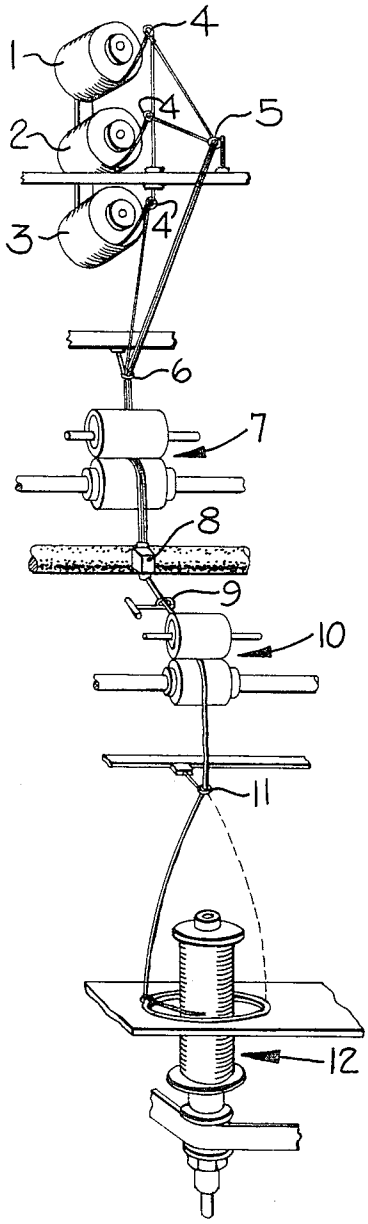
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INTERLEAVED MOULINEE YARN

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INTERLEAVED MOULINEE YARN

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ABSTRACT OF THE DISCLOSURE

A process for the preparation of an iridescent moulinee yarn and the product produced thereby, the process comprising interleaving at least two separate ends of yarns which have hues which are not more than about 72° and not less than about 36° apart, and then twisting.

This invention relates to moulinee yarn and more specifically to interleaved moulinee yarn having little or no twist.

Moulinee yarns are yarns obtained by plying together several yarn components, each having a different color. While other types of multi-colored yarns are available, such as, for instance, melange, or jaspe yarns, moulinee yarns are especially desirable in that they are suitable for continuous filament yarns. Moulinee yarn manufacturers have made efforts to achieve desirable color effects by means of various critical twisting combinations or texturing combinations in combination with twisting combinations, the end products being of course, very uniform yarns, which differ greatly from the coloration achieved in melange or jaspe yarns, wherein a random distribution or color is prevalent. The moulinee yarns of the prior art however, are characterized by a twist level which is greater than manufacturers twist, that is to say, greater than about 6 turns per inch with the resultant product usually having a "barber pole" coloration. It should be understood that a random distribution of color rather than a "barber pole" distribution is not only desirable in order to have the moulinee yarns resemble the more expensive melange or jaspe yarns, but it is also desirable in that certain novel effects which can be achieved through critical combinations of random color distribution are possible.

It is therefore an object of this invention, to provide a process for the preparation of moulinee yarns of random color distribution.

It is another object of this invention to provide a moulinee yarn of random color distribution.

It is still another object of this invention to provide a process for the preparation of moulinee yarns having an iridescent coloration.

It is a further object of this invention to provide a process for the preparation of moulinee yarns having a heather coloration of random color distribution.

It is an additional object of this invention to provide iridescent moulinee yarns.

It is still another object of this invention to provide heather yarns of random color distribution.

In accordance with this invention, it has now been discovered that moulinee yarns of random color distribution can be achieved by interleaving a plurality of yarns, having different colorations which may be within a heather or iridescent moulinee yarn, the individual yarns making up a combination must be of adjacent hues. In order to obtain an iridescent moulinee yarn, it is also essential that at least two yarns, each having a different color, be employed, and preferably from two to five yarns and most preferably, three yarns. It is also essential for purposes of obtaining an iridescent yarn that at least two of the colors be of adjacent hues.

The yarns employed in producing the novel moulinee yarn of this invention may be any continuous filament yarns such as for instance, regenerated cellulose, cellulose esters, polyamides, polyesters, polyolefins, acrylics, regenerated keratin, silicious fibers and the like. It should be understood that the moulinee yarn of this invention may be blends of various continuous filaments, the blends embodying variations in denier as well as variations in the chemical compositions of the continuous filaments. Blends which have been found to be especially suitable for the production of high bulk yarns are blends of shrinkable and non-shrinkable filaments. Where an iridescent yarn product is desired, it is preferred that the continuous yarns be high luster yarns.

The interleaving of the plurality of yarns is preferably accomplished by means of a bulking operation whereby the bulking of the singles yarn will provide an interlocking of the composite yarn structure with a minimum of twist. The preferred bulking operations are air jet entangling operations and false twisting operations. The bulking operation may be accompanied by a subsequent twisting operation, the twist imparted being manufacturers twist, that is to say, not more than 4 turns per inch.

A better understanding of the invention may be had from a discussion of a drawing wherein yarn supply packages **1**, **2** and **3** are arranged so as to feed a supply of yarn through their respective pigtail guides **4**. Yarns from supply packages **1** and **2** are then passed through a common pigtail guide member **5**. The 2-ply strand composed of yarn from supply packages **1** and **2** is then formed into a 3-ply strand by simultaneous passage through pigtail passage member **6** with the yarn from supply package **3**. The positioning of the pigtail guide members is not critical and it should be understood that arrangements other than those illustrated may be employed. The 3-ply strand is then fed into the nip of a pair of feed rolls **7** and from there into a texturizing device **8**. While the texturizing device **8** may be any of a number of the well-known textile texturizing devices it is preferred that the texturizing device **8** be an air jet wherein the ends of yarn are fed into the air jet and thereby briefly exposed to a turbulent stream of high velocity air, the yarn being over-fed by feed roll **7** to the texturizing device **8** whereby the yarn bundle is opened, thereby disarranging and looping the individual filaments in the bundle. Upon exit from the texturizing device **8** the 3-ply yarn is more or less permanently secured in its disarranged and looped state by means of the internal friction existing between the filaments making up the composite yarn structure. The yarn upon exiting from texturizing member **8**, is passed through pigtail guide **9** and then into the nip of a second pair of nip rolls **10**, nip rolls **10** being driven at a lower speed than nip rolls **7** so as to maintain an over-feed condition of the yarn entering texturizing unit **8**. The yarn exiting from nip rolls **10** is in the form of a product which is suitable for knitting or weaving operations. However, it may be desirable to impart a slight additional degree of twist in order to increase the yarn strength and therefore the yarn may be passed through pigtail guide member **11** and then taken up on standard ring and follower downtwister **12**.

As previously stated, where it is desired to produce an iridescent moulinee yarn, the colors composing the moulinee yarn should be of adjacent hues. Where it is desired to produce a heather type yarn, the color combinations are not critical. For purposes of this invention, color is considered as having three dimensions, which are hue, value and chroma. Hue is the distinctive characteristic of any chromatic color distinguishing it from other hues, such as are found in the spectrum or between the ends of the spectrum. Hue is generally comprehended

by five words which are red, yellow, green, blue and purple used either singly or in conjunction with each other. Chroma is the strength or weakness of a chromatic color. In terms of chroma, color is described as weak, moderate or strong. Value is the lightness or darkness of any color. In terms of value, the color may be described as dark, middle or light. The three terms, hue, value and chroma allow any color to be described in three-dimenisonal terms. For purposes of defining the three dimensional characteristics of a color, a sphere may be considered wherein the top pole of the sphere is white and the bottom pole black, and the axis is a graduated scale of greys. Clockwise around the equator of the sphere as seen from the top pole and at equal distances apart are the five principal hues which are red, yellow, green, blue and purple and the five intermediate hues which are combinations of the aforementioned hues. To facilitate the ready identification of "in-between" hues, second intermediate hues are added in logical sequence in the succession of principal and intermediate hues around the equator. Each principal and intermediate hue is given a value of 5 with hues disposed counterclockwise having values ranging down to 1 and hues disposed clockwise having values ranging up to 10. Spaced evenly between each two of these in the order named are the five intermediate hues, yellow-red, green-yellow, blue-green, purple-blue and red-purple. If radial segments are cut from the sphere, it will be seen that a segment may be obtained which is of a single hue category having a value ranging from white through black. Within this segment, the third variable or chroma may be considered. Chroma is measured in a plane at right angles from the polar neutral axis. That is to say, the chroma value may be obtained for any level of value. Chroma may be considered as being weaker as a position is being taken inwardly on the plane toward the neutral axis and stronger as a position is taken on the plane toward the outer periphery. In terms of the Munsell Book of Color, by A. H. Munsell, standard edition copyrighted 1929, value may be numerically defined in gradients of from 1–9, 1 being the arithmetic value assigned to the black side of the pole and 9 being the arithmetic value assigned to the white side of the pole. Correspondingly, chroma is given values of from 1–8, 1 being the arithmetic value assigned to a position nearest the polar axis and 8 being the arithmetic value assigned to a position nearest the periphery of the sphere.

For purposes of this invention, "adjacent colors" is deemed to mean colors having an adjacent hue which is calculated to produce an iridescent effect. Preferably at least two of the colors making up the iridescent yarn should be of a hue not more than about 72° and not less than about 36° apart and preferably the colors should vary no more than three units in chroma and three units in value and still more preferably, the colors should be of equal chroma and equal value.

The following specific examples are given for purposes of illustration and should not be considered as limiting the spirit or scope of this invention.

Example I

Three ends of 100 denier 26 filament Celaperm (dope dyed cellulose acetate marketed by Celanese Corporation) having 4 turns per inch of Z twist is fed simultaneously from three different bobbins over a set of feed rolls at 241 revolutions per minute, the revolutions corresponding to 62.5 yards per minute. The three yarn ends are then fed into a texturizing jet which is a type IX jet marketed by U.S. Textile Machine Company, 411 Gilligan Street, Scranton 8, Pennsylvania, the air bulking jet employing air at 40 pounds per square inch. The bulked and entangled yarn is then taken up on a second set of feed rolls operated at 201 revolutions per minute which corresponds to 50 yards per minute, resulting in a total overfeed of 20%. From the second set of feed rolls, the yarn is taken up on a conventional ring and follower down-twister resulting in a final product which is 325 denier having 5 turns of Z twist and a total of 78 filaments. The specific colors of the dope dyed acetate filaments are Celaperm C–24 pastel blue (Munsell color designation 10 blue, value 7, chroma 6), Celaperm C–71 medium blue (Munsell color designation—2.5 purple blue, value 4, chroma 12) and Celaperm C–22 dark blue (Munsell color designation—purple blue, value 2, chroma 8). The final product is found to have a tone on tone heather effect wherein a random distribution of the various colors is obtained and wherein a barber pole coloration is substantially absent.

Example II

Three ends of 100 denier 26 filament Celaperm yarn (acetate yarn marketed by Celanese Corporation) having 4 turns of Z twist are fed simultaneously from three different bobbins over a set of feed rolls at 241 revolutions per minute corresponding to 62.5 yards per minute through a false twist spindle. Upon emerging from the false twisting device the yarn is taken up on a second set of feed rolls operating at 235 revolutions per minute corresponding to about 60 yards per minute, resulting in a very slight over-feed of the yarn. From the second set of feed rolls the yarn is taken up on a conventional ring and follower downtwister in a manner so as to place 5 turns of Z twist in the end product which is a 325 denier 78 filament yarn. The specific colors which are employed are Celaperm C–65 medium green (Munsell color designation—5 green, value 5, chroma 8), Celaperm C–69 dark green (Munsell color designation—7.5 green yellow, value 5, chroma 6) and Celaperm C–46 light green (Munsell Color designation—10 green yellow, value 8, chroma 4). The end product is found to have a tone on tone heather effect with a random dispersion of color and substantially no barber poling of colors.

Example III

Procedure of Example II is again repeated with the exception that the two ends of 100 denier 26 filament Celaperm yarn is employed, the specific colors being Celaperm C–65 medium green and Celaperm C–69 light green. The end product is found to be a tone on tone heather yarn wherein a random distribution of color is obtained with substantially no barber poling of colors.

Example IV

Three ends of 30 denier (3 d.p.f.) nylon yarn having 4 turns of Z twist are simultaneously fed from three different bobbins over a set of feed rolls at 241 revolutions per minute corresponding to 62.5 yards per minute. The yarn is then passed through an air-bulking jet which is a type IX jet manufactured by U.S. Textile Machine Company, the jet employing air pressures of 40 pounds per square inch. The yarn, upon leaving the jet is passed into the nip of the second set of feed rolls running at 201 revolutions per minute, corresponding to 50 yards per minute resulting in a total over-feed of 20%. From the second set of feed rolls, the yarn is taken up on a sales package with substantially no twist, the end product being 90 denier 30 filament yarn having substantially no plying twist. The yarns employed in preparing the final product were package dyed prior to undergoing the air jet texturizing operation, the specific colors employed being as the first color Munsell 5.0 green, value 5, chroma 8, as the second color Munsell 5.0 blue, value 4, chroma 8, and as a third color, Munsell 5.0 blue, value 6, chroma 6. The final product is found to have an iridescent coloration with a random distribution of color and substantially no barber poling of colors.

Example V

The procedure of Example IV is repeated with the exception that the colors employed are Munsell 5.0 red,

value 4, chroma 12, and as a second color, Munsell 5.0 yellow-red, value 6, chroma 10, and as a third color Munsell 5.0 yellow-red, value 7, chroma 8. The final product is found to be an iridescent product having a random distribution of color and substantially no barber poling of colors.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Iridescent moulinee composite yarn characterized in that the yarn has a plying twist not greater than 4 turns per inch, at least two separate ends making up the composite having hues which are not more than about 72° and not less than about 36° apart.

2. The product of claim **1** composed of from 2 to 5 ends.

3. The product of claim **1** wherein said yarn is a bulked yarn.

4. A process for the prepartion of an iridescent moulinee yarn, said process comprising interleaving at least two separate ends of yarn which have hues which are not more than about 72° and not less than about 36° apart and then ply twisting up to about 4 turns per inch.

5. The process of claim **4** wherein said iridescent moulinee yarn is bulk entangled by simultaneous passage of the yarn ends through an air texturing jet.

6. The process of claim **4** wherein said iridescent moulinee yarn is bulk entangled by simultaneous passage of the yarn ends through an air texturing jet and then ply twisted up to about 4 turns per inch.

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