing solutions in a suitable volatile solvent therefor which is substantially immiscible with water. Thermoplastic materials which are suitable for use in accordance with this invention are organic esters of cellulose, as, cellulose acetate, cellulose propionate, etc.; mixed esters of cellulose, as, cellulose nitro-acetate, cellulose aceto-butyrates, cellulose aceto-laurate, etc.; cellulose ethers, as, ethyl cellulose, propyl cellulose, hydroxy ethyl cellulose, butyl cellulose, etc.; polyvinyl acetate resins; mixed vinyl acetate-vinyl chloride resins; polyacrylic acid ester resins, as, polyethyl acrylate, polymethyl acrylate, methyl methacrylate; mixtures of vinyl and acrylate resins, mixtures of glycol, glycerol and glycol esters of terpinene maleic anhydride resins, chlorinated rubber, rubber hydrochloride, chlorinated rubber hydrochloride, etc. Nitrocellulose is not suitable for this purpose, since it is not resistant to the action of aqueous alkaline solutions, and is not a true thermoplastic.

The solution of the thermoplastic material

may, if desired, contain a suitable softening or plasticizing agent for lowering the softening temperature of the material. When using a material which softens at a temperature of 400° F. or above, a plasticizer will desirably be added. The plasticizer selected for this purpose will desirably be resistant to hydrolysis in alkaline solutions. The particular plasticizer used will also desirably be compatible with the thermoplastic material used. Suitable plasticizers for use with thermoplastic cellulose derivatives are, for example, hydrogenated methyl abietate, hydrogenated ethyl abietate, triphenyl phosphate, tricresyl phosphate, tributyl phosphate, methyl phthalyl methyl glycolate, ethyl phthalyl ethyl glycolate, etc.

The aqueous emulsion which I use will contain an emulsifying agent of a non-film forming type or mixture of such emulsifying agents and will desirably be finely dispersed. Suitable emulsifying agents are, for example, the alkali metal salts of the higher aliphatic half ester sulfates, as sodium lauryl sulfate, sodium stearyl sulfate, etc.; sulfonated oils, as sulfonated castor oil, sulfonated olive oil, etc.; soaps, as sodium stearate, sodium oleate, etc.; alkali metal salts of alkyl naphthalene sulfonic acids, as sodium butyl naphthalene sulfonate, sodium isopropyl naphthalene sulfonate, etc.

The solids deposited in a textile fabric when impregnated with a thermoplastic film-forming material resistant to alkaline hydrolysis by the method in accordance with this invention, will generally be laid down in the threads of the fabric as an adherent mass. However, with certain impregnating materials, as for example, ethyl cellulose, an emulsion deposits the material as fluffy, poorly adhering masses. In the use of such a material, it is desirable, although not essential, to subject the textile fabric to a pretreatment with a dilute aqueous solution of an inorganic salt, and preferably a salt of a polyvalent metal, prior to impregnating the fabric with the emulsion. Salts used for this purpose may be, for example, aluminum chloride, aluminum sulfate, zinc chloride, zinc sulfate, calcium chloride, etc. An aqueous solution of an inorganic salt having a concentration within the range of about 0.5% to about 3.0% by weight will be found suitable for this purpose.

The following examples further illustrate emulsion compositions suitable for the treatment of a textile fabric, such as for example, organdy, broadcloth, the heavy cotton fabric used for nurses' uniforms, etc., in accordance with this invention.

EXAMPLE I

A solution of the following composition was prepared:

	Per cent by weight
Ethyl cellulose	16.6
Hydrogenated methyl abietate.....	3.4
Toluol.....	56.0
Butanol.....	16.0
Naphtha (Hi-Flash).....	8.0
	100.0

Five hundred grams of the above solution were emulsified in 300 cc. of water containing 1.5 grams of sodium lauryl sulfate and 3 grams of sulfonated castor oil, to form an oil-in-water type emulsion by admixing the two solutions and

passing the mixture through a colloid mill. The emulsion was uniform and of fine particle size.

EXAMPLE II

A solution of the following composition was prepared:

	Per cent by weight
Cellulose acetobutyrate.....	12
Methyl phthalyl ethyl glycolate.....	6
Triphenyl phosphate.....	6
Ethylene dichloride.....	46
Ethylene glycol monoethyl ether acetate (Cellosolve acetate).....	20
B-B dichlorethyl ether.....	10
	100

One hundred parts of the above formula were emulsified in 40 parts of water containing ½% sodium lauryl sulfate and 1% sulfonated castor oil by admixture and then passage through a colloid mill.

EXAMPLE III

Film phase

	Parts by weight
Chlorinated rubber (Tornesit-30 cp. grade) ..	100
Hydrogenated methyl abietate.....	15
Oleic acid	4.9
Toluol.....	16
Xylol.....	110

Water phase

Distilled water	98.5
NaOH.....	0.7

These two phases are run together through the colloid mill for emulsification.

EXAMPLE IV

Film phase

	Parts by weight
Poly vinyl acetate resin (Gelva 15).....	25
Toluol.....	55
Butyl acetate	20

Water phase

Distilled water.....	39.4
Sodium lauryl sulfate.....	0.2
Sulfonated castor oil.....	0.4

The two phases may be shaken together for dispersion, or emulsified in a colloid mill.

The following examples further illustrate the method in accordance with this invention.

A sample of heavy, unsized cotton broadcloth was immersed in a 1% aqueous solution of aluminum chloride, passed between squeeze rolls and then immersed in an emulsion of the composition shown in Example I, containing ethyl cellulose. The broadcloth saturated with the ethyl cellulose emulsion was then passed between padded squeeze rolls to remove the excess, and then through a drying tunnel at approximately 100° F. At this stage of the treatment the cloth was no stiffer than the untreated broadcloth, and microscopic examination showed that the individual threads of the cloth were impregnated with minute pellets of ethyl cellulose plastic. The treated broadcloth was pressed with a hot iron at a temperature of about 340° F. After ironing, the weight of the broadcloth was found to have been increased about 30%. It was found to have a starched appearance, and to be much stiffer than the untreated cloth, yet still pliable. It was found to be more difficult to tear than

the original cloth, and when torn gave a clean tear with unraveled edges. The interstices between the threads of the treated cloth were not closed, so that the treated cloth was not im-

5 pervious to the passage of water and moisture, and can be used for the same purposes as the untreated broadcloth which has been starched. The broadcloth so treated has a decided advantage over broadcloth which has been starched,

10 in that the sizing is not removed even after repeated laundering.

A sample of organdy was immersed in an emulsion of the composition shown in Example II, containing cellulose acetobutyrate. The organdy saturated with emulsion was then passed

15 between padded squeeze rolls and through a drying tunnel. The cloth so treated was then pressed with a hot iron at a temperature of about 340° C. The organdy so treated was found to

20 have been increased in weight by about 25%, and to have a starched appearance.

It will be understood that the details and examples hereinbefore set forth are illustrative only, and that the invention as herein broadly de-

25 scribed and claimed is in no way limited thereby.

This application is a continuation-in-part of my application for United States patent, Serial No. 158,261, filed August 9, 1937, which is in turn a division of my application, Serial No. 99,957,

30 filed September 9, 1936, and now U. S. Patent No. 2,176,053.

What I claim and desire to protect by Letters Patent is:

1. A method for the production of a sized textile fabric characterized by stiffness and a starch-like finish in the absence of starch, and pervious-

35 ness to both moisture and air, which includes impregnating a fabric with an aqueous emulsion comprising a substantially water-immiscible solution of ethyl cellulose in a volatile solvent so as

40 to impregnate the individual threads of the fabric and to substantially bond the threads together where directly adjacent but insufficient to fill the interstices between the threads or to form a continuous coating over the surface of the fabric, the

45 amount of emulsion remaining in the fabric being such as to leave, on drying, non-volatile material in the fabric in amount within the range of about 5% to about 40% by weight of the fabric, evaporating the water and volatile solvent from the emulsion contained in the said fabric and then pressing the fabric at a temperature at which at least incipient fusion of the ethyl cellulose composition occurs.

2. A method for the production of a sized textile fabric characterized by stiffness and a starch-like finish in the absence of starch, and pervious-

55 ness to both moisture and air, which includes impregnating a fabric with an aqueous emulsion comprising a substantially water-immiscible solution of ethyl cellulose in a volatile solvent so as

60 to impregnate the individual threads of the fabric and to substantially bond the threads together where directly adjacent but insufficient to fill the interstices between the threads or to form a continuous coating over the surface of the fabric, the amount of emulsion remaining in the fabric being such as to leave, on drying, non-volatile material in the fabric in amount within the range

70 of about 5% to about 40% by weight of the fabric, evaporating the water and volatile solvent from the emulsion contained in the said fabric and then pressing the fabric at a temperature within the range of about 180° F. to about 360° F.

75 3. A method for the production of a sized tex-

tile fabric characterized by stiffness and a starch-like finish in the absence of starch, and pervious-

5 ness to both moisture and air, which includes impregnating a fabric with an aqueous emulsion comprising a substantially water-immiscible solution of ethyl cellulose in a volatile solvent so as to impregnate the individual threads of the fabric and to substantially bond the threads together where directly adjacent but insufficient to fill the interstices between the threads or to form

10 a continuous coating over the surface of the fabric, the amount of emulsion remaining in the fabric being such as to leave, on drying, non-volatile material in the fabric in amount within the range of about 5% to about 40% by weight of

15 the fabric, evaporating the water and volatile solvent from the emulsion contained in the said fabric and then pressing the fabric at a temperature within the range of about 240° F. to about 360° F.

4. A method for the production of a sized textile fabric characterized by stiffness and a starch-like finish in the absence of starch, and pervious-

25 ness to both moisture and air, which includes impregnating a fabric with an aqueous emulsion comprising a substantially water-immiscible solution of ethyl cellulose in a volatile solvent so as to impregnate the individual threads of the fabric and to substantially bond the threads together where directly adjacent but insufficient to

30 fill the interstices between the threads or to form a continuous coating over the surface of the fabric, removing the excess emulsion from the fabric so that the emulsion remaining therein will, on drying, leave non-volatile material in the fabric in amount within the range of about 5% to about 40% by weight of the fabric, evaporating the water and volatile solvent from the emulsion contained in the said fabric and then pressing the fabric at a temperature at which at least incipient fusion of the ethyl cellulose composition occurs.

5. A method for the production of a sized textile fabric characterized by stiffness and a starch-like finish in the absence of starch, and pervious-

45 ness to both moisture and air, which includes impregnating a fabric with an aqueous emulsion comprising a substantially water-immiscible solution of ethyl cellulose and a plasticizer therefor in a volatile solvent so as to impregnate the individual threads of the fabric and to substantially bond the threads together where directly adjacent but insufficient to fill the interstices between the threads or to form a continuous coating over the surface of the fabric, the amount of emulsion remaining in the fabric being such as to leave, on drying, non-volatile material in the fabric in amount within the range

50 of about 5% to about 40% by weight of the fabric, evaporating the water and volatile solvent from the emulsion contained in the said fabric and then pressing the fabric at a temperature at which at least incipient fusion of the ethyl cellulose composition occurs.

6. A method for the production of a sized textile fabric characterized by stiffness and a starch-like finish in the absence of starch, and pervious-

65 ness to both moisture and air, which includes impregnating a fabric with an aqueous emulsion comprising a substantially water-immiscible solution of ethyl cellulose in a volatile solvent so as to impregnate the individual threads of the fabric and to substantially bond the threads together where directly adjacent but insufficient to fill the interstices between the

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threads or to form a continuous coating over the surface of the fabric, removing the excess emulsion from the fabric so that the emulsion remaining therein will, on drying, leave non-volatile material in the fabric in amount within the range of about 5% to about 40% by weight of the fabric, evaporating the water and volatile solvent from the emulsion contained in the said fabric and then pressing the fabric at a temperature within the range of about 240° F. to about 360° F.

7. A method for the production of a sized textile fabric characterized by stiffness and a starch-like finish in the absence of starch, and perviousness to both moisture and air, which includes impregnating a fabric with an aqueous emulsion comprising a substantially water-immiscible solution of ethyl cellulose and a plasticizer therefor in a volatile solvent so as to impregnate the individual threads of the fabric and to substantially bond the threads together where directly adjacent but insufficient to fill the interstices between the threads or to form a continuous coating over the surface of the fabric, removing the excess emulsion from the fabric so that the emulsion remaining therein will, on drying, leave non-volatile material in the fabric in amount within the range of about 5% to

about 40% by weight of the fabric, evaporating the water and volatile solvent from the emulsion contained in the said fabric and then pressing the fabric at a temperature within the range of about 240° F. to about 360° F.

8. A method for the production of a sized textile fabric characterized by stiffness and a starch like finish in the absence of starch, and perviousness to both moisture and air, which includes impregnating a fabric with an aqueous emulsion comprising a substantially water-immiscible solution of ethyl cellulose in a volatile solvent so as to impregnate the individual threads of the fabric and to substantially bond the threads together where directly adjacent but insufficient to fill the interstices between the threads or to form a continuous coating over the surface of the fabric, removing the excess emulsion from the fabric so that the emulsion remaining therein will, on drying, leave non-volatile material in the fabric in amount within the range of about 5% to about 40% by weight of the fabric, evaporating the water and volatile solvent from the emulsion contained in the said fabric and then pressing the fabric at a temperature within the range of about 320° F. to about 360° F.

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