April 5, 1960 F. C. FIELD, JR 2,931,090

TEXTILE APPARATUS

Filed Sept. 18, 1956

Fig. 1

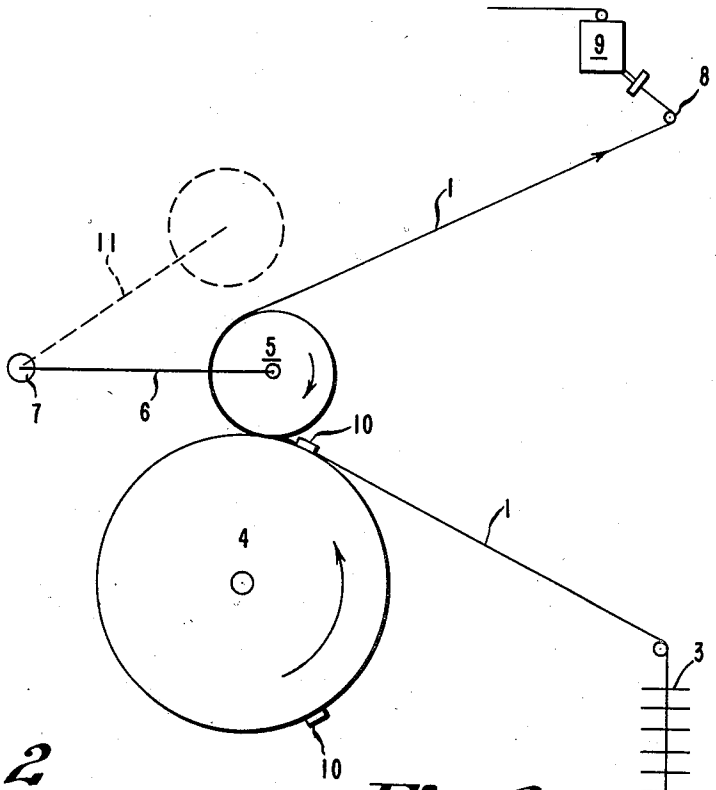


Fig. 2

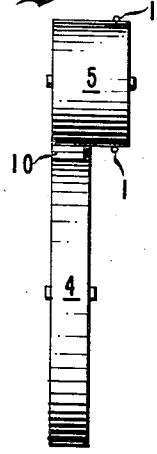
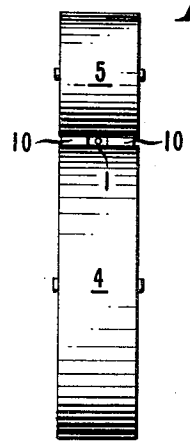


Fig. 3



INVENTOR

FREDERICK C. FIELD JR.

BY Frank C. Hilberg

ATTORNEY

United States Patent Office

2,931,090

Patented Apr. 5, 1960

2,931,090

TEXTILE APPARATUS

Frederick C. Field, Jr., Wilmington, Del., assignor to E. I. du Pont de Nemours and Company, Wilmington, Del., a corporation of Delaware

Application September 18, 1956, Serial No. 610,546

12 Claims. (Cl. 28—1)

This invention relates to textile apparatus and more particularly to apparatus to be used in combination with a fluid jet to impart intermittent or random bulkiness to continuous multi-filament yarn and fabrics made therefrom.

Fabrics prepared from continuous filament synthetic yarns are satisfactory for many purposes; but when they are used to make fabrics for wearing apparel worn next to the skin, they have a characteristic feel which is usually disliked by many people. In order to overcome this difficulty, synthetic yarns are cut into staple and then treated in a manner similar to cotton and wool staple.

Recently synthetic multi-filament yarns have been subjected to a turbulent fluid atmosphere to impart coils, loops, and whorls at random intervals along their lengths to impart a softer feel, increased warmth, and improved bulkiness to fabrics made from these yarns. Another somewhat similar process has been proposed for imparting a chenille-like character to continuous filament yarns. In these processes the resulting yarns are essentially uniformly textured throughout their lengths since this is desirable for many types of fabrics. Sometimes, however, it is preferred to produce yarns of variable texture to furnish novelty effects to fabrics. A variable texture in yarns of this type produces a distinctive hand feel and surface characteristics to fabrics prepared from them. Such fabrics are especially suitable for making dress goods, draperies, upholstery, and the like.

Novelty yarns are relatively expensive to make due to the low production rate which is sometimes as low as five yards per minute and the cost is also considerable because of the necessary twisting and plying which is required. It would be very desirable to have a high speed procedure for producing intermittently textured yarn that would be suitable for the same end uses as the thick and thin type.

It is, therefore, an object of this invention to provide a simple, practical, inexpensive method for producing intermittently textured yarn. Another object of the invention is a simple and effective apparatus for producing thick and thin type textured yarns. Other objects will appear as the description of the invention proceeds.

These and other objects are accomplished by intermittently and randomly varying the rate of feeding yarn through the turbulent atmosphere normally used for texturing the yarn. These objects are also accomplished by the use of a special device for obtaining intermittent and random rates of feeding the yarn as will be more apparent from the drawing.

In the drawing, Figure 1 represents a diagrammatic sketch of the apparatus used to accomplish the result described above. Figures 2 and 3 are end views of optional forms of Figure 1. The yarn 1 is withdrawn from yarn supply 2 and drawn over pre-tension gate 3. The draw tension on the yarn is produced by driving feed roll 4 and driven feed roll 5. The latter is supported by arm 6 which is pivoted at point 7. After the yarn passes over roll 5, it is drawn around guide bar 8

and into the jet 9 where it is subjected to a turbulent atmosphere or air jet to produce whorls and coils throughout its length, after which it is wound up in a package ready for further processing.

The process is not dependent on any specific type of jet but may be of any known type; e.g., that shown in Field S.N. 450,075, now abandoned. The feed driving roll 4 is provided with lugs or pips 10 which may be in pairs at the peripheral edges of roll 4, with sufficient space between the paired lugs to accommodate the yarn as shown in Figure 3. One or more pairs of these lugs are disposed on the circumference of the roll 4 at random locations. It is preferred that a plurality of pairs be located in a non-symmetrical manner when novelty fabrics are to be prepared from the yarn. Instead of pairs of lugs, single lugs may be disposed on the surface of roll 4 at suitable intervals as shown in Figure 2. In this case, roll 5 is wider than roll 4, and the yarn 1 passes over the overhang portion of roll 5.

In operation, the yarn is drawn from any suitable package 2 through the pre-tension gate 3 which assures even withdrawal of the yarn from package 2 and an even tension on the yarn as it is drawn over the driving feed roll 4 and driven feed roll 5 to the jet 9. The feed driving roll rotates rapidly and as the lugs or pips 10 strike the roll 5 it is given a sharp thrust upwardly to the position shown in dotted lines 11. The roll 5 then returns by gravity, spring, weights, or other means to its original position against roll 4 until it is again thrust upwardly by the lugs or pips.

The feed to the texturing jet is interrupted in a random fashion by causing the driven feed roll to bounce on the feed driving roll. When the feed roll bounces, the length of the thread line is temporarily changed and the tension applied to the supply yarn en route to the feed roll causes the rotation of the feed roll to diminish and hence the rate of feed to diminish. It is likely that slippage occurs between the feed roll and the yarn being textured. The interaction of these three variable factors causes the effect to be random with respect to a given length of product.

It will be apparent from the intermittent action of the coacting rolls 4 and 5 that the tension on the yarn as it passes through the jet or turbulent zone for texturing will be varied intermittently depending on the position of the lugs or pips 10. The yarn is thereby given what may be described as a jabbing motion as it proceeds through the jet 9.

In accordance with one embodiment, this yielding suspension, which permits the driven feed roll to move away from the driving feed roll in a substantially radial direction thereto as a result of a blow by a pip on the rotating driving feed roll, is accomplished by attaching the axis of the driven feed roll to lever arms which in turn are attached for pivotal movement at the opposite extremity. (Alternatively yielding suspension of the driven feed roll may be obtained by positioning the driven feed roll axis for free movement in a pair of tracks (longitudinal slots) extending radially from the axis of the driving roll.) With such an apparatus, the driven feed roll, upon being bounced away from the driving feed roll, will tend to move in a circular path about pivotal axis of the lever arms.

Desirably, the driven feed roll will be positioned substantially above the driving feed roll so that after such a "bounce" gravity alone will return the driven feed roll to contact with the driving feed roll. Obviously, however, the driven feed roll may be positioned elsewhere with respect to the driving feed roll, and return of the driven feed roll to contact with the driving feed roll following a bounce may be accomplished by springs, rubber bands, or other devices for maintaining the driven feed roll in yielding tangential contact with the driving feed

roll. Naturally, the weight of the driven feed roll, the rate of rotation of the driving feed roll, the number and size of the pips, etc., will, in combination, determine the amount of "bounce" (the distance which the driven feed roll will move apart from the driving feed roll), and the length of the lever arms positioning the driven feed roll and the relative positions of the two rolls must be chosen accordingly.

In feeding yarn to the yarn-treating apparatus of this invention by means of variable and random yarn rate feed rolls described above, bouncing of the driven feed roll due to contact with the pips on the revolving driving feed roll causes changes in tension and unit length of the threadline upstream of the yarn-treating apparatus. Increases in tension (upstream of the yarn-treating apparatus) slow down the rotation of the driven feed roll when it is out of contact with the driving feed roll and lower temporarily the rate of feed of yarn to the apparatus. At the same time slippage occurs between the driven feed roll and the yarn, and the end result of the bouncing motion of the driven feed roll is to supply yarn to the fluid jet apparatus at a random intermittent rate whereby there is produced a random intermittently textured yarn product.

The method herein disclosed is satisfactory for texturing synthetic continuous multi-filament yarns like nylon, polyester yarns, such as those sold under the trade name "Dacron," regenerated cellulose, cellulose esters, acrylonitrile polymers, vinyl an vinylidene polymers and copolymers.

The invention is illustrated by the following example although it will be understood that the invention is not limited thereto since any of the filaments mentioned above may be substituted for the polyester of the example with similar results.

Example

A 200-denier, 34-filament 7Z t.p.i. nylon yarn was passed from a yarn package over a pretension gate produced by the air jet and then to the driven feed roll. The driving feed roll was 6 inches in diameter and had a surface 0.75 inches wide. The driven feed roll was mounted on a pivoted arm 8 inches long. The driven roll had a diameter of 2.5 inches and was 2.5 inches wide and covered with resilient rubber. It was held against the driving roll by means of gravity. The latter was provided with two lugs or pips about 0.5 inches wide and 1.0 inches long made of brass. The lugs were fastened to the feed driving roll at an angular difference of about 120°. The yarn as it left the driving rolls was passed over a guide bar and a wick (not shown) for applying a film of water to the yarn to stabilize the convolutions and then into a jet of the type disclosed in Figures 4 and 5 of Field S.N. 450,075. The yarn speed to the jet was normally 100 y.p.m. but when the driven roll bounced from the driving roll the speed was reduced momentarily to about 80 y.p.m. The jet was supplied with air at about 50 p.s.i. gage pressure. The yarn produced was randomly textured with loops and whorls intermittently spaced along its entire length.

The example was repeated with similar results using nylon and acetate yarns.

The subject invention can be carried out using low twist yarn such as zero or producer twist yarn as well as twisted yarn. A yarn after texturing may be packaged directly without further twisting or if desired it may be twisted or plied.

The novelty effect of this texturing process is achieved by the difference in degree of bulk along the length of the yarn. Variations in the differences of degree of bulking can be achieved by varying the air pressure, the wind-up tension, degree of twisting, the rate or amount of yarn overfeed, and others.

The texturing operation to include the apparatus necessary for random and intermittent texturing can be carried out in combination with many of the normal textile

process operations such as drawing, twisting, spooling, winding, and the like. One convenient place is after the yarn has left the spinneret and has coagulated or set up sufficiently. It may be desirable to interpose a tensioning device after the jet and prior to winding to adjust winding tension levels to the desired range necessary to achieve proper package formation.

The intermittently bulked yarn prepared by the subject invention has many of the desirable properties of thick and thin filament or staple yarn. The action of the bouncing feed roll insures truly random texturing. This avoids any periodicity of effect and resultant unsightly geometric patterns as occurs in fabric woven from yarn having regularly spaced variations.

These novelty textured yarns can be used for any of the common end uses normally associated with textile material. They will be particularly useful for the novel and decorative effects that have been traditionally associated with thick and thin yarns in the past.

It will be apparent that many widely different embodiments of this invention may be made without departing from the spirit and scope thereof, and therefore it is not intended to be limited except as indicated in the appended claims.

I claim:

1. In a process for preparing a continuous multi-filament novelty yarn having alternating bulked and smooth regions of varying lengths along the yarn line which comprises withdrawing a yarn from a yarn supply, feeding said yarn to a zone of fluid turbulence at an established rate of speed for a first period of time by passing said yarn over a driven roll, varying said rate of speed by changing the tension on said yarn and altering its path of travel by bouncing said roll, feeding said yarn again at said established rate for a second period of time different from said first period, and again feeding said yarn at a rate of speed varying from said established rate.

2. The process of claim 1 wherein said second period of time is less than said first period of time.

3. The process of claim 1 in which the yarn is composed of a synthetic polyester.

4. The process of claim 1 in which the yarn is composed of nylon.

5. The process of claim 1 in which the yarn is composed of cellulose acetate.

6. The process of claim 1 in which the yarn has low twist.

7. In a process for preparing a continuous multi-filament novelty yarn having alternating bulked and smooth regions of varying lengths along the yarn line which comprises withdrawing a yarn from a yarn supply and continuously repeating the steps of feeding said yarn to a zone of fluid turbulence at an established rate of speed for a given period of time by passing said yarn over a driven roll, varying said rate of speed by changing the tension on said yarn and altering its path of travel by bouncing said roll, feeding said yarn again at said established rate for a period of time different from said given period, and again feeding said yarn at a rate of speed varying from said established rate.

8. Apparatus for producing a novelty yarn from a continuous multi-filament yarn comprising a yarn supply and a texturing jet, a driving roll, and a driven roll over which said yarn passes, said rolls being positioned between said yarn supply and said texturing jet and being normally in contact with each other, means on the periphery of at least one of said rolls for imparting a quick separation of said rolls whereby the tension on said yarn and its path of travel are altered, and means for returning said rolls into contact with each other.

9. The apparatus of claim 8 wherein said means for imparting separation comprises lugs on the periphery of said driving roll.

10. Apparatus for producing a novelty yarn from a continuous multi-filament yarn comprising a yarn supply

and a texturing jet, a driving roll, and a driven roll over which said yarn passes, said rolls being positioned between said yarn supply and said texturing jet and being normally in contact with each other, at least two projecting lugs disposed in non-symmetrical relationship on the periphery of said driving roll for imparting a quick separation of said driven roll from said driving roll, and means for returning said driven roll into contact with said driving roll.

11. The apparatus of claim 10 wherein said driven roll is mounted for pivotal movement above said driving roll.

12. The apparatus of claim 10 wherein two pairs of lugs, each pair having a space therebetween for the passage of said yarn, are separated by an angular distance of about 120° on the periphery of said driving roll.

References Cited in the file of this patent

UNITED STATES PATENTS

386,623	Boyd	July 24, 1888
2,038,722	Dreyfus et al.	Apr. 28, 1936
2,783,609	Breen	Mar. 5, 1957