This invention relates to composite textile yarns. The object of the invention is to provide a novel type of composite abrasion-resistant yarn which is of particular use as a pile yarn in the manufacture of carpets.

According to this invention a composite yarn is obtained by twisting together (a) one or more continuous filament viscos rayon yarns which are all twisted in the same direction and (b) one or more continuous filament yarns of different material which are all twisted in the opposite direction from that of the viscos rayon yarns, the direction of the twisting together being in the direction of the twist of the viscos rayon yarns thereby producing a composite yarn composed of yarns having different degrees of twist, in the same direction and the viscos rayon yarns being twisted more than the other yarns, bulbking the composite yarn by passing it through a turbulent zone produced by a high velocity fluid jet, preferably a high velocity steam jet, and collecting the yarn at a speed which is less than the speed at which the composite yarn is fed to the high velocity fluid jet. The yarn may conveniently be collected on a winding machine or in a can for subsequent coiling.

The yarns used for one component in this invention are continuous filament viscos rayon yarns twisted in the same direction which may be either S or Z twist. The yarns used for the other component may be of continuous filament cellulose acetate yarns, either secondary di-acetate or triacetate yarns, twisted in the direction which is opposite to that in the continuous viscos rayon yarns. One or more ends of each type of yarn may be used.

The two types of yarn are then twisted together in the direction of the viscos rayon yarns so that the twist in the viscos rayon yarns is increased and the twist in the other yarns is first taken out and then inserted in the twisting direction. As an actual example, a number of viscos rayon yarns having a 3 t.p.i. (turns per inch) S twist may be twisted together using 3.5 t.p.i. S twist with a number of acetate yarns having 1 t.p.i. Z twist. In the composite yarn the viscos rayon yarns have 6.5 t.p.i. S twist and the acetate yarns 2.5 t.p.i. S twist.

The composite twisted yarn is then subjected to a bulking process of the type in which the yarn is fed into a turbulent zone formed by a fluid jet. Such a process is described in the Breen Patent No. 2,783,069. The form of jet having a resonance chamber as described in U.S. Patent No. 3,010,270 to Richmond et al. dated November 28, 1961, may be used with advantage in carrying out the bulking step of this invention. In the type of bulking process using a fluid jet, the yarn is usually over-fed into the fluid jet, that is to say the rate of collection of the yarn is less than the rate of feed; in bulking the composite yarn in the process of this invention an over-feed is used. The actual amount of over-feed will depend to some extent on the number and types of yarn being treated and experiments may be necessary to determine the optimum overload in particular cases. Air may be used as the fluid medium for the jet but, as indicated above, it is preferred to use steam for this purpose.

The abrasion resistance of yarns produced by this invention is appreciably greater than that of corresponding mixed yarns spun on conventional systems.

The invention is illustrated by the following example.

**Example**

3 ends of 750 denier, 50 filament (continuous) secondary acetate yarns having 1.0 t.p.i. Z twist and 5 ends of 500 denier, 50 filament (continuous) viscos rayon yarns having 3.0 t.p.i. S twist were folded together with 3.5 t.p.i. S twist. The folded yarn has 6.5 t.p.i. S twist in the viscos rayon yarns and 2.5 t.p.i. S twist in the acetate yarns.

The yarn was then passed at a speed of 70 meters per minute through a jet constructed in accordance with U.S. Patent No. 3,010,270 to Richmond et al. dated November 28, 1961, and supplied with steam at 80 lb. per square inch; the over-feed was 1.61 to 1. The bulked yarn was collected on a winding machine.

The yarns obtained were tufted on a 3/8 inch gauge tufted carpet machine using 9 stitches per inch and a tuft length of 0.8 inch, the carpet being backed with a standard latex composition. The resistance to abrasion was measured on the Wool Industries Research Association's carpet wear testing machine using standard cross-bred wool fabric as the abradant under a pressure of 8 lb. The wear was assessed by examining the samples after every 500 revolutions and noting the number of revolutions before the hessian back began to show through the pile.

Using yarns made according to the above example the number of revolutions over a number of trials varied between 8,500 and 11,500. A similar blend of yarns, linen spun to 3/8.16 lea, tufted at 10 stitches per inch gave figure of 1,500 to 3,000. A 100 percent wool yarn, 2/50s Dewsby, tufted at 9 stitches per inch, gave figures of 2,000 to 4,000. Other corresponding figures for comparison are that with exactly the same construction and procedure given in the example but using (a) all acetate yarns the abrasion figure was 4,000, and (b) all viscos rayon yarns the abrasion figure was 6,000. In a further construction in which the only modification was that the twist of the viscos rayon was 1 t.p.i. Z instead of 3.5 t.p.i. S, the abrasion figure was 4500; in this case the direction of twist of the viscos rayon and acetate yarns was the same and the abrasion resistance was appreciably lower than that of the yarn of the example where the twists were of opposite directions.

The construction described in the example may be modified in a number of ways. For example combinations other than 5 ends of the viscos rayon yarn and 3 of the acetate yarns may be used; thus 2, 3 or 4 ends of viscos rayon may be folded with 2 or 4 ends of acetate. In addition the acetate yarns may be replaced by continuous filament nylon yarns. Modifications may also be made in the degrees and direction of twist provided that the non-viscos yarns used are twisted in the direction opposite to the direction of twist of the viscos yarns and that the degree of twist used in folding the yarns together is sufficient first to untwist and then to re-twist the non-viscos rayon yarns.

What we claim is:

A process for the production of a composite, abrasion-resistant yarn suitable for use as a pile yarn in the manufacture of carpets which comprises twisting together (a) from 2 to 5 continuous filament viscos rayon yarns which are all twisted in the same direction, and (b) from 2 to 4 continuous filament cellulose acetate yarns which are all also twisted in the same direction but which direction of twist is opposite to that of the viscos rayon yarns, the direction of the twisting together of the viscos rayon yarns and of the cellulose acetate yarns being in the direction of the twist of the viscos rayon yarns and of such a magnitude that the composite yarn is composed of
yarns a and b having different degrees of twist in the same direction and the viscose rayon yarns a being twisted more than the acetate yarns b, bulking the composite yarn by passing it through a turbulent zone produced by a high velocity fluid jet and collecting the resultant yarn at a speed which is less than the speed at which the composite yarn is fed to the high velocity fluid jet.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION


Alexander Henderson Gentle et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, lines 50 and 51, strike out "In addition the acetate yarns may be replaced by continuous filament nylon yarns."

Signed and sealed this 25th day of September 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents