

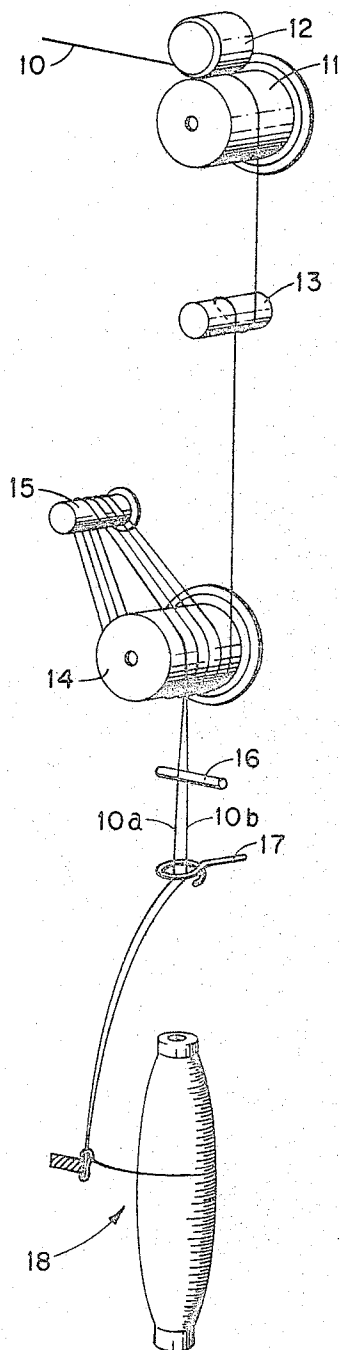
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PROCESS FOR THE MANUFACTURE OF MULTICOLORED TUFTED FABRICS

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**PROCESS FOR THE MANUFACTURE OF
MULTICOLORED TUFTED FABRICS**

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This invention relates to a process and apparatus for the production of tufted carpets, rugs, upholstery, and other napped fabrics. More particularly, the invention relates to the production of multicolored carpets from synthetic linear high polymer yarns such as nylon, polyester, polypropylene, and the like.

Fiber producers and carpet manufacturers have, for several years, manufactured carpets from a plurality of differently colored yarns to produce various color combinations so as to present a tweed or salt-and-pepper appearance in the tufted product.

In the normal manner of production, yarns of different colors, or yarns capable of producing different color effects when dyed, are combined by plying into a single strand. The subject yarns are spun, draw twisted, textured, and plied in various combinations to produce the color combination desired. The resulting yarn product is then tufted into a fabric having a tweed or salt-and-pepper appearance in which each color in the plied yarns can be distinguished. Due to the regularly repeating patterns imparted to the yarns by the plying operation, all such tufted carpets contain streaks whenever individual tufts are of sufficient height to place the repeating ply patterns in phase. For this reason, all multicolored carpets produced from plied yarns contain streaks in varying degrees. Such a method of plying to produce a multicolored carpet is disclosed in U.S. Patent No. 3,101,522. In this patent, a composite strand of three yarns, after being made into a fabric, is dyed in a single dye bath to produce a variegated colored textile article. Although multicolored tufted fabrics such as carpets, rugs, upholstery, etc., may be produced by plying predyed yarns of different colors, it is advantageous to be able to dye such articles in the piece, i.e., after the yarn has been knit, woven, or tufted into the fabric. In either case, the method of combination of the yarns in the same and, since the yarns are twisted and plied, the resulting tufted fabrics show a streakiness due to the aforementioned repeating ply patterns.

Since it is recognized that any multicolored twisted or plied strand, when tufted, will produce a streaky product, there has been much effort to tuft the multicolored yarns without the necessity of a plying or twisting step. However, it has been found that if the dissimilar yarns do not have a certain amount of cohesion when combined, they cannot be handled properly after subsequent texturing or tufting. Without the coherence produced by plying the yarns, they tend to separate and cannot be handled as a single, multicomponent strand required for tufting operations. It has been proposed to parallel two differently colored yarns or two yarns having different dye characteristics while in a zero twist and intermittently tangle three yarns by the use of an air jet to create the cohesion necessary to enable the yarns to be textured and tufted. However, this air jet tangling step is quite costly and involves additional time and labor. Moreover, when fabrics are produced by yarns which have been intermittently tangled and dyed, a blotchy or mottled effect, caused by the dissimilar dye absorption in the fabric at the yarn tangle points, can be seen.

It is therefore an object of the present invention to provide a process for producing tufted multicolored carpet fabrics in which the disadvantages and imperfections of the prior art processes are largely overcome.

It is a further object of the invention to provide a convenient, inexpensive process and apparatus for producing a streak-free multicolored tufted carpet.

An additional object of the invention is to produce a streak-free textile fabric in which a more suitable color blending can be obtained when yarns of different colors or of different dye characters are combined in a random fashion, rather than by uniform plying.

The manner in which these and other objects of the invention are obtained will become apparent from a study of the following description, when considered in conjunction with the accompanying drawing wherein the figure represents a schematic view of the apparatus of this invention.

In the figure, two differently colored untwisted, undrawn yarns 10 are propelled from a suitable source (not shown) to a feed godet 11, the yarns being held in parallel by a presser roll 12. From the godet 11 the yarns are passed to and around a draw pin 13 and thence to a draw godet 14. They are wrapped several times around the draw godet and adjacent idler roller 15. The draw godet is rotated (by means not shown) at an r.p.m. higher than that of the feed roll 11 so as to effect the desired drawing of the yarns on the draw pin 13. In order to maintain the yarns separate until they reach the twisting device, a separator pin 16 is mounted below godet 14. Yarn 10a passes on one side of the pin and yarn 10b passes on the other side. They are brought together through pigtail guide 17 and twisted less than one turn per inch on ring twister 18.

It is imperative that a separator means such as pin 16 be utilized between the two yarns after the drawing but before the ring twister. This prevents intermingling of the differently colored filaments which would otherwise show up in the carpet fabric as a blurred third color rather than having a distinct two-tone effect.

A streak-free multicolored textile fabric can be produced by combining yarns of at least two different colors or color characteristics before twist is inserted into any of the individual yarns. It has been found that if such yarns are combined and drawn in an untwisted state and subsequently twisted on a ring twister, the yarns cohere sufficiently to enable them to be simultaneously bulked and then tufted. The resulting tufted fabric which contains yarn having a low twist produces a multicolor combination free of streaks.

If dissimilar yarns requiring different drawing conditions such as different draw ratios and temperatures are used, then each yarn is collected on a spin winder package. It is then collected on a draw winder package (untwisted) separately. These yarns are combined on a ring twister by inserting one-half turn per inch.

To produce a tufted textile fabric, the subject yarns are spun and draw twisted on a conventional draw twister. During twisting, the dissimilar yarns to be combined are paralleled in the untwisted state and combined into a single package on a ring-type twister take-up. At this point, the composite yarn contains a production twist of a fraction of a turn per inch, e.g., approximately one-half S or Z turn per inch. It is critical that the yarn must not be twisted as much as one turn per inch, because it has been determined that such yarn, when tufted into a carpet fabric, has the same objectionable streakiness herein in plied yarns.

The composite yarn on the draw twister package may then be subjected to a texturing or bulking step. Such a step is generally accomplished by passing the composite yarn through a conventional stuffer box crimping device, although the yarn may be textured by other systems.

After the drawing and bulking operations, the composite yarn is found to have sufficient cohesion to enable

it to be quite satisfactorily tufted into a fabric. It has quite surprisingly been found that the usual plying step heretofore necessary in the multicolored tufted fabric production may be omitted and tufting operations are found to be unhindered thereby.

The following examples will serve to exemplify the invention.

EXAMPLE I

One end normal nylon plus one end of differential dyeing (acid resist) nylon

Each component yarn was spun separately to give a 1040/68 yarn if drawn at a ratio of 3.5 to 1. The undrawn yarns were collected on winder packages and then placed on the draw twister so that one end of the normal dyeing yarn and one end of the differential dyeing yarn were fed to the same set of draw godets. The two yarns were maintained in a parallel but separate position during drawing (3.5 to 1) to prevent intermingling of filaments. After drawing, the two parallel yarns were combined and twisted to one-half turn per inch and wound onto a pin. Normal bulking and tubing procedures were then followed.

EXAMPLE II

One end normal nylon plus one end of polyester

Each yarn was spun, collected on a spin winder package, drawn and collected on a draw winder package (untwisted) separately. In the case of the nylon, the yarn was cold drawn at a ratio of 3.5 to 1 to give a denier of 1040/68. The polyester was drawn at a ratio of 6:1 over a 75° C. pin and relaxed over a 180° C. hot plate. The resulting denier was also 1040/68. The two zero twist drawn yarns were combined on a ring twister by inserting one-half turn per inch. Normal bulking and tubing procedures were then followed.

Whereas the invention has been described in connection with combining two differently colored yarns, it is to be understood that three or more may be combined, provided they are maintained separate until they reach the ring twister.

Moreover, when the expression "differently colored

yarns" is employed, it is intended to cover yarns having dissimilar dye characteristics which will provide multicolored fabrics when dyed in fabric form.

What is claimed is:

- 5 1. A method of producing a multicolored carpet fabric which comprises
 - 10 (a) propelling in parallel side-by-side relationship from a suitable source at least two substantially undrawn and untwisted continuous filament synthetic linear high polymer yarns having different dye characteristics while maintaining the yarns separate one from the other,
 - 15 (b) simultaneously drawing said yarns while preventing intermingling of the filaments,
 - 20 (c) collecting said yarns while plying them together into a composite yarn with a ply twist of not more than a fraction of a turn per inch, and
 - (d) tufting the composite yarn into a carpet which is characterized by an absence of color streakiness throughout its surface.
2. A method of producing a multicolored carpet fabric as set forth in claim 1 wherein the yarns are of at least two different colors.
- 25 3. A method of producing a multicolored carpet fabric as set forth in claim 1 and including the additional step of bulking said composite yarn prior to tufting into a carpet fabric.

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