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TEXTILE SIZING

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The invention relates, in general, to a process of sizing textile materials and, in particular, to a process of sizing synthetic yarns in the produc-
tion of crepe fabrics therefrom and to correlated
improvements in sizing compositions employed in
such process.

Synthetic fibers in the form of filaments, threads, yarns, etc., of the type employed in the manufacture of woven fabrics, particularly the crepe-type fabrics, are characterized by being somewhat plastic in nature and elongate or stretch readily when subjected to tensile forces of a degree equal to that normally employed in the processing thereof or in the fabrication of goods therefrom. Synthetic yarns, filaments, threads, etc., are not inherently capable of retaining or storing the energy imparted thereto during the twisting step in the manufacture of crepe fabrics with the result that the desired kink or waviness called crepe is not obtained. Moreover, these textile materials show a loss in denier when subjected to the aforementioned elongation or twisting, and also exhibit as a result of such deformation a decreased pliancy and decreased affinity for dyes.

In an attempt to overcome the foregoing difficulties, it is now customary to size or otherwise apply a protective coating around filamentary bodies composed of synthetic materials before processing and/or fabricating goods therefrom. In the manufacture of woven crepe fabrics, for example, the desired number of warp threads are sized and wound upon a beam in the usual manner. The weft or filling threads are the elements in the completed crepe fabric that impart the crepe effect thereto and their preparation usually comprises subjecting a synthetic thread, yarn, filament or the like, to the following steps: (1) soaking, (2) conditioning, (3) twisting, or better known as throwing, (4) twist setting, and (5) coping or quilling. Synthetic fibers are manufactured in various sized filaments, a number of which are combined with a slight twist to produce a yarn having given denier. A filament 450 meters long and weighing $\frac{1}{20}$ of a gram is called a single denier. The size of filling threads normally employed may vary from 50-300 deniers. In preparing filling yarns the first step comprises soaking skeins of the yarn in a fluid composition comprising a water-soluble material, such as glue, gelatine, synthetic condensation products, etc. and a softener or plasticizer therefor, after which the yarn is hydroextracted and dried. The second operation comprises conditioning the yarn in a humidified atmosphere so that the yarn will

regain its normal moisture content and thus prepare it for the third step of throwing, during which a twist is imparted to the yarn that may run as high as 70 or more turns per inch. It might be stated here that usually about one-half of the filling yarns are given a right-hand twist and the remainder a left-hand twist so as to impart the desired crepe effect in the finished fabric. The fourth step involves setting of the twist by subjecting the twisted yarns to an atmosphere of steam under pressure for a suitable period of time, after which the fifth step of coping is carried out, i. e., rewinding the yarn from spools onto quills, cops, shuttle bobbins or the like.

A warp and the filling threads prepared in the above-described manner are woven into a fabric having any desired design, count, width, etc., the left and right-hand twisted filling threads being alternated singly or in groups of any desired number. After the fabric has been woven, it is subjected to a so-called boil-off or scouring operation wherein the sizing material is dissolved or emulsified and removed from the fibers, thus allowing the filling threads to spring back to their most natural condition and thereby producing a kinked or creped effect in the resulting fabric.

While the hereinbefore described procedure is being practiced with varying degrees of success, the fact remains that many difficulties arise therefrom. For example, (a) the sizing composition in the common gelatine or glue type baths tend to decompose due to bacterial action, (b) the viscosity of the sizing bath is changed due to heating and reheating thus affecting the thickness of the film applied to the yarns, (c) the strength of the film-forming constituent is affected by ageing and heating the bath, (d) the concentration of the film-forming constituent is continuously decreased, (e) these changes in the properties of the bath render successive skeins of yarn non-uniform, (f) the sizing is not readily removed from the fibers during scouring, (g) the resulting crepe or pebble effect is not even or deep enough, etc.; and in view of these and other disadvantages, there is a constant demand for improved sizes and improved processes of producing crepe-effects in woven and other fabrics.

The general object of the invention is to obviate the foregoing and other disadvantages present in the prior known practices.

A specific object of the invention is to provide a novel sizing having enhanced stability and which is highly responsive to scouring.

Another object of the invention is to provide

a process of producing crepe fabrics having a deeper and rougher pebble than heretofore obtained without sacrificing evenness and refinement.

- 5 Another object of the invention is to provide a sized yarn which is substantially resistant to electro-static forces.

A further object of the invention is to provide an improved process of sizing hydrophilic synthetic yarns whereby a very thin and uniform film is applied to the yarns.

- 10 An additional object of the invention is to provide an improved sizing bath which is substantially resistant to selective absorption of its constituents during successive soakings.

Another object of the invention is to provide an improved sizing composition which will provide adequate lubrication in addition to aiding in storing the energy in a thrown yarn.

- 20 Other objects of the invention will in part be obvious and will in part appear hereinafter.

According to the invention, there is provided a sizing composition comprising a partially saponified triglyceride. More specifically, the sizing composition comprises a soap and a degraded glyceride with or without the inclusion of a mineral or other oil.

- 25 The invention further comprises the process of applying the novel sizing composition of the invention to textile yarns in the manufacture of crepe or like fabrics as well as the sized yarn produced by such process.

The invention accordingly comprises the several steps and relation of one or more of such steps with respect to each of the others, and a composition of matter possessing the characteristics, properties and relation of components, all of which will be exemplified in the following detailed disclosure, and the scope of the invention will be indicated in the claims.

- 40 The present invention is particularly concerned with the manufacture of crepe type fabrics composed wholly or partially of non-fibrous cellulosic materials. The warp threads may be composed of any suitable material, such, for example, as cellulose acetate, cellulose nitrate, partially or completely de-esterified cellulose esters, cellulose ethers, cellulose oxy or hydroxy ethers, regenerated cellulose, casein, synthetic resins, natural cellulose fibers, etc. The filling threads, which are the elements that impart the crepe or pebble effect to the finished fabric, are preferably composed of a hydrophilic colloidal material such as regenerated cellulose, which may be obtained in a known manner from viscose, cupra-ammonium solutions of cellulose, or by the partial or complete de-esterification of cellulose esters or by other suitable processes. Other water or alkali swelling cellulose derivatives may also be used as filling threads such as alkali-soluble cellulose ethers and the like.

- 60 The sizing composition of the invention which is dispersible or emulsifiable in an aqueous medium comprises a soap of a higher fatty or like acid, an organic solvent vehicle and a degraded glyceride of a higher fatty or like acid. The term "degraded glyceride" is used herein to denote a mono or diglyceride of higher fatty acids or similar acids such as the naphthenic acids or any mixture of these glycerides. The sizing composition of the invention may be prepared by merely admixing the several constituents, thereby forming a composition readily dispersible in water, but it is preferred to produce the composition by dispersing and/or dissolving a suitable

natural occurring triglyceride in a suitable inert solvent vehicle and adding a strong alkali thereto in an amount sufficient to react with only one or two of the three available ester groups in the triglycerides, thereby forming the desired soap and degraded glycerides in situ. The sizing composition produced in accordance with the latter procedure is superior in many respects to the product obtained by merely admixing the several ingredients.

10 In preparing the sizing composition of the invention according to the preferred method, any suitable triglyceride of the higher fatty acids may be used, and, more particularly, the natural occurring triglycerides, such, for example, as olive oil, teaseed oil, rapeseed oil, cottonseed oil, coconut oil, rice bran oil, peanut oil, sesame oil, corn oil, soya bean oil, fish oils, tallow, Japan wax, menhaden oil, almond oil, etc., as well as blown or hydrogenated products of these or other triglycerides or any mixture of these triglycerides. While the common strong alkalis, such as potassium hydroxide, sodium hydroxide, etc., may be employed to saponify the triglyceride, it is highly preferred to use potassium hydroxide due to the superior results obtained thereby. As aforementioned, it is necessary to effect the saponification of the triglyceride in the presence of a suitable inert solvent vehicle, such, for example, as diethylene glycol, ethylene glycol monoethyl ether, diethylene glycol monoethyl ether, etc., or mixtures of these or other hydroxy or hydroxy-ether solvents. The expression "solvent vehicle" is employed herein to connote any suitable inert solvent or mixture of solvents which will function to yield the results described. The temperature at which saponification is caused to take place preferably lies within the range of room temperature to 45° C. and for best results should not exceed 50° C.

40 The sizing composition of the invention may be blended with a suitable quantity of animal, vegetable or mineral oils, particularly the latter, which has been found valuable as a diluent and/or plasticizer for the fatty constituents of the composition. In any event, the blended sizing composition should remain readily dispersible in an aqueous medium. Other materials may be admixed or blended with the composition to further enhance its properties with respect to the production of crepe fabrics.

50 In the process of sizing warp and filling yarns in preparation for their fabrication into crepe fabrics, the sizing composition is admixed with water (preferably warm) and agitated until it is dissolved or uniformly dispersed therein. This solution or dispersion may be applied to the yarn in a still bath or by means of any other known method or apparatus used for soaking rayon. In the still bath method a predetermined quantity of yarn is wrapped in cheese cloth nets to afford protection of the delicate filaments against abrasion, the wrapped yarn being then immersed in the sizing bath for a given period of time. After soaking, the yarn is withdrawn from the bath, hydro-extracted and dried to a moisture content of about 5-15%. The yarn thus sized is then ready for conditioning, throwing, twist setting or steaming and finally weaving. The yarn may be sized by using the conventional rayon soaking machine which comprises a set of rotating arms on which skeins of yarn are suspended. The yarn laden arms are caused to rotate through the sizing bath until the yarn is thoroughly wet out, after which the yarn is sub-

jected to hydro-extraction and drying as disclosed above. Hydro-extraction is carried out in an extractor or so-called whizzer. The temperature of the sizing composition is preferably maintained at a temperature of about 30° to 65° C. during application to the yarn.

After the sizing step, the dried yarn possesses a thin coating of the size which is uniformly distributed over the surfaces of the yarn and which is characterized by having sufficient binding qualities to eliminate any damage to the yarn through abrasion during the throwing and weaving operations. It is to be understood that the sizing composition may be applied to the yarn by any suitable mode other than that aforementioned, such, for example, as by spraying or by means of an applicator roll or wick or by running the yarn through a bath by immersing in the bath a yarn wound upon a foraminous core or spool, etc. Irrespective of the method of application, the sizing may be readily removed from the yarns after they have been fabricated into the desired product. In view of the character of the composition, it may be rapidly removed from the fibers by simple scouring. Through the ease and rapidity of scouring afforded by use of the novel sizing composition, it is possible to produce a deeper and rougher pebble effect than that obtained with known sizes, without sacrificing the desired evenness and refinement in the resulting fabric. It has also been found that the yarn absorbs and adsorbs the constituents of the emulsified composition, including the water, in substantially the same proportion as they exist in the bath. In view of this feature, the composition of the bath remains substantially constant during successive soakings, thereby rendering it unnecessary to keep an accurate check on the composition of the bath. Moreover, a large batch of the sizing may be made up at one time and the several baths used may be replenished periodically by mere addition from the original batch.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following examples which are given merely to further illustrate the invention and are not to be construed in a limiting sense:

Example I

79.4 parts by weight of palm oil are dispersed in 14.3 parts by weight of diethylene glycol after which 6.3 parts by weight of 45% KOH are added with stirring. The alkali added is sufficient only to partially saponify the palm oil and the resulting composition comprises the corresponding potassium palmitate, a mixture of glyceryl mono and di-palmitates and the inert solvent vehicle diethylene glycol.

In carrying out the process of the invention 20 pounds of the above composition are dispersed in 60 gallons of water at a temperature of about 55° C. The resulting bath is capable of sizing 110 pounds of rayon. The rayon is wrapped in cheese cloth nets and immersed in the bath and permitted to soak for about 30 minutes while maintaining the temperature of the bath at approximately 55° C. During this soaking operation, the yarn is thoroughly wet out and is thereafter hydro-extracted to a moisture content of about 100% after which it is dried, by means of hot air, to a moisture content of about 6%–8%. The sized yarn is then ready for throwing and weaving.

Example II

82.5 parts by weight of olive oil in 12.6 parts by weight of diethylene glycol monoethyl ether are saponified with 4.9 parts by weight of 45% KOH. The resulting composition will comprise potassium oleate, glyceryl mono and dioleate and the solvent diethylene glycol monoethyl ether.

20 pounds of this composition are dispersed in 60 gallons of water at about 38° C. 110 pounds of rayon are distributed on the rotating arms of a conventional rayon soaking machine which is caused to rotate through the bath held at about 55° C. for 4 or 5 minutes or until the yarn is completely wet out. The treated yarn is then hydro-extracted to about 100% moisture content and then dried to a moisture content of about 6%–8%.

Example III

17 parts by weight of teaseed oil in 7.5 parts by weight of diethylene glycol are saponified with 7.5 parts by weight of 45% KOH. The resulting mass comprises potassium oleate, glyceryl mono and dioleate and the solvent. 6 parts by weight of oleic acid in 62 parts by weight of mineral oil may then be blended with the resulting composition. Better results are obtained if about 1.5 parts of the given quantity of KOH is added after the mineral oil and oleic acid have been partially or completely blended with the saponified base.

10 to 15 pounds of this composition dispersed in 60 gallons of water at 55° C. will produce a suitable bath for sizing 110 pounds of rayon. The mode of application may be the same as that set forth under Example I.

Example IV

13 parts by weight of coconut oil in 7.75 parts of diethylene glycol are saponified with 7.75 parts by weight of 45% KOH. The reacted mixture would comprise potassium laurate, glyceryl mono and dilaurate and solvent. In view of the fact that the coconut oil contains some triglycerides of myristic acid, the corresponding soap and degraded glycerides of this acid would also be present. After the alkali is spent, the reacted mixture is blended with 13 parts by weight of palm fatty acids in 58.5 parts by weight of mineral oil. This composition may be applied to rayon in the manner disclosed under Example III, except that the temperature of the water in which the composition is to be dispersed should preferably be about 70°–80° C. to facilitate quick dispersion.

Example V

10.58 parts by weight of tallow dispersed in 4.46 parts of diethylene glycol are saponified with 4.46 parts by weight of 45% KOH. The resulting composition would comprise a mixture of potassium oleate and stearate, glyceryl mono and dioleates and stearates and solvent. 75 parts of paraffin oil with 5.6 parts of oleic acid may be blended with the resulting composition. This sizing composition may be employed in the same manner as set forth in Example III.

The compositions illustrated under Examples III, IV and V may be effectively employed for sizing without the inclusion of the mineral oil and fatty acid constituents, and likewise mineral or other oils may be blended with the compositions illustrated in Examples I and II. In blending the mineral oil with the saponified base, care should be taken to gradually add about one-third of the mineral oil with stirring, after

which the remaining two-thirds may be added at once. In certain cases the sizing composition will be a pasty or somewhat solid mass, in which event it will be necessary to heat the same when dispersing the same in the warmed aqueous medium. The mineral oil serves as a diluent and/or plasticizer for the fatty constituents of the sizing, whereby the film applied to the yarns will be pliable and uniform in thickness.

While it is highly preferred to apply the sizing in an emulsified state, it may be applied directly in some cases. The sizing composition may also be used for soaking natural silk in the preparation of the same for throwing. Moreover, the sizing composition may be used even though only a relatively low twist yarn (5 to 30 turns per inch) is to be produced. Such yarns are usually used in making hosiery and fabrics other than crepe fabrics.

Many advantages over the heretofore known practices result from employing the hereindescribed invention, and a few of the salient features thereof may be enumerated as follows:

1. A very thin and uniform sizing is obtained on the yarns.

2. Unusual skein softness and lubricity is afforded which is a material aid in the throwing operation.

3. The rapid response of the sizing to simple scouring.

4. Through the ease and rapidity of scouring, it is possible to obtain a deeper and rougher pebble effect without sacrificing the desired evenness and refinement.

5. Elimination of selective absorption of the constituents in the sizing bath.

6. Stability of the sizing composition before as well as after dispersion in water.

7. Ease and economy in preparing and replenishing the sizing baths.

The expression "yarns" is used herein to include yarns, threads, filaments, fibers and like textile materials.

Since certain changes in carrying out the above process and certain modifications in the composition which embody the invention may be made without departing from its scope, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all the generic and specific features of the invention herein described and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween; and that they are intended to be inclusive in scope and not exclusive, in that if desired, other materials may be added to my novel composition of matter herein claimed without departing from the spirit of the invention.

Particularly it is to be understood that in said claims, ingredients or components recited in the singular are intended to include compatible mixtures of said ingredients wherever the sense permits.

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

1. In a process of preparing warp and filling yarns for weaving into a crepe fabric, the step which comprises sizing hydrophilic artificial cellulosic yarns with an aqueous dispersion comprising a soap of a higher fatty acid, a degraded glyceride of a higher fatty acid and a mineral oil.

2. In a process of preparing warp and filling yarns for weaving into a crepe fabric, the step which comprises sizing hydrophilic artificial cellulosic yarns with an aqueous dispersion comprising a potassium soap and a degraded glyceride.

3. In a process of preparing filling yarns for weaving into a crepe fabric, the step which comprises sizing hydrophilic artificial cellulosic yarns with an aqueous dispersion comprising a soap of a higher fatty acid and a degraded glyceride of a higher fatty acid.

4. In a process of preparing filling yarns for weaving into a crepe fabric, the step which comprises sizing hydrophilic artificial cellulosic yarns with potassium oleate and a mixture of glyceryl mono and dioleates.

5. In a process of preparing filling yarns for weaving into a crepe fabric, the step which comprises sizing hydrophilic artificial cellulosic yarns with a potassium stearate and a mixture of glyceryl mono and distearates.

6. In a process of preparing filling yarns for weaving into a crepe fabric, the step which comprises sizing hydrophilic artificial cellulosic yarns with a potassium palmitate and a mixture of glyceryl mono and dipalmitates.

7. A process of preparing filling yarns for weaving into a crepe fabric comprising sizing hydrophilic artificial cellulosic yarn with an aqueous dispersion of a potassium soap and a degraded glyceride, hydro-extracting the yarn, drying, conditioning, twisting and finally setting the twist in the yarn.

8. A hydrophilic artificial cellulosic textile yarn bearing a size comprising a soap and a degraded glyceride of a higher fatty acid.

9. A filling yarn adapted to be woven into a crepe fabric comprising a twisted hydrophilic artificial cellulosic yarn bearing a size comprising a fatty acid soap and a degraded glyceride of a higher fatty acid.

10. A filling yarn adapted to be woven into a crepe fabric comprising a twisted hydrophilic artificial cellulosic yarn bearing a size comprising a fatty acid soap, a mineral oil and a degraded glyceride of a higher fatty acid.

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