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PROCESS FOR LUBRICATING AND PROMOTING THE COHESION OF TEXTILE FIBERS

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This invention relates to a process for lubricating and promiting the cohesion of textile fibers, natural or synthetic, such as wool, rayon or nylon, which facilitates the operations which are performed upon them in the various textile fabricating processes such as carding, drawing, spinning, winding and the like. This application is a continuation in part of our co-pending application, Serial No. 246,330, filed on September 12, 1951, for "Dressing for Textile Fibers."

Textile fabrics are formed by knitting or weaving textile yarns which previously have been formed from the individual textile fibers. The individual fibers may be relatively short in length, such as cotton or wool fibers, or may be continuous as in rayon or the other artificial fibers. In any case many individual fibers make up a yarn and the bundles of fibers must be drawn and twisted to produce a yarn having the proper strength and physical characteristics. During these operations it is desirable to have cohesion between the individual fibers, in the case of the shorter fibers to obtain strength and in the case of continuous to prevent breakage during the mechanical steps of forming the yarn and fabric.

While performing these mechanical operations, during which cohesion of the fibers is desired, it is also necessary that lubrication be provided between the fibers and the parts of the machinery with which they come in contact.

It is the purpose of this invention to provide a process which promotes cohesion between the individual fibers and at the same time lubricates the fibers. Our process may be adapted to various types of textile operations by the use of appropriate treating compositions, as will later be described, and provides many advantages such as the reduction of losses in carding, reduction of dropped ends during roving and spinning operations, increase in average tensile strength of the yarn produced, in addition to lubricating the fibers.

These benefits are achieved by the process in which polymerized fatty acids compounded with an appropriate oily diluent or viscosity reducer are applied to the fibers prior to the steps of mechanical treatment.

One type of polymerized fatty acids has been generally known as dimer acid or dilinoleic acid as they have been produced by the dimerization of linoleic acid or its methyl esters. One method of producing dimer acids from linoleic acids is disclosed in U.S. Patent 2,482,761. Other methods of bringing about the polymerization of unsaturated fatty acids are disclosed in copending applications Ser. Nos. 475,005 and 475,006 which are now Patent Nos. 2,793,219 and 2,793,220 respectively, both issued May 21, 1957.

The products of all of these methods of manufacture are primarily thirty-six carbon dibasic acids. They are very viscous liquids which upon superficial inspection seem to be like heavy molasses or heavy lubricating oil. Even though substantially identical in pertinent physical properties it is not probable that the chemical structures of the acids made by different processes are identical as the acids differ in iodine value, which depends both upon

the nature of the starting materials and the nature of the polymerization process employed.

We prefer, therefore, to use the term polymerized fatty acids to represent the compounds formed by the polymerization of two or more molecules of unsaturated acids. We have also found that all polymerized acids, regardless of the method of manufacture or raw material source, may be used interchangeably in our process for oiling textiles as the physical properties are the same regardless of the raw materials or the process used in their manufacture.

The polymerized acids are tacky or sticky to the touch in which respect the acids resemble molasses. On the other hand, if the acids are pressed between the fingers into a film, surprisingly lubricity becomes apparent, and the acids seem more like a heavy lubricating oil than like molasses. The acids, by coating the surfaces of textile fibers, promote cohesion thereof advantageously.

We have discovered and determined that textile fibre may be cohered and lubricated for practically all textile fabricating operations by a composition comprising from 5 to 50 percent by weight of polymerized fatty acids dissolved in an oily diluent. In general, we utilize compositions of greater viscosity than the textile oils which have been most commonly used for the particular operation in question. In other words, the polymerized fatty acids by themselves are too viscous to be used alone for any normal or average textile fabricating operation, but are advantageously used when appropriately diluted to reduce viscosity somewhat, though not as far as those skilled in the art would think necessary in the absence of specific instruction or empirical tests. The desired degree of lubricity may be further controlled by selection of a proper diluent.

The polymerized fatty acids also have a chemical characteristic which is of very great advantage in textile oil, namely, that their alkali metal soaps are readily water soluble, even more so than the soaps of oleic acid which are widely used in textile processing. On this account, textiles which have been treated with the polymerized fatty acid compositions may be much more easily washed or scoured than yarn or fabrics which have been processed with ordinary oils or soaps or mixtures of them. The washing is preferably conducted in a weak alkaline solution to which ordinary fatty acid soap may be added, if desired. This alkaline solution readily reacts with the polymerized fatty acids, converting them primarily to a highly water soluble thirty-six carbon dibasic fatty acid soaps which are possessed of sufficient emulsifying and detergent properties to usually insure complete removal of the remainder of the dressing from the fiber. The use of ordinary fatty acid soap in the scour may be desirable where added detergency or emulsifying power is needed.

The textile fibers may be treated with the polymerized fatty acids either in the form of an admixture with a selected diluent or in admixture with the unpolymerized portion of the fatty acids from which they were derived. The polymerized fatty acids, for reasons of economy, are generally produced from the mixtures of fatty acids obtained from naturally occurring oils and fats. The saturated acids present in such mixtures are unchanged by the polymerization treatments and a certain proportion of the unsaturated acid remain unpolymerized. The polymerized fatty acids are generally recovered as residues by distilling off the unpolymerized monomeric acids. However, for the purposes of this invention fibers may be processed with the entire mixture of polymerized and unpolymerized acids with or without the addition of further diluents and/or modifying or emulsifying agents.

In place of the polymerized fatty acids, derivatives of the carboxyl groups of the same may be used in our

process. Such derivatives include the mono- or diesters of low molecular weight aliphatic monohydric alcohols of up to eight carbons chain length, polymers of the polymerized fatty acids and dihydric alcohols of up to eight carbons chain length, or the polyalkylene glycols of up to twenty-six carbons chain length, condensates with alkanolamines and organic amine soaps. Such materials retain the viscous characteristics of the polymerized acids and are hereinafter referred to as polymerized acid derivatives.

The oily diluents suitable for the purpose are: petroleum oils such as paraffin oils, white mineral oils, and refined lubricating oils; vegetable or animal oils such as soyabean oil, teaseed oil, peanut oil, lard oil, tallow oil and sperm oil; liquid fatty acids such as oleic, and the fatty acids derived from soyabean oil, fatty acid esters of monohydric alcohols of from one to eight carbon atoms such as methyl stearate, n-propyl oleate, butyl palmitate and the octyl ester of coconut oil fatty acids; aliphatic hydrocarbon solvents such as kerosene, Stoddard solvent and mineral spirits and aromatic solvents such as toluene, xylene and solvent naphthas. These oily diluents may be used alone or in various admixtures to provide the necessary or desired blending and solvency characteristics and to provide viscosity, lubricity, tack and other characteristics which are necessary or desirable for any particular textile fabricating operation.

The polymerized fatty acids and the polymerized fatty acid derivatives and the oily dilutents which have been described and identified in the two preceding paragraphs are miscible in all proportions to provide homogeneous blends. Otherwise expressed, the polymerized acids and derivatives are soluble in the oils and the oils are soluble in the acids and derivatives which intersolubility permits the mixing of the ingredients to provide a textile oil having the preselected characteristics which are desired for a given textile fabricating operation.

These blends of polymerized fatty acids and oily diluents may be rendered miscible with water, if desired, by incorporation of appropriate emulsifying agents, the selection of the agents depending in part upon the characteristics of the oily diluents. In general, it is desirable to use an emulsifier of the non-ionic type for rendering the thirty-six carbon dibasic fatty acids dispersible in water. Among the suitable agents of this type are the sorbitan fatty acid esters, ethoxylated alkyl phenols, ethoxylated fatty acids and the alkanolamine condensates.

The process of the invention may be practiced on the individual fibers before carding or spinning or to spun yarns, threads or fabrics by spraying or otherwise coating by means of rollers, wicks and the like. In certain instances, application may be from a volatile solvent applied as indicated above.

The process may also be practiced by applying the polymerized acid compositions in the form of an emulsion in water in which case emulsions may be formed by incorporating suitable emulsifying agents in the polymerized acid composition or by incorporating alkaline agents such as sodium carbonate, borax or organic alkaline agents in the water, emulsification resulting from the soaps of the polymerized acids thus formed.

Examples

I. Raw wool, prior to carding, is treated with an emulsion consisting of 4 parts of water and 1 part of a composition consisting of 48 parts of polymerized fatty acids, 10 parts of a polyglycol monoester of oleic acid made by ethoxylating the oleic acid with 12–15 mols of ethylene oxide, 38 parts 100 second Saybolt viscosity paraffin oil, 2 parts petroleum mahogany sulfonates and 2 parts of monoisopropanolamine. In this composition, the polyglycol oleic acid ester serves as the emulsifying agent and the petroleum sulfonates and monoisopropanolamine aid in stabilizing the emulsion.

Sufficient emulsion is applied so as to leave 10 percent by weight of the composition on the wool stock. The wool processed in this manner showed less fly loss in carding and produced a more uniform yarn than when processed in the conventional manner.

II. In the conversion of viscose rayon tow into staple fibers, the tow is processed either by spraying or by immersion in an aqueous emulsion of a composition comprising 5 parts of the polymeric ester made by reacting equal molar amounts of polymeric fatty acids and hexaethylene glycol until the acid number of ester is approximately 60, and 95 parts of xylene.

III. In the treatment of worsted fibers, the top is sprayed with a composition comprising 20 parts by weight of the butyl half ester of polymerized fatty acids with 80 parts by weight of propyl oleate.

IV. For the overoiling of sized nylon hosiery yarn, a composition comprising 50 parts of the dibutyl ester of polymerized fatty acids and 50 parts of 70 second Saybolt viscosity white mineral oil is applied by means of a wick, roller or immersion of the yarn in composition.

V. For the coning of cellulose acetate yarn, the yarn is lubricated by passing over a revolving roller immersed in a composition comprising 10 parts of polymerized fatty acids and 90 parts of lard oil.

The improvements in processing which result from the use of our process are believed to be due to the fact that the polymerized fatty acids impart an unusual and characteristic tackiness to the individual fibers themselves, which tackiness promotes cohesion between the fibers, but at the same time does not decrease or impair the lubricity which is otherwise requisite to avoid friction under the conditions of operation. Additionally, our process applies compositions which are very readily removed from fibers and do not interfere with subsequent bleaching or dyeing operations. Moreover, since our process employs compositions which are relatively stable and standard chemicals, any variation of our process which has been found to be particularly suitable for any particular textile fabricating operation may be reproduced with substantial exactitude.

It is to be understood that all proportions of materials which are disclosed herein are given by weight.

Having described our invention, we claim:

1. A process for pretreating organic textile fibers to provide lubricity and promote cohesion during textile fabricating operations said process comprising applying to the textile fibers a textile dressing comprising a solution of 5% to 50% polymerized fatty acid compound selected from the group consisting of polymerized fatty acids, polymerized esters of fatty acids and monohydric alcohols of up to 8 carbon atoms chain length, and the polymers of polymerized fatty acids and dihydric alcohols of up to 8 carbon atoms chain length, and 95% to 50% of an oily dilutent for the fatty compound said dilutent being selected from the group consisting of animal, vegetable, and mineral oils, liquid fatty acids, and the liquid esters of fatty acids.

2. The process of claim 1 in which the textile dressing has been rendered self-emulsifying in water by incorporation of a suitable emulsifying agent therein.

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