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MANUFACTURE OF CREPE YARNS AND FABRICS

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FIG. 1

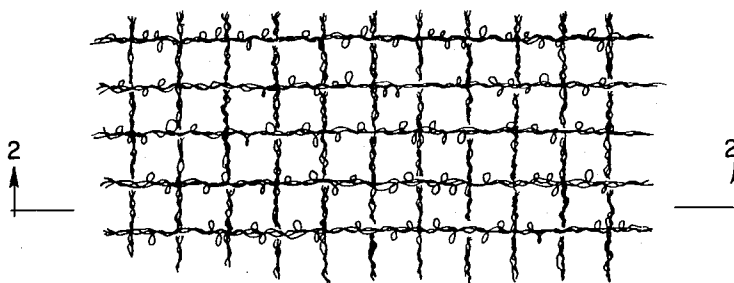
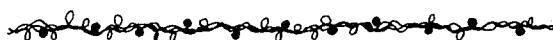


FIG. 2



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MANUFACTURE OF CREPE YARNS
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This invention relates to the production of crepe yarns and creped fabrics made therefrom.

It is, of course, well known that crepe fabric having a crinkled or puckered effect may be produced by employing crepe yarns having a very high or hard twist. The crepe fabric may contain crepe yarns in the warp or weft, or both. When the fabric is wet out for the first time after weaving in the creping process which precedes dyeing and finishing, the crepe yarns crinkle and shrink against the resistance offered by the non-crepe yarns. Creping produces a fabric having attractive surface designs. However, the fibers or filaments in a crepe yarn must be very closely bound together in view of the fact that the primary function of the high twist in crepe yarns is to produce such a compact thread that the fibers or filaments have very little lateral freedom of movement. Accordingly, the softness of hand and covering power may not be entirely satisfactory, especially when continuous filaments are used.

A method of producing a bulky yarn is disclosed in copending application Serial No. 354,503, filed May 12, 1953, now U.S. Patent 2,874,443, having common ownership with the present application. This yarn possesses the combined properties of a filament yarn and a spun yarn and has the bulkiness and covering power of a spun yarn, the evenness of a filament yarn and its own particular structure and hand. This yarn in particular is characterized by filaments that are individually convoluted into coils, loops and whorls at random intervals along their lengths.

The principle underlying the manufacture of the above described voluminous or bulky yarn is the displacement of the filaments in a strong current of air, as the result of which loops or filaments project outwardly from the body of the threads. Ordinarily, this operation shortens the thread, thus increasing the filament count and the volume.

The loops in the filaments impart several characteristic properties to this yarn. The normal properties of the yarn are not fundamentally altered by this blowing process. It does, however, acquire several new properties, in addition to those already mentioned, such as greater insulating power, enhanced capacity to absorb moisture, a toned-down luster, and others. However, fabric made from the looped yarns often have the disadvantage of creasing during use.

An object of the present invention is to provide a method for producing crepe continuous multifilament yarn having many of the apparent characteristics of wool, such as softness of feel, warmth and bulk.

Another object of the present invention is to provide a crepe yarn having the aforesaid desirable properties.

An additional object of the present invention is to provide a crepe textile fabric resembling fine woolen crepe fabrics.

Other objects will become apparent from the following description.

In the drawing, FIGURE 1 represents a diagrammatic enlarged top view of a fabric made according to the present invention. FIGURE 2 represents a diagrammatic cross section along the line 2—2 of FIGURE 1.

In accordance with the present invention, two or more

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ends of continuous multifilament threads having different shrinkage characteristics are plied together to form a crepe twist yarn. The filaments of the yarn, either before or after plying, are displaced by the action of a strong current of air thereon; and as a result thereof, random filamentary loops project outwardly from the yarn. The yarn thus formed is processed into crepe fabric. Very surprisingly, it has been found that this crepe fabric is highly crease resistant during use.

According to a preferred embodiment of the present invention, a fully shrunk nylon thread is combined with an unshrunk nylon thread after which the yarn is processed to the crepe fabric with this invention. A fully shrunk nylon thread as used herein is one which upon immersing in boiling water will not shrink more than 3% and preferably less than 1/2%. An unshrunk nylon thread has a residual shrinkage in the range of 11–13%. Nylon thread may be fully shrunk, for example, by subjecting it in cake form to the action of live steam at 105° C. for about a two-hour period. Also, polycaprolactam yarn and poly(hexamethylene adipamide) yarn are very suitable components when used together in view of their inherently different shrinkages.

Crepe fabric made entirely of nylon yarn has the improved properties as herein described. This was unexpected since nylon does not crepe easily and was not heretofore regarded as a suitable material for producing crepe fabric.

The present invention contemplates, in general, processing different continuous multifilament threads into what is essentially a blended filament crepe yarn having a bulky structure and possessing random filamentary loops. The process may be carried out in accordance with various favorable modifications. The threads may be first combined and thereafter bulked; or part of the component threads may be bulked and thereafter combined.

According to the first modification the threads to be plied together may be twisted or not twisted. However, if two twisted threads are combined, none of the threads should have an initial twist over 150 turns per meter in the same direction of the plying twist. In addition, the ply twist direction may be the same as, or opposite to, that of the original threads.

When employing the process according to this first modification in a preferred manner, at least two bundles of filaments which have different shrinkage capabilities are plied together with a high crepe twist in the range of 300 to 1000 turns per meter. The composite yarn preferably has a twist of from 500 to 700 turns per meter.

By having such a high twist, the yarn when released from tension has a tendency to form kinks; and consequently, difficulties may arise when subjecting this twist-lively yarn to the action of the air. Accordingly, before the blowing process this twisted yarn may be treated to reduce its twist-liveliness. In order to do this, the yarn may be treated with any suitable agent for accomplishing this. However, preferably the twist-liveliness is reduced by treating it with an oil or oil emulsion which also imparts antistatic properties to the yarn. This can be accomplished by using any suitable sizing system.

After the threads are twisted together, the composite yarn is fed to a bulking jet of the type disclosed in copending application Serial No. 410,918, filed February 17, 1954, now U.S. Patent 2,874,444 having common ownership herewith. The yarn enters the jet at an angle. Air under pressure propels the yarn through a confined zone in the jet. Shortly after leaving the jet the direction of yarn travel is changed while the yarn is still under the influence of the stream of air. The change in direction may be accomplished by having the yarn impinge against an obstacle after leaving the jet. Thereafter the yarn is taken up in an orderly arrangement in a package form.

According to the second modification, part of the threads having different shrinkage properties is bulked as above described prior to being plied together with an unbulk portion. The threads may be twisted or non-twisted; but preferably they are twisted. However, if only one component is twisted, then, of course, it is preferred to bulk this thread. Moreover, if all of the component threads are twisted, it is preferred that the direction of twist be the same for all the threads. It is not necessary that the threads have the same number of turns per given length. Furthermore, the plying of the threads is preferably accomplished in a direction opposite to the direction of twist in the threads. It is best that the composite yarn have a twist of about 100 to 500 turns per meter.

It is preferred, according to the second modification of the present invention, to bulk the thread with a jet adapted in such a manner that the air in the jet is given a helical movement running in the same direction as the twist in the thread. A jet of this type is disclosed in copending application Serial No. 484,218, filed January 26, 1955, now U.S. Patent 2,924,000, owned by the present assignee. The winding velocity of the bulked thread is preferably at least 5% less than the velocity with which the thread is delivered to the bulking jet.

In some cases it may be preferred to reduce the twist-liveliness of the composite yarn which may be accomplished as hereinabove described.

The bulked yarn may now be woven to produce the crepe fabric of the present invention. The said fabric may contain the yarn in the warp or weft, or both. The creping power of these new yarns is so satisfactory that they may be woven into a large variety of weaves depending upon the type of crepe desired. For example, a very good crepe fabric may be woven with the yarns of the present invention, alternately with a yarn of right hand twist and the yarn of left hand twist.

After the wearing of the yarn into a suitable fabric, the crinkling or pebble effect characteristic of crepe fabric may be imparted in several different ways. Preferably, this is done by immersing the fabric in a tension-free condition in a bath of hot water or soap solution for a suitable length of time. The bath is preferred to be maintained at a temperature of from 95 to 100° C. After withdrawing the yarn from the bath and rinsing, if necessary, the crepe fabric is dried tension-free or under some tension.

The invention is generally applicable to the use of any two or more types of yarn, the only requirements being that the component yarns have different shrinkage properties and the twist as herein described. The composite yarn of the present invention may be composed entirely of one type of fiber. However, the shrinkage extent of one component must be more or less than the other. Also, it is not necessary that the threads consist of the same material. Thus, for example, threads of polyamide and polyacrylonitrile, cellulose acetate and viscose, polyamide and polyvinylchloride, etc., may be twisted together provided that the threads have different shrinkage properties.

If the yarn consists of thermoplastic filaments the crepe fabric should be dried free of tension. In addition, the fabric with or without tension should then be stabilized by a drying operation, both in the direction of the width and the length, and at high temperatures at least higher than those used during washing. This may be accomplished in any known manner. The fabric can be dyed and otherwise handled as any crepe fabric.

The crepe fabric produced in accordance with the present invention has many desirable properties. It has a woolly, fluffy character, a soft pliable hand, drapes well in spite of its light weight, and is highly crease resistant. Also, the crepe effect is substantially permanent under normal conditions of use. End uses are undergarments, blouses, dresses, accessories, linings, etc.

The crepe fabric of the present invention is particularly

characterized by being produced at least in part from a twist-lively yarn having random filamentary loops projecting outwardly therefrom to provide a marked inter-filament friction. The yarn is composed of at least two continuous multifilament threads twisted together and possessing different shrinkage characteristics. The loops are formed by the action of a strong current of air on the yarn. The fabric is creped due to the differential shrinkage between the threads upon treating the fabric in a hot liquid.

For a fuller understanding of the invention, reference is made to the following examples which are given merely to further illustrate the invention and are not to be construed in a limiting sense.

Example I

An unshrunk 50 denier/10 filament polycaprolactam nylon thread having a low S-twist of 20 turns per meter was plied together with a fully shrunk 70 denier/24 filament polycaprolactam nylon thread also having a low S-twist of 20 turns per meter to form a composite yarn having an S-twist of 600 turns per meter.

The plied yarn thus obtained was propelled through a tube by means of a flow of gas in the manner described in application Serial No. 354,503 referred to above. After leaving the tube the direction of movement of the yarn was changed; and the yarn was wound on a take-up device. The winding velocity of the looped yarn was 20% lower than the velocity with which the plied yarn was drawn off a spool.

A looped yarn having an original Z-twist of 600 turns per meter was manufactured in the same manner.

The S-twist and Z-twist yarns were woven alternately as the weft of a fabric. The warp consisted of normal smooth 50 denier/10 filament polycaprolactam nylon threads.

The fabric was washed over its entire width at 95° C. in a tension-free condition and then dried without tension. Finally, the fabric was stabilized under a slight tension at 190° C. The finished fabric had a crepe appearance resembling fine woolen crepe fabric. Upon dyeing and repeated washing, the crepe structure remained substantially unchanged.

Example II

A completely shrunk 72 denier/38 filament polycaprolactam nylon thread having an S-twist of 800 turns per meter was bulked by propelling it through a tube by means of a flow of gas in the manner described in application Serial No. 354,503 referred to above. After leaving the tube the direction of movement of the yarn was changed; and the yarn was wound on a take-up device. The winding velocity of the looped yarn was 15% lower than the velocity with which the yarn was drawn off a spool.

The looped yarn thus obtained was plied with an unshrunk and unbulk 72 denier/24 filament polycaprolactam nylon thread having an S-twist of 300 turns per meter to form a composite yarn having a Z-twist of 200 turns per meter.

This composite yarn was woven as the weft of a fabric. The warp consisted of normal smooth 72 denier/24 filament polycaprolactam nylon threads.

The fabric was washed over its entire width at 95° C. in a tension-free condition and then dried without tension. Finally, the fabric was stabilized under a slight tension at 190° C. The finished fabric had a crepe appearance resembling fine woolen crepe fabric. Upon dyeing and repeated washing, the crepe structure remained substantially unchanged.

Certain modifications and equivalents of the present invention will become apparent to those skilled in the art and are intended to be included within the scope of the present invention, which is to be limited only to the extent of the appended claims.

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What is claimed is:

1. A method of producing yarn suitable for crepe fabric which comprises twisting together at least two continuous multifilament threads having a low twist and different shrinkage properties into a twist-lively composite yarn, displacing the filaments of the composite yarn by the action of a strong current of air as the result of which random filamentary loops project outwardly therefrom subjecting the composite yarn to a shrinking-inducing temperature and collecting the yarn in an orderly manner.

2. A method of producing yarn suitable for crepe fabric which comprises twisting together at least two continuous multifilament nylon threads having different shrinkage properties into a twist-lively yarn, displacing the filaments of the composite yarn by the action of a strong current of air as the result of which random filamentary loops project outwardly therefrom subjecting the composite yarn to a shrinkage-inducing temperature and collecting the yarn in an orderly manner.

3. A method of producing yarn suitable for crepe fabric which comprises twisting together two continuous multifilament nylon threads having a twist of less than 150 turns per meter and different shrinkage properties into a twist-lively composite yarn, displacing the filaments of the composite yarn by the action of a strong current of air as the result of which random filamentary loops project outwardly therefrom subjecting the composite yarn to a shrinkage-inducing temperature and collecting the yarn in an orderly manner.

4. A method of producing yarn suitable for crepe fabric which comprises twisting together at least two continuous multifilament nylon threads having a twist of less than 150 turns per meter and different shrinkage properties into a composite yarn having a twist of from 300 to 1000 turns per meter, displacing the filaments of the composite yarn by the action of a strong current of air as the result of which random filamentary loops project outwardly therefrom subjecting the composite yarn to a shrinkage-inducing temperature and collecting the yarn in an orderly manner.

5. A method of producing yarn suitable for crepe fabric which comprises displacing the filaments of a first continuous multifilament thread by the action of a strong

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current of air as the result of which random filamentary loops project outwardly therefrom, twisting said thread together with a second continuous multifilament thread having different shrinkage properties as compared with said first thread into a composite yarn subjecting the composite yarn to a shrinkage-inducing temperature and thereafter collecting the yarn.

6. A method of producing yarn suitable for crepe fabric which comprises displacing the filaments of a first continuous multifilament nylon thread by the action of a strong current of air as the result of which random filamentary loops project outwardly therefrom, twisting said thread together with a second continuous multifilament nylon thread having different shrinkage properties as compared with said first thread into a composite yarn subjecting the composite yarn to a shrinkage-inducing temperature and thereafter collecting the yarn.

7. A crepe fabric containing a weft of plied yarn consisting essentially of at least two nylon threads having different shrinkage characteristics and comprising a plurality of continuous filaments having coils, loops and whorls at random intervals along their lengths and a warp of smooth thread.

8. A crepe fabric containing a weft of a twist-lively yarn having random filamentary coils, loops and whorls projecting outwardly therefrom and plied from at least two continuous multifilament threads having different shrinkage properties.

9. A crepe fabric containing a weft of a twist-lively yarn having random filamentary coils, loops and whorls projecting outwardly therefrom and plied from two continuous multifilament nylon threads having different shrinkage properties.

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