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PROCESS FOR THE MANUFACTURE OF STAPLE YARNS BY FILAMENT DECOMPOSITION

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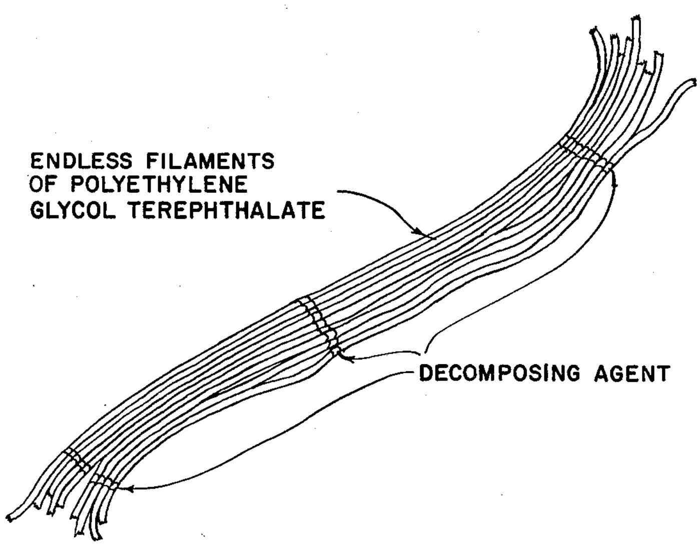

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PROCESS FOR THE MANUFACTURE OF STAPLE YARNS BY FILAMENT DECOMPOSITION

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All fibres artificially produced are primarily obtained in continuous form. Filaments and fabrics consisting of such fibres show a very silky character, but not the full and warming handle of textile goods consisting of short-stapled fibrous material, as, for instance, wool or cotton. For this reason it is necessary to decompose the continuous filaments by means of cutting devices in order to obtain short fibres showing spinning properties and allowing of variations of length, for instance from 20 to 250 mm.

In the case of fibres of a high swelling capacity, for instance fibres of cellulose or protein regeneration products, the cutting can be performed very easily when the fibres are wet. In the case of completely synthetic fibres, however, e.g. those belonging to the polyamide, polyacryl and polyester series, the process of forming "staples" gives rise to a considerable consumption of energy and in increased abrasion of the knives.

In principle, the decomposition into short fibres shows the drawback that the single filaments arranged in parallel and leaving the spinning nozzles become snarled in the course of the cutting and finishing processes so that they have to be subjected to the same process in order to secure their parallel arrangement in the spinning process, as is necessary with natural fibres. Also the losses of fibres occurring during cutting and the following run over the carding machines represent a perceptible economical factor.

In order to avoid this consumption of substance and energy and to reduce the costs, numerous tests have been carried out in order to obtain, by tearing or cutting of endless slivers or cables of fibres arranged in parallel, staple fibres which keep their original parallel arrangement and can be spun for obtaining only the count of yarn desired.

These processes, however, caused multiple difficulties. With fibres subjected to tearing, it is difficult precisely to keep the desired length of staple; in view of the fact that the fibres are overstretched by the tearing, undesired displacements of the original stretching values of the starting material occur.

The cutting process causes a rapid abrasion of the knives, thereby diminishing the capacity of the machines and, due to unsharp cutting or tearing, also injuriously affecting the quality of the staple.

Now, I have found that it is possible to obtain, in a completely novel manner, fibres showing spinning properties by applying onto bundles, cables or slivers of endless filaments, chemical compounds in the form of small stripes by means of patterns, rollers and the like, thereby damaging or destroying the fibres. This is to be done in such a way that the distance between one spot of application and the next one corresponds to the length of staple required. The material to be treated is to be subjected to such conditions that local breaks of the fibre substance sufficient for the decomposition of the continuous filament, take place.

The method of the invention is illustrated in the accompanying drawing, which shows a bundle of endless filaments having a decomposing agent applied to the filaments in the form of a stripe.

The present invention is to be distinguished from that

described and claimed in copending application Serial No. 598,741, filed July 19, 1956, by Nüsslein et al. The invention of the copending application relates to the selective printing of fabrics with decomposing agents, and not the use of such agents on fibers adaptable to subsequent fashioning into fabrics.

The chemical compounds to be chosen in each case depend upon the chemical nature of the fibrous substance. For instance, cellulose regeneration fibres can be destroyed by means of substances showing an acid reaction, whereas protein regeneration fibres can be destroyed by means of substances showing an alkaline reaction. Among the fibres which are synthetically produced, superpolyamide fibres are affected by strong mineral acids, acid amides, or aqueous chloral hydrate solution of 70% strength. In the case of polyester fibres excellent results can be attained with highly concentrated mineral acids as well as with several bases, especially with guanidine carbonate in connection with glycol, glycol derivatives, quarternary ammonium compounds and the like. Dimethyl formamide is appropriate for fibres of polyacrylonitrile.

The continuous filaments to be decomposed are printed with the chemical compounds decomposing or destroying the fibre substances, advantageously in a thickened consistency, by means of rollers, patterns, screens and other devices showing a similar action, which are correspondingly discharged, provided with a relief pattern or engraving; then the filaments are dried and heated to such a temperature that a partial or complete decomposition of the fibre takes place.

In the course of the subsequent stretching of the material the decomposition takes place by means of very low consumption of mechanical forces in order to obtain, with complete destruction, the staple desired. Partial decomposition is still of importance in the scope of the known tear spinning process. The decomposition of the fibres of high tensile strength takes place considerably more easily and more uniformly, since the spots of tear are already prepared.

The process permits the production of fibres of uniform as well as of varying staple length in one and the same yarn. If printing is performed with printing dies arranged in parallel, a uniform length of staple is obtained, while printing dies of irregular arrangement result into a mixed staple as regards the length of the fibres.

Since the parallel arrangement of the fibres can be completely preserved, the spinning process does not suffer any interruption. After decomposition of the continuous filaments into fibres the further treatment is carried out in known manner in the roving frame and the fine count spinning mill. By a corresponding classification applied in the process described above it is possible directly to go over to the high stretching values, thereby considerably reducing consumption of time and labor. With appropriate arrangement of machinery it is, however, also possible immediately to start the twisting process, which is of special importance when fine yarns are concerned.

A completely novel type of yarn can be manufactured by means of the process described above, by uniting to a yarn a number of endless filaments printed with the decomposing chemical substance in irregular intervals or in such a way that the printed spots are staggered, then twisting it, heating it to local decomposition and then stretching it. Thereby the filaments break at the weakened places without disconnecting the bundle of fibres. The endless filaments have now been transformed into a yarn whose properties correspond to those of a spun yarn, although it has been produced in a different manner.

Such a process is well suitable for coarse as well as for very fine yarns.

With kinds of fibres such as superpolyamides, polyacrylonitrile and its varities, polyvinyl alcohol, polyester fibres which undergo an intense stretch, appreciable effects can be produced by carrying out only a partial stretching, i.e. of two thirds of the usual extent, before printing the continuous filaments with the decomposing chemical substances, and using the last third for tearing the fibres after heating. It is also possible to use continuous filaments stretched to different extents whereby yarns which show other textile values are obtained.

After the fibers have been treated with the decomposing agents of the invention, they may be knitted or woven to form a textile before the fiber is decomposed.

Another possibility for the manufacture of novel yarns hitherto not existing consists in mixing the printed and dried bundle of filaments to be treated with yarns which have not been treated and finishing them in the manner described above or in treating together chemically differing yarns so that a part of the yarn is attacked by the chemical substance chosen, while the other part is not affected. In principle, the further treatment takes place in the same way as described above.

According to this method numerous novel kinds of yarns of great value for the textile industry, fashion and so on are obtained, particularly since mixing ratio, titre, count of yarn, twist, lustre, receptivity for dyes, curliness and the like may vary within wide limits.

The following examples serve to illustrate the invention; but they are not intended to limit it thereto:

Example 1

A bundle of filaments of regenerated cellulose viscose is largely conducted over a flat support and provided by means of a gum roller or a metal roller with a thin print containing per 1000 grams of paste about 200 grams of aluminum sulphate and 700 grams of a wheat starch-tragacanth thickening, for the local fixation of the aluminum sulphate.

The printing is performed in the form of fine lines applied at intervals of 30–60–80–120 mm., for instance from the lower part left hand to the upper part right hand in an angle of 45°.

By uniting single continuous filaments printed at irregular intervals, in order to form a yarn, and subsequent heating causing the destruction of the cellulose at the printed parts, a fibrous yarn is obtained which, in many respects, is equal to a spun yarn. After carbonization, i.e. heating of the fibre at the printed places, the acid residue is washed out.

Example 2

A bundle of filaments of acetate rayon is printed in a technically similar manner as described in Example 1 with a paste containing per kilo:

200 grams of benzoyl peroxide,
200 grams of benzyl-acetate,
350 grams of British gum-tragacanth thickening,
50 grams of weakly sulphatized castor oil
200 grams of H_2O.

After printing, the material is heated for 3–5 minutes at about 110° C. and then torn, whereby the tear occurs at the places weakened by the printing paste. It is, however, also possible to heat for a prolonged time, for instance 15–20 minutes, at a temperature of 130–140° C., then to steam for 1 hour. A length of staple given by the first print is obtained, i.e. the endless yarn has been transformed into staple fibre yarn. The final product is washed and further treated in the usual manner in order to produce tissues or knit goods.

Example 3

The process described in Example 2 is applied to a bundle of filaments consisting of a mixture, in a ratio of 1:1, of viscose rayon and acetate rayon. With the printing paste described in Example 2 the acetate rayon can be decomposed into staple fibres, but not the viscose rayon.

In this way a mixed yarn of continuous filaments enclosing a bundle of staple fibres is obtained. Tissues and knit goods produced thereof are characterized by a fine, woolen handle, high smoothness and suppleness.

Example 4

Endless filaments of polythylene terephthalate, of e.g. 50 den., consisting of 24 single filaments, are printed before spooling or also at a later time, at intervals of, for instance, 60 mm., with a paste containing per kilogram:

300 grams of crystal gum (1:2)
300 grams of British gum (1:1)
100 grams of thiodiglycol,
50 grams of guanidine carbonate,
250 grams of H_2O.

The material is dried, woven and then subjected to a short action of heat, for instance of 30 seconds at 180–210° C. In view of the decomposition immediately taking place at the printed places, the endless filament is transformed into a staple yarn.

I claim:

1. A process for the manufacture of staple products which comprises locally applying a small stripe of a decomposing agent comprising guanadine carbonate and thiodiglycol as active ingredients to endless filaments of a polyethylene terephthalate fiber, and then severing said fiber by decomposition.

2. A process as in claim 1 in which said fiber is decomposed by heating.

3. A process as in claim 1 in which said fiber is severed by decomposition after the fiber has been woven to form a textile.

4. A process as in claim 3 in which said fiber is decomposed by heating.

5. A process as in claim 1 in which said fiber is severed by decomposition after the fiber has been knitted to form a textile.

6. A process as in claim 5 in which said fiber is decomposed by heating.

7. A process for the manufacture of staple products which comprises locally treating endless filaments of polyethylene terephthalate at spaced intervals along their length with a decomposing agent comprising guanidine carbonate and thiodiglycols as active ingredients, and then severing said filaments by decomposition.

8. A process as in claim 7 in which said fiber is decomposed by heating.

9. Yarns obtained by locally treating endless filaments of polyethylene terephthalate with a decomposing agent comprising guanidine carbonate and thiodiglycol as active ingredients applied to said filaments in the form of small stripes, and then severing said filaments by decomposition.

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