ABSTRACT: A high density bulked yarn having a bulk density of less than 0.050 g./cm.³ is formed by stitching a matt comprised of bulkable synthetic continuous filaments to form a plurality of aligned seams by cutting the matt between the seams to form individual yarns and subsequently bulking the synthetic filaments locked in the seams by contacting the yarns with a heated fluid. Upon being bulked, the synthetic filaments curl to cover the seam.
FORMING MATT OF CONTINUOUS BULKABLE FILAMENTS

STITCHING THE MATT LONGITUFINALLY

CUTTING THE MATT BETWEEN ROWS OF STITCHES

BULKING THE FILAMENTS TO COVER THE STITCHES

FIG. 4.
HIGH BULK YARNS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a bulked yarn and, more particularly, to a bulked yarn which is made by the seaming of a non-woven batt of synthetic bulkable filaments and by the subsequent cutting and bulking of the filaments.

2. Description of Prior Art

Bulked yarns are well known in the art and are generally formed by heat treating bicomponent synthetic filaments. The primary disadvantages of yarns of this type is that the bulk density cannot easily be controlled and the yarns are expensive to produce. Also, yarns of this type which are comprised of a plurality of continuous synthetic filaments produce products having a silky rather than a velvety like hand.

SUMMARY OF THE INVENTION

This invention relates to the Arachne process which is currently used in the making of blankets and other textile fabrics where the conventional weaving and knitting steps are omitted. The Arachne process includes the forming of a mat generally from staple fibers and the sewing of the batt along various directions to give the mat strength. A typical product of the Arachne process is disclosed in U.S. Patent No. 3,365,918 which produces a simulated nonwoven corduroy fabric.

In the present invention, yarn strength is developed not by the conventional drafting and twisting of a fiber bundle which results in a great loss of volume but by the stitching of a fine sewing thread through a fibrinous mat. As a result of the suitable volume to weight ratio of the yarns, a savings in material of up to 20 percent can be obtained.

Therefore, an object of this invention is to provide high-bulk yarns. Another object of this invention is to form high-bulk yarns by sewing a series of threaded seams in the machine direction of a continuous filament mat and by subsequently slitzing the mat between adjacent threaded seams.

A further object of this invention is to form high-bulk yarns from mats comprised of bulkable synthetic continuous filaments.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a mat of bulkable synthetic filaments having a series of substantially parallel threaded seams; FIG. 2 is an enlarged view of a yarn having been cut from the seamed mat of FIG. 1 prior to bulking; and FIG. 3 is the yarn of FIG. 2 after said yarn has been subjected to a bulking treatment; FIG. 4 is a flow chart identifying the steps of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred process for forming the nonwoven web is carried out on a continuous basis as set forth in U.S. Patent Application Ser. No. 646,720. In that application, the filaments having been spun and laid down onto a belt was subsequently bonded by gaseous means; however, permanent bonding does not form a part of this invention and the mat is ultimately left un-bonded. For ease of handling the nonwoven mat, a weak water soluble cellulose gum may be applied to the mat which is subsequently removed after seaming by washing in a hot water bath. The filaments as shown are bicomponent and may be freshly spun from two polyamides having different heat shrinkage characteristics, two polyesters having differential heat shrink characteristics or a polyester and a polyamide having different heat shrinkage characteristics. Also, the bicomponent filament may be formed at a prior time and supplied to the assembler mechanism as shown in the mentioned application by means of a bobbin. Where the bicomponent filaments are formed at a prior time, two acrylonitrile-based polymers having different heat shrinkage characteristics may be used.

The mat which is comprised of continuous bicomponent synthetic filaments and which has been formed on a conveyor belt is moved by the conveyor belt to a bank of sewing needles which are positioned across the width of the mat. Each of the needles is adapted to sew a seam along the length of the mat with the seams being separated from each other a distance, the distance being determined by the ultimate denier of the produced yarn. The mat having the seams formed along the length thereof is then fed to a slider which is adapted to cut the mat equidistantly between adjacent seams. The yarns may then be bulked, wound onto bobbins or wound onto a beam. Where bulking is to take place immediately after the formation of the yarns, the yarns are contacted with a heated gaseous medium or submerged in hot water whereupon the portions of the bicomponent fibers having the greatest heat shrinkage characteristics causes the filaments to bend back on themselves and to cover the threaded seam.

In reference to FIG. 1, mat 10 is comprised of a plurality of bicomponent filaments 11 which are laid down in a manner as herein set forth. Matt 10 is provided with seams 12 which are comprised of a plurality of linearly interlocking stitches 13. As shown in FIG. 1, the preferred orientation of filaments 11 is normal to the direction of seams 12.

The density of the bulked yarns of this invention vary from 0.02 to 0.10 gms/cm². In comparison, cotton yarns generally have densities of between 0.45 and 1.28 gms/cm² and worsted yarns have densities ranging generally between 0.38 and 0.73 gms/cm². Turbo-stapled acrylic fiber yarns after bulking have densities of about 0.25 gms/cm². It can be seen that considerably savings of material can be made by following the teachings of this invention.

For some end use applications, elastic yarns find utility. The bulked yarns of this invention are easily provided with the required elasticity by substituting threads comprised of an elastomeric urethane rubber or the like for the mentioned threads. Such threads are generally stitched into the mat under tension to increase the bulk density of the yarn.

EXAMPLE I

Continuous bicomponent nylon filaments, 15 denier, were spun from an extruder in the conventional manner. The filaments were passed through an aspirator jet and laid randomly onto a foaminous conveyor belt. The weight of the mat was approximately 1.5 oz/yd². The mat was passed through a bank of sewing needles which formed a threaded seam in the machine direction every 0.40 inch. The stitching thread was 040 cotton. The stitching needles were set to sew approximately six stitches in the mat per linear inch in the machine direction. The seamed mat was comprised of 82 percent by weight of the bicomponent continuous nylon filaments and 18 percent by weight of the sewing thread. A seammed mat was then passed through cutters which slit the mat equidistantly between each of the seams.

The density of the yarn before bulking was 0.089 gms/cm². The yarn was then passed through a hot water bath, the water being heated to approximately 212°F, where bulking occurred. After bulking and drying, the density of the yarn was 0.035 gms/cm². The denier of the bulked yarn was 5,670 and the bulked yarn had a tenacity of 4.81 lbs. and a tenacity per denier of 0.38.

EXAMPLE II

The procedure as set forth in example I was repeated with the exception that the mat weighed approximately 1.0 oz/yd² and the bicomponent continuous nylon filaments were laid down preferentially normal to the machine direction. The seaming width was 0.5 in. and the mat after seaming was comprised of 83 percent by weight of the synthetic nylon fibers, 17 percent by weight of the sewing thread. After slitting, the density before bulking of the yarn was 0.102 gms/cm² and the density after bulking was 0.029 gms/cm². The bulked yarn had a denier of 5,000 a bulked yarn tenacity of 3.95 lbs. and a tenacity in grams per denier of 0.36. It can be seen that by
orienting the filaments slightly in the direction normal to the machine direction, the density after bulking decreases.

The specification has set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a descriptive sense only and not for the purposes of limitation only, the scope of the invention being defined in the claims.

1. A high-bulked textile yarn comprising a stitching including individual and interconnected stitches of fine threads extending continuously in a given direction and a plurality of bulked staple bicomponent synthetic fibers having been trapped by said individual stitches along a given direction with a number of said fibers being arranged transversely with respect to said given direction and being of such lengths to be entangled and curled about said stitching to substantially cover the same.

2. The high-bulked textile yarn of claim 1 wherein said bicomponent synthetic fibers are comprised of two polyamides having different shrinkage characteristics.

3. The high-bulked textile yarn of claim 1 wherein said bicomponent synthetic fibers are comprised of two polyesters having different shrinkage characteristics.

4. The high-bulked textile yarn of claim 1 wherein said bicomponent synthetic fibers are comprised of polyesters and polyamides having different shrinkage characteristics.

5. The high-bulked textile yarn of claim 1 wherein said bicomponent synthetic fibers are comprised of two acrylonitrile-based polymers having different shrinkage characteristics.

6. The high-bulked textile yarn of claim 1 wherein said yarn has a bulk density of less than 0.001 gms/cm² per cubic centimeter.

7. The high-bulked textile yarn of claim 1 wherein said stitching consists of an elastic yarn.