

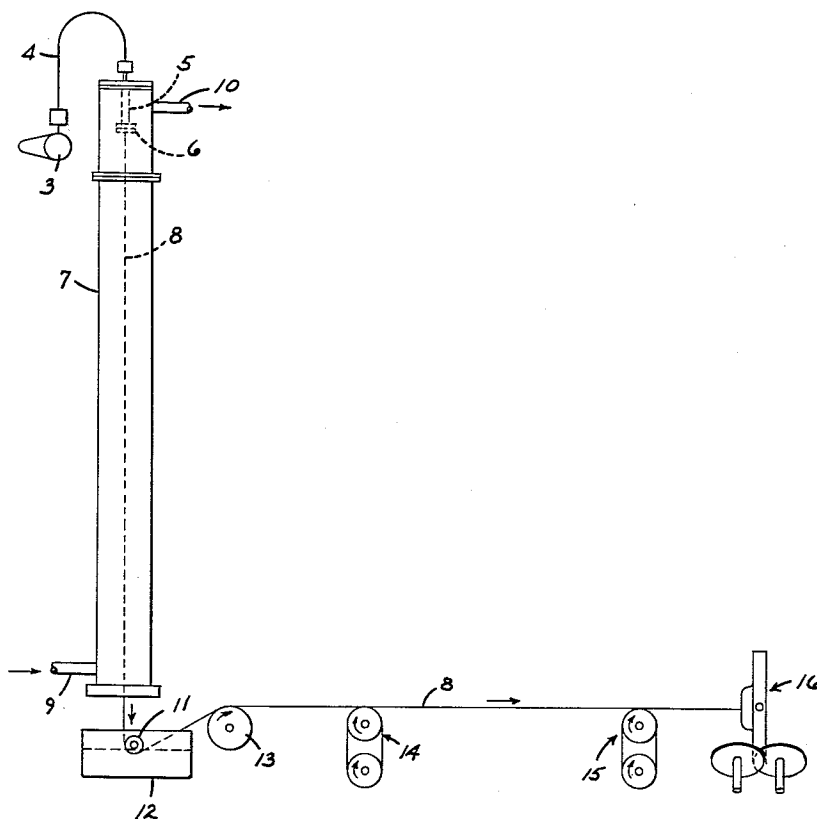
Aug. 23, 1955

R. G. MARLEY

2,715,763

SYNTHETIC TEXTILE FIBER

Filed June 27, 1950



INVENTOR.
ROBERT G. MARLEY

BY

Thomas R. Marley
ATTORNEY.

1

2,715,763

SYNTHETIC TEXTILE FIBER

Robert G. Marley, Meadville, Pa., assignor to American Viscose Corporation, Wilmington, Del., a corporation of Delaware

Application June 27, 1950, Serial No. 170,540

3 Claims. (Cl. 28—82)

This invention relates to a method of producing synthetic filaments and staple fibers. More particularly the invention relates to a method of producing filaments and staple fibers from vinyl resins.

While the present invention is broadly applicable to the processing of many kinds of synthetic fibers, such as those made from the cellulose derivatives, vinyl resins, and the like, it is primarily concerned with the treatment of filaments made from the vinyl resins. Vinyl resins contemplated by the present invention are those which are formed by conjointly polymerizing two or more vinyl derivatives, of which vinyl halides, particularly the chloride, vinyl esters of aliphatic acids, such as vinyl acetate, propionate and butyrate, and vinyl benzene or styrene are illustrative. The preferred resins are those resulting from the conjoint polymerization of vinyl chloride and vinyl acetate in the proportions of from about 70 to 93 parts of vinyl chloride to about 30 to 70 parts of vinyl acetate.

It is a principal object of the present invention to provide a method of producing a vinyl resin filament or staple fiber having higher strength and greater shrinkage properties, without affecting the final length or denier of the fibers, than those produced by conventional and known methods.

It is another object of the present invention to provide a method of producing vinyl resin filaments and staple fibers comprising shrinking the filaments emerging from the spinneret rather than stretching the same as is now done in known practiced methods.

Other objects and advantages of the present invention will be obvious from the description thereof hereinafter.

The usual and known method for producing vinyl resin staple fibers comprises passing a solution of the vinyl resin, usually a volatile solvent solution such as an acetone solution, or the like, through a spinneret into a spinning tube, and through the tube to a godet, or through a finish bath preceding the godet if desired. In the tube the filament is stretched. The filament then passes over two sets of double godets between which the filament is further stretched. The filament then passes to a staple fiber cutter.

The present invention differs from the method above described and the objects of the invention are in general accomplished by allowing the filament to shrink in the spinning tube or before the same is substantially set and then later stretching the filament between the double godets in the cold after the same is substantially set up.

In order to more clearly understand the following detailed description of the invention, reference should be had to the accompanying drawing which shows a diagrammatic sketch of an illustrative form of apparatus which may be employed in practicing the invention, it being understood of course that the same is not to be limited thereby but only insofar as the same is defined in the appended claims.

Referring to the drawing the vinyl resin solution, for example, an acetone or a volatile solvent solution of Vinyon (copolymer of vinyl chloride and vinyl acetate)

2

is pumped, by means of pump 3, through line 4 and filter 5 to the spinneret 6. The spinneret is located in a spinning cell or tube 7 which contains an evaporative medium, such as heated or unheated air, inert gas, or the like, which may flow countercurrently to or concurrently with the direction of travel of the filament 8 contained therein. As shown the cell has a pipe 9 opening into the bottom of it through which the evaporative medium enters and a second pipe or conduit 10 at the top through which the medium leaves. If desired, the cell 7 may be jacketed for heating.

The filament 8 passes out of the spinning cell under a roller or guide 11 located in a finish bath 12 containing a lubricant, or anti-static agent, or the like. The filament then passes over a godet 13, which merely acts as a guide, to a double godet 14.

The speed of the double godet 14 and the pump 3 are so regulated that the vinyl resin filament remains in the spinning cell longer than usual wherein it sets up substantially and in so doing shrinks. The ratio of extrusion to withdrawal of the filaments from the evaporative medium may vary between 1.1:1.0 to 2.0:1.0.

The filament 8 then passes to a second double godet 15 which is rotated at a speed greater than that of the first double godet 14 thus stretching the filament between the double godets. The filament then enters the rotary cutter 16 where it is cut into staple length. Any type rotary cutter may be employed, for example, the Beria type cutter is satisfactory (see U. S. 1,723,998). Upon leaving the cutter, the fibers are fed to a dryer and opener where conditions are controlled in accordance with the particular type of yarn to be produced. If it is desired to produce continuous filament yarn, the cutter 16, of course, is by-passed and the filaments wound in package form in any known and convenient manner.

In place of the double godets 14 and 15 single godets may be employed. The double godets are preferred, however, since there is less danger of the filaments winding back on themselves. In place of the godet 13, a simple guide of the bar type, or the like, may be employed. When desired, the godet 13 may be bypassed, as may also the finish bath 12 and the filaments may be led directly to the double godet 14 from the spinning cell 7.

The distance between the godets 14 and 15 is variable depending on the size or denier yarn it is desired to produce. The unique feature of the present invention is the first shrinkage process, between the spinneret and godet 13, plus a determined amount of stretch between godets 14 and 15 at a variable distance, which produces a vinyl resin staple fiber with higher strength and greater shrinkage properties without affecting the final length or denier of a yarn produced from such staple fibers. The amount of stretch imparted to the filaments between the godets should be at least 50% and preferably at least 100%.

In addition to varying the distance between the godets, the pump speed and godet speeds may be varied to give various amounts of increased strength and shrinkage.

In prior art methods, where the filament is stretched between the spinneret and first godet, the stretching is effected with ease since the filament is heated and is plastic thus allowing the vinyl resin molecules to easily slip past one another. This in no way affects appreciably the stability of the final structure. In the present process, however, where the filaments are first shrunk and then stretched while cold, or at room temperature, and while the same are not so highly plastic, the vinyl resin molecules do not slip by each other easily and as a result the instability of the final structure is increased. This is evidenced by the higher shrinkage capacity of the staple fibers so produced.

As illustrative of the present invention, the following example is given. An acetone solution of Vinyon, a co-

polymer containing approximately 85% vinyl chloride and 15% vinyl acetate, was spun through a spinneret into a spinning cell containing heated air moving counter-currently to the direction of travel of the filaments. The spinning pump was operated at a speed to produce 150 meters of filaments per minute. In order to shrink the filaments in the spinning cell, the first double godet was operated at a speed of 113 meters per minute and then to stretch the filaments the second double godet was operated at a speed of 240 meters per minute, there being a space of 147 inches between the first and second double godets. These speeds and the distance between the godets were so chosen as to give a fiber having a denier of 5.5. For purposes of comparison, staple fibers were also produced from the same Vinyon solution in conventional manner, i. e., wherein the filaments were stretched between the spinneret and first double godet instead of being allowed to shrink.

Various tests were run on the staple fibers so produced with the following results:

Table

	Conventional Method	Method of Present Invention
Denier.....	5.5	5.5
Strength.....gms./denier	0.6	0.8
Shrinkage.....percent	56-57	70-72
Extensibility.....do.	7.5	8.8

The results tabulated above show a definite increase in strength of the fibers produced in accordance with the present invention as well as increased residual shrinkage. Filaments and fibers produced in accordance with the present invention may have a residual shrinkage varying between 60 and 90%.

Heretofore it has been difficult to spin vinyl resin staple fiber into a thread or yarn because of its low strength. However, by employing the method of the present invention, the increased strength of the vinyl resin staple fiber so produced allows the spinning of the same into a thread or yarn with greater ease and efficiency and the yarn so produced has increased strength as well as increased shrinkage properties.

Staple fibers and yarns produced in accordance with this invention find wide application in the manufacture of carpets and rugs as well as in the manufacture of rubber goods. For example, the yarns may be used in making the base fabric for carpets and rugs such that when shrunk they will bind the pile yarns more tightly. In covering rubber thread, the vinyl resin yarns can be

shrunk about the rubber thread thus making a tighter and more uniform wind.

Vinyl resin staple fiber yarns of the present invention are useful when employed with other yarns in making crepe fabrics since they can be shrunk to give the desired puckered effect. Further the vinyl resin yarns can be wiven or knit loosely into a fabric and then shrunk to give a closely knit or woven fabric the tightness of which is impractical by mechanical means. Numerous other uses and advantages of the present invention will be obvious to those skilled in the art.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

15 I claim:

1. As an article of manufacture, staple fiber comprising a copolymer containing from about 70 to 93 parts by weight of vinyl halide and 30 to 7 parts by weight of vinyl ester, said staple fiber being characterized by a denier of the order of 5.5, a strength of about 0.8 gram per denier, a shrinkage on heating of 60 to 90%, and an extensibility of about 8.8%.

25 2. As an article of manufacture, staple fiber comprising a copolymer which contains from about 70 to 93 parts by weight of vinyl chloride and 30 to 7 parts by weight of vinyl acetate, said staple fiber being characterized by a denier of the order of 5.5, a strength of about 0.8 gram per denier, a shrinkage on heating of 60 to 90%, and an extensibility of about 8.8%.

30 3. As an article of manufacture, staple fiber comprising a copolymer of approximately 85% vinyl chloride and 15% vinyl acetate, said staple fiber being characterized by a denier of the order of 5.5, a strength of about 0.8 grams per denier, a shrinkage on heating of 60 to 90%, and an extensibility of about 8.8%.

References Cited in the file of this patent

UNITED STATES PATENTS

2,161,766	Rugeley et al.	June 6, 1939
2,277,782	Rugeley	Mar. 31, 1942
2,278,896	Rugeley et al.	Apr. 7, 1942
2,327,460	Rugeley	Aug. 24, 1943
2,353,270	Rugeley et al.	July 11, 1944
2,354,744	Dreyfus	Aug. 1, 1944
2,403,464	Smith	July 9, 1946
2,425,086	D'Alelio	Aug. 5, 1947
2,447,140	Shelton et al.	Aug. 17, 1948
2,462,927	Woodell	Mar. 1, 1949
2,517,694	Merion et al.	Aug. 8, 1950
2,579,451	Polson	Dec. 18, 1951