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PROCESS FOR LUBRICATING FILAMENTS

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This invention relates to finishing of filaments and to a new and improved finishing process.

In the manufacture of artificial filaments such as threads and fibers, finishing materials are applied. Usually, this application is made after spinning and deacidifying, desulfurating, bleaching, washing the threads or fibers, by rinsing or spraying them with or passing them through a finishing bath. Thereafter, the greatest part of the adhering liquid is removed mechanically, as by centrifuging or squeezing so that in the drying process which follows, it will not be necessary to evaporate excessively large quantities of water. In these processes, a large loss of finishing substances cannot be avoided. Furthermore, employing these finishing processes, the later operations often were unsatisfactory.

It is therefore an object of the invention to provide a new and improved process or method for finishing filaments with the usual finishing compositions e.g. sulfonates of tallow, esters of polyglycols and fatty acids, emulsions of mineral oils, or mixtures of these components.

A particular object is to provide a process which reduces the losses of finishing substances.

Another object is to provide a finishing process which improves the subsequent operations, e.g. coiling rayon filaments or producing yarns from staple fibers.

An additional object is to provide a process wherein filaments are simultaneously or concurrently finished and moisture-conditioned, so that they have the desired moisture or water content.

Another object is to provide a flexible two-stage finishing process, wherein drying of the filaments may take place between the finishing stages or subsequent to both stages, as desired.

A more particular object is to provide a process wherein a relatively very dilute aqueous finishing emulsion is first applied to the filaments, the emulsion being very dilute as compared to the standard or prior emulsions applied, so that losses of the emulsion represent reduced losses of the finishing substances corresponding to their decreased concentration, and then a relatively concentrated aqueous finishing emulsion is applied for precise application to the filaments without losses, to provide on the filaments the quantity of finishing substances required for satisfactory execution of the subsequent operations. These and other objects and advantages of the invention will be apparent on reference to the specification.

In accordance with the invention, it has now been found that by effecting the finishing in two steps or stages considerable quantities of finishing materials are saved in comparison with previously known processes, and also, considerable improvements are obtained in the subsequent manufacturing operations. In the invention, the filaments are treated or contacted following to the washing process with a dilute finishing liquid composition, excess liquid is mechanically separated, and the filaments are treated with a concentrated finishing liquid composition.

The first application is with a composition which is dilute relative to the compositions usually employed for

finishing, which contained e.g., 2–10 grams per liter, and it contains the finishing substances in a concentration of about 0.02–0.2 g./1. preferably 0.1 to 0.2 grams per liter. The second application is with a finishing composition or concentrate which is relatively concentrated with respect to the usual finishing compositions applied, and there are preferably about 70 to 200 grams per liter of finishing substances in the concentrate. The concentration is selected within this range according to the desired amount of finishing application and the desired amount of moisture-conditioning. The mechanical separation of excess liquid subsequent to the first application preferably takes place by centrifuging or squeezing, with no concentration such as by drying.

The filaments are dried either between the two finishing stages or treatments, following the mechanical separation of excess liquid, or following both of them. In either event, the usual volume of finishing liquid composition is applied in the first stage, but the concentration is much less than usual. When drying takes place intermediate the finishing applications, the second finishing is preferably carried out so that the filaments are simultaneously moisture-conditioned without employing and with no necessity for a subsequent drying or moistening operation. Operating in this manner, the concentration of the second finishing composition is adjusted so as to impart the desired moisture content to the filaments while applying the desired amount of finishing substances. The total amount of finishing substances applied in the first and second stages corresponds to that usually applied in one operation according to the prior processes. The application of the dilute composition is as before, by rinsing or spraying or passing through a finishing bath. The second finishing composition may be applied after drying by spraying, rinsing or moistening with moist rollers.

With intermediate drying, it is unnecessary to provide and use a moistening zone with the dryer, because the moisture-conditioning is combined in the second finishing step.

If simultaneous moisture-conditioning of the filaments is not desired, the two finishing stages can be carried out in the absence of a drying operation or prior to drying, with intervening mechanical separation of excess liquid as described above, and the filaments thus processed are more advantageously employed in the subsequent operations than when operating according to the prior procedures. The resulting yarn is more uniform. After applying the second, concentrated finishing composition, the filaments are dried, the drying being carried out employing the usual moistening zone.

The finishing conditions are those conventionally employed, with the described new conditions according to the invention. The compositions are applied either at about room temperature, about 15–25° C., or at about 50–60° C., depending upon the finishing materials. The drying conditions are those usually employed e.g. in streaming dry air of a temperature of about 50–120° C. and up to a rest moisture content of 5%.

The process of this invention is suitable for every kind of artificial filaments, such as filaments and staple fibers of regenerated cellulose, casein or alginates. Naturally, the kind of finishing material must be adjusted to the kind of filament, thickness, intended use, etc. If staple fibers are concerned, the first step of the process is carried out with the usual finishing machinery. The second step of the process is carried out while the more or less open staple fiber fleece leaves the dryer. It is also possible to insert this second step between the dryer and the packing of the staple fibers, for instance after the opening operation.

If the endless threads, thread groups, thread cables or

thread cable groups are concerned, the first operating step can be carried out in the same manner as in the case of staple fibers by spraying, rinsing, or passing through a finishing bath. The second step also can be carried out before or after the drying operation. In the case of thick cables it is necessary to lay them out wide during the second step in order to obtain even distribution of the finishing material. It is advantageous to use moistening rollers in the case of cables, thread groups, etc.

The following examples are furnished to illustrate the invention, and it is to be understood that the invention is not limited thereto nor the particular materials, proportions and conditions set forth therein.

Example 1

A fiber fleece of regenerated cellulose is rinsed after the deacidifying, desulfurating, bleaching and washing process with a finishing bath containing 0.1 to 0.2 grams per liter of finishing material, as sulfonate of tallow, at 50 to 60° C. Excess liquid is separated from the filaments by centrifuging to a moisture content of 120 to 130%, and the filaments are then dried without the use of a moistening zone. At the exit from the dryer, the fiber fleece is sprayed with a finishing emulsion concentrate of 50 grams per liter of room temperature, the concentrate consisting of ⅓ of sulfonate of tallow and ⅔ of polyglycol ester of stearine acid. When the dryer has an hourly capacity of 500 kg. of fiber, 23.3 liters of finishing emulsion are sprayed per hour, which increases the moisture content from 6% to 11% and applies 0.25% by weight of finishing substances in this step. After this a yarn is produced in the usual manner, which is distinguished by an excellent uniformity.

Example 2

A fiber fleece is finished, as in Example 1, following to the washing operation with a dilute finishing bath containing 0.1 to 0.2 gram per liter of finishing material at 50 to 60° C. After squeezing the fiber fleece to a moisture content of 120 to 130%, the fleece is passed through a pair of rollers on which is applied a finishing emulsion of 100 grams per liter, containing ⅔ sulfonate of tallow and ⅓ polyglycol ester of stearine acid, at 50 to 60° C. in such a quantity that 0.2 kg. of finishing substances are applied on 100 kg. of fiber. Thereafter, the filaments are dried in the usual manner.

Example 3

A thread cable of 300,000 denier of regenerated cellulose is passed after leaving the washing trough through a bath containing 0.1 to 0.2 gram per liter of finishing material, as sulfonate of tallow, at 50 to 60° C. and it is then squeezed and dried to 6% moisture content without the use of a moistening zone. At the exist from the dryer, the thread cable is passed over a spreading roller and then finished with moistening rollers at room temperature with a finishing composition consisting of ⅓ sulfonate of tallow, ⅓ of polyglycol ester of stearine acid and ⅓ of mineral oil. When 150 kg. of cable pass through the dryer per hour, 7.1 liters of finishing emulsion having a concentration of 55 grams per liter is applied per hour, raising the moisture content from 6% to 11% and applying 0.25% of finishing substances.

The invention thus provides a new and improved two-stage finishing process which results in substantial savings of finishing substances and provides improvements in the operations. In a preferred embodiment, the filaments may be moisture-conditioned simultaneously with application of the finishing substances. The process is adaptable to intervening or subsequent drying, and the two stages combine very advantageously to reduce losses while providing effective application of the finishing substances.

The invention is hereby claimed as follows:

1. In a process for lubricating artificial filaments after the washing operation following spinning wherein the lubricants are applied to the filaments in a dilute aqueous liquid composition of the lubricants followed by mechanical separation of excess liquid, the improvement which comprises dividing said application of lubricants into two stages, the first said stage comprising the application of said lubricants in a dilute aqueous liquid composition substantially more dilute than the first-mentioned aqueous composition, the second said stage comprising the application of said lubricants in an aqueous liquid composition substantially more concentrated than the first-mentioned aqueous composition, the total amount of said lubricants applied in said first and second stages being substantially equivalent to the amount applied by the first-mentioned aqueous composition, and mechanically separating excess liquid from the filaments solely between said stages, said second stage application being made in a controlled quantity of a composition of sufficient concentration to provide the required amount of lubricants on the filaments without mechanical separation of liquid, the losses of lubricants consequently being reduced owing to their reduced concentration in the liquid losses which accompany said sole mechanical separation between stages.

2. The process as defined in claim 1 wherein said filaments are dried between said stages and following said separation of excess liquid, and the concentration and quantity of said second stage composition are such as to impart the desired moisture content to said filaments.

3. The process as defined in claim 1 wherein said filaments having finishing materials applied thereto are first dried following said second stage.

4. In a process for lubricating artificial filaments after the washing operation following spinning wherein the lubricants are applied to the filaments in a dilute aqueous liquid composition containing on the order of 2–10 grams of the lubricants per liter followed by mechanical separation of excess liquid, the improvement which comprises dividing said application of lubricants into two stages, the first said stage comprising the application of said lubricants in a dilute aqueous liquid composition containing 0.02 to 0.2 gram of the lubricants per liter, the second said stage comprising the application of said lubricants in an aqueous liquid composition containing 50 to 200 grams of the lubricants per liter, the total amount of said lubricants applied in said first and second stages being substantially equivalent to the amount applied by the first-mentioned aqueous composition, and mechanically separating excess liquid from the filaments solely between said stages, said second stage application being made in a controlled quantity of a composition of sufficient concentration to provide the required amount of lubricants on the filaments without mechanical separation of liquid, the losses of lubricants consequently being reduced owing to their reduced concentration in the liquid losses which accompany said sole mechanical separation between stages.

5. The process as defined in claim 4 wherein said filaments are dried between said stages and following said separation of excess liquid, and the concentration and quantity of said second stage composition are such as to impart the desired moisture content to said filaments.

6. The process as defined in claim 4 wherein said filaments having finishing materials applied thereto are first dried following said second stage.

7. In a process for lubricating artificial filaments after the washing operation following spinning wherein the lubricants are applied to the filaments in a dilute aqueous liquid composition containing on the order of 2–10 grams of the lubricants per liter followed by mechanical separation of excess liquid, the improvement which comprises dividing said application of lubricants into two stages, the first said stage comprising the application of said lubricants in a dilute aqueous liquid composition

containing 0.02 to 0.2 gram of the lubricants per liter, the second said stage comprising the application of said lubricants in an aqueous liquid composition containing 50 to 200 grams of the lubricants per liter, the total amount of said lubricants applied in said first and second stages being substantially equivalent to the amount applied by the first-mentioned aqueous composition, and mechanically separating excess liquid from the filaments solely between said stages, said second stage application being made by rollers in a controlled quantity of a composition of sufficient concentration to provide the required amount of lubricants on the filaments without mechanical separation of liquid, the losses of lubricants consequently being reduced owing to their reduced concentration in the liquid losses which accompany said sole mechanical separation between stages.

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