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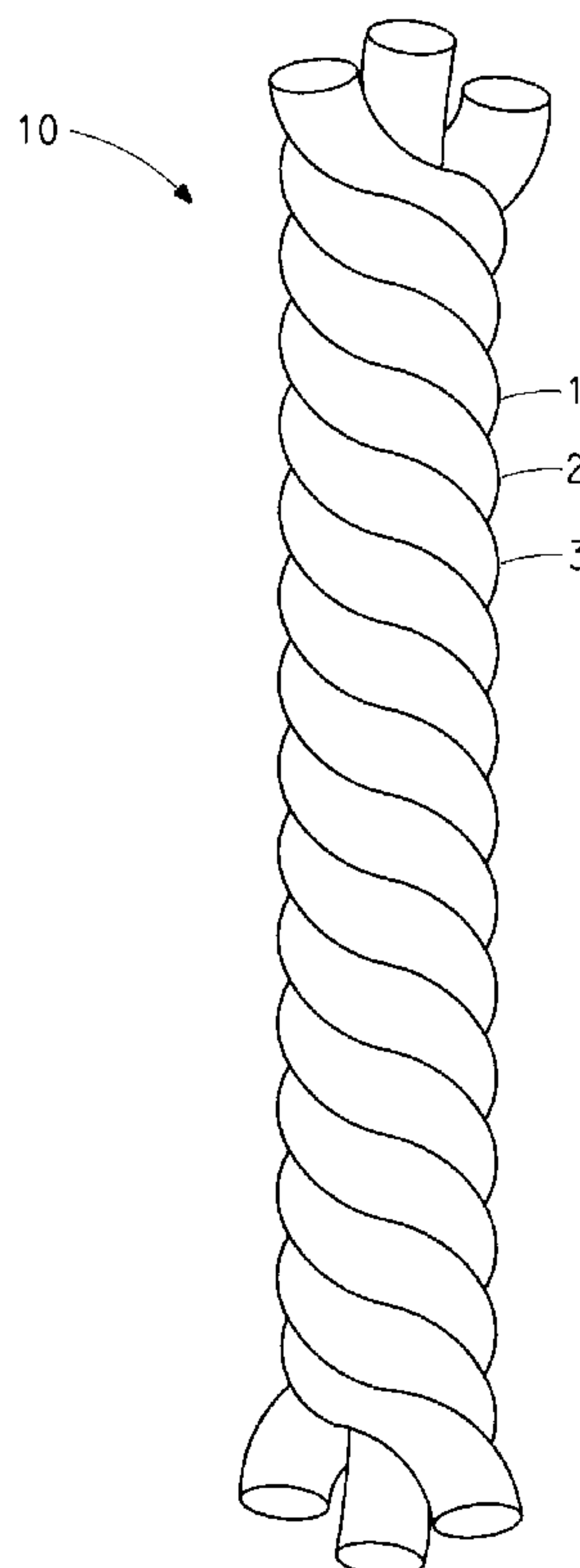
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(54) Title: MULTICOLOR FLOORING ARTICLE



(57) Abrégé/Abstract:

Multicolor flooring articles such as carpets are made from combined yarns (10) of at least three component yarns. At least one of the component yarns (1, 2, 3) is an acid dyeable nylon yarn; at least one of the component yarns is a cationically dyeable nylon yarn; and at least one of the component yarns is a poly(trimethylene terephthalate) yarn. The component yarns (1, 2, 3) are combined either by commingling with air or by cable twisting. The combined yarns (10) are tufted or woven into a carpet. When dyed using acid, cationic and carrier-free disperse dyestuffs of different colors, the resulting carpet exhibits at least three different colors.

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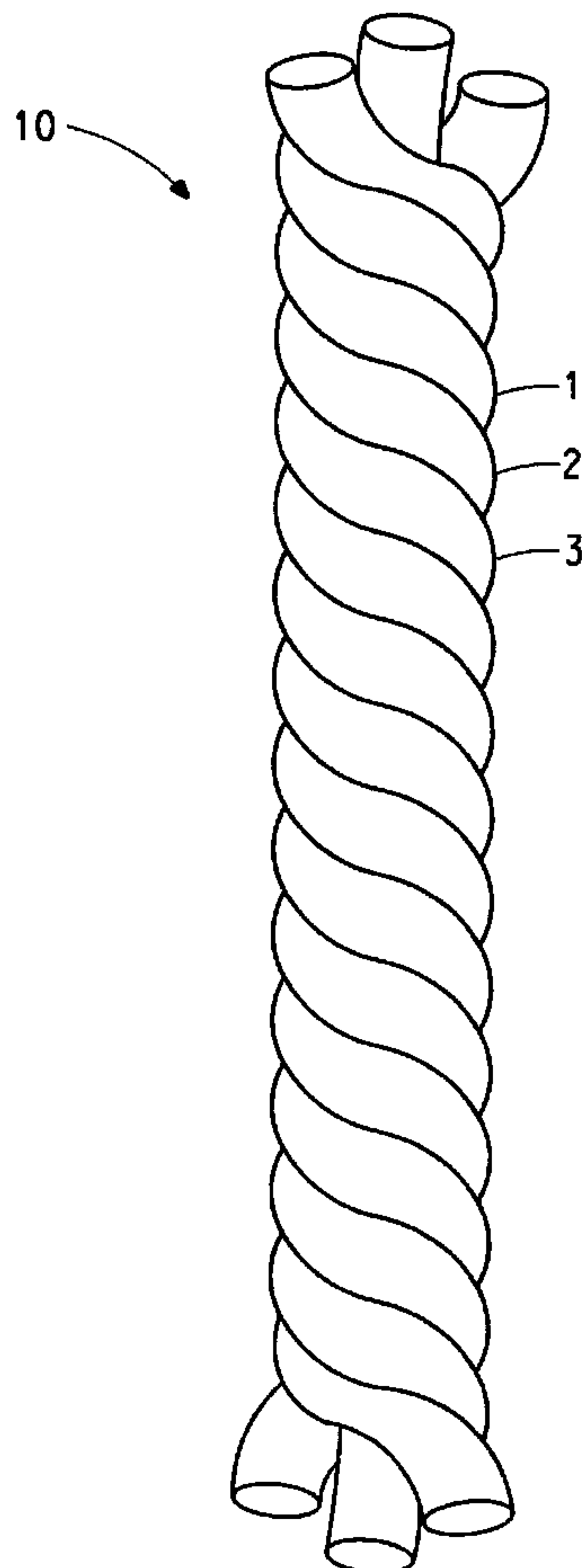
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(54) Title: MULTICOLOR FLOORING ARTICLE



(57) **Abstract:** Multicolor flooring articles such as carpets are made from combined yarns (10) of at least three component yarns. At least one of the component yarns (1, 2, 3) is an acid dyeable nylon yarn; at least one of the component yarns is a cationically dyeable nylon yarn; and at least one of the component yarns is a poly(trimethylene terephthalate) yarn. The component yarns (1, 2, 3) are combined either by commingling with air or by cable twisting. The combined yarns (10) are tufted or woven into a carpet. When dyed using acid, cationic and carrier-free disperse dyestuffs of different colors, the resulting carpet exhibits at least three different colors.

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TITLE

MULTICOLOR FLOORING ARTICLE

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FIELD OF THE INVENTION

The invention relates to a multicolor flooring article, and more particularly a multicolor carpet made from a combined yarn comprising at least three component synthetic yarns.

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BACKGROUND OF THE INVENTION

Multicolor flooring articles, such as carpets, are desired by designers and consumers to add diversity and flexibility to the aesthetics of carpets over solid color carpet. One conventional method of making a multicolor carpet is to make it from yarns which are themselves combinations of component yarns having different dyeabilities and then to dye the carpet using a mixture of dyes such as acid and cationic. For example, nylon yarns with deep acid, light acid and cationic dyeabilities may be combined by twisting them together or commingling them with high pressure air forming a combined yarn. The combined yarn may be tufted or woven to form a carpet, and the carpet may then be dyed in a dye bath containing acid and cationic dyestuffs. In this example, since two of the three yarn components are acid dyeable, the combined yarn will always include two component yarns dyed in the same color family, having light and deep shades of the same color. Thus, it is not possible to dye this combined yarn in such a way that it has three entirely different colors, i.e. the color styling flexibility of the carpet is limited.

Another process for making multicolor carpets is to combine acid and cationic dyeable nylon yarns with a polyethylene terephthalate (abbreviated PET or alternately, 2GT). PET is inert to acid and cationic dyes and can only be dyed with disperse dyes. PET (unmodified) is not suitable for dyeing on a continuous dye line, or

equipment designed to dye carpet on a continuous basis, because the dye leveling or uniformity of the dye is poor. Dyeing on a continuous dye line is the most economical method for dyeing carpet. Poor dye leveling occurs when the the fiber has low dyeability in terms of dye rate and dye exhaust that results in poor dye uniformity and splotchiness. PET can be dyed with disperse dyes in conjunction with a carrier. A carrier is an organic chemical used to swell or open the polymer structure of the PET fiber so that the fiber may be dyed acceptably in a high speed continuous dyeing process. However, carriers are costly and toxic. A carpet using this combination of yarns when dyed with acid, cationic and disperse dyestuffs and carrier can result in a multicolor effect in which each color of a yarn component is different from the other. However, these carpets have poor resistance to crushing and matting, due to the poor resiliency of the PET yarn component. Thus, the multicolor carpet made in this manner is not a desirable option because the crushing resistance is unacceptable and requires a costly and toxic carrier.

The following disclosures may be relevant to various aspects of the present invention and may be briefly summarized as follows:

U.S. Pat. No. 5, 160, 347 to Kay et al. discloses carrier dyeable polyester yarns that are space dyed by spraying with water dispersions of disperse dyes without thickeners or carriers followed by a short steaming process and autoclaving to develop the dyes or by a process of knitting the yarn into socks or tubes which are roller printed with disperse dyestuff, thickener and carrier dissolved in water in various colors followed by steaming, washing, drying and deknitting. The thus produced space dyed yarns are then tufted into area rugs along with undyed yarns of "carrierless" polyester fibers and/or nylon fibers and dyed with a cationic, acid or disperse dye appropriate to

the dye receptivity of the undyed yarns while avoiding over dyeing of the space dyed yarns to produce a multi-color piece dyed area rug.

5 U.S. Pat. No. 5, 354, 342 to Jenkins discloses stain-resistant, multicolored cationic dyeable carpet fibers space dyed with an acid dye or premetalized acid dye, heatset, then tufted together with undyed cationic dyeable nylon fibers into a carpet. The carpet is then
10 overdyed with an acid dye or premetalized acid dye to selectively dye only the previously undyed cationic dyeable nylon fibers, without staining or discoloring the adjacent previously dyed fibers, resulting in a multicolored stain resistant carpet.

15 U.S. Pat. No. 5, 199, 958 to Jenkins et al. discloses a multicolored stain-resistant nylon carpet prepared by tufting a space dyed cationic-dyeable carpet nylon, dyed with an acid or premetalized dye intermixed and tufted with an acid dyeable nylon and overdyed with
20 an acid dye to selectively dye the acid dyeable fibers but not the already space dyed yarns.

 U.S. Pat. No. 3, 652,198 to Farber et al. discloses a process for dyeing fibers, fabrics or other shaped articles made from blends of either poly (alpha-
25 olefins) or polyesters and various thermoplastic nitrogen-containing basic polymers to a multicolor pattern.

 It is desirable to have a system for dyeing a multicomponent carpet in which each of component of three
30 component yarns may be dyed a different color without the use of a carrier and the resultant carpet has a high resistance to crushing and matting.

SUMMARY OF THE INVENTION

35 Briefly stated, and in accordance with one aspect of the present invention, there is provided a multicolor flooring article comprising combined yarns, each combined yarn comprising at least an acid dyeable

nylon multifilament yarn, at least a cationically dyeable
nylon multifilament yarn and at least a poly(trimethylene
terephthalate) multifilament yarn wherein the flooring
5 article is dyed at least three different colors in a
carrier free dye bath containing a combination of acid
dye, cationic dye and disperse dye.

Pursuant to another aspect of the present
invention, there is provided a process for making a
10 multicolor flooring article comprising the steps of:
combining at least an acid dyeable nylon multifilament
yarn, at least a cationically dyeable nylon multifilament
yarn and at least a poly(trimethylene terephthalate)
multifilament yarn forming a combined yarn; making a
15 flooring article using the combined yarn; and dyeing the
flooring article at least three different colors in a
carrier free dye bath using acid dyes, cationic dyes and
carrier-free disperse dyes.

20 BRIEF DESCRIPTION OF THE DRAWINGS

Other features of the present invention will
become apparent as the following description proceeds and
upon reference to the drawing, in which:

Figure 1 is a schematic illustration of an
25 embodiment of the present invention of a combined yarn
comprising three component yarns twisted together.

While the present invention will be described
in connection with a preferred embodiment thereof, it
will be understood that it is not intended to limit the
30 invention to that embodiment. On the contrary, it is
intended to cover all alternatives, modifications, and
equivalents as may be included within the spirit and
scope of the invention as defined by the appended claims.

35 DETAILED DESCRIPTION OF THE INVENTION

The present invention provides versatility in
multicolored flooring articles such as rugs and carpets.
In an embodiment of the present invention, the combined

yarn comprises at least two polyamide yarns and at least one poly(trimethylene terephthalate) (i.e. PTT) yarn for at least three distinct colors for the flooring article.

5 The two polyamide yarns useful for an embodiment of the present invention include any known bulked continuous filament (i.e. BCF) or yarn of either type nylon 6 or nylon 6,6 polymer. Such yarns are commonly used in carpet manufacturing. The linear density, or denier, of these
10 yarns typically range between about 500 and about 2800. In an embodiment of the present invention, at least one of the polyamide yarns is dyeable by acid dyestuffs. The dyeability of these yarns can vary from light, to medium to deep in color. Additionally, at least another of the
15 polyamide yarns useful for the invention is dyeable by cationic dyestuffs. Thirdly, at least one poly(trimethylene terephthalate) yarn useful for the invention is any known bulked continuous filament yarn. The denier of this yarn also ranges between about 500 and
20 about 2800.

The polyamide and PTT multifilament yarns, of an embodiment of the present invention, are combined by either air entangling or cable twisting together.

Several methods of air entangling (for example, those
25 described in US Patent 3,978,558 herein incorporated by reference) and cable twisting (for example, the one described in US Patent 3,368,336 herein incorporated by reference) are well known in the art. Any of the known methods may be applied in the present invention.

30 Combining the yarns by air entangling results in a yarn having colors that are blended and generally muted. Combining the yarns by cable twisting results in a yarn having more color separation. Typically, three yarns of 500 to 2800 denier each are combined by either method.

35 Referring now to the drawings, where the showing is for the purpose of describing a preferred embodiment of the invention and not for limiting same. For clarity the Figure is drawn outside of scale. Figure

1 illustrates a cable twisted combined yarn 10 where yarn 1 is an acid dyeable polyamide yarn, yarn 2 is a cationically dyeable polyamide yarn and yarn 3 is a poly(trimethylene terephthalate) yarn. Additional yarns may also be included in the combined yarn to give a desired aesthetic in the resulting carpet.

The multicolor carpet according to an embodiment of the present invention is made by tufting or weaving in a conventional manner, preferably by tufting. A typical carpet construction of the present invention is about 12 to about 80 oz. weight per square yard with 1/8" to 1" pile height. The multicolor carpet is preferably loop pile, although it may also be cut pile. Loop pile provides a better view of the different colors in the carpet.

The carpet is dyed with a combination of acid, cationic and disperse dyes in a bath that is carrier-free. By "carrier-free" is meant that no carrier is present in the dyeing process. Each yarn (yarns 1, 2 and 3 from Figure 1) when dyed is receptive to different dyes. For example, yarn 1 being acid dyeable, has its color determined by the acid dye and disperse dye; yarn 2 being cationically dyeable, is more receptive to the cationic dye and disperse dye; and yarn 3's color determination is determined by the carrier free disperse dye only. Thus, providing at least three distinct colors for an aesthetically pleasing multi-color carpet.

The carpet may be dyed using a conventional dyeing process, such as that used with continuous range dyers such as a commercially available dyeing unit from Kuster Corporation. In continuous range dyeing, first the dyestuffs are sprayed onto the carpet. The dyes are applied in amounts ranging from about 0.01% to about 2%, but preferably between about 0.01% to about 1%, of the weight of the fiber. The carpet is then steamed for about 2 to about 5 minutes at temperatures typically about 210 to about 212 degrees F. The carpet is then

5 The dyed carpet of the present invention has excellent pile height retention. The carpet of the present invention has a pile height retention of at least 85% and preferably at least 90%, when subjected to the Vetterman Drum Test.

Vetterman Drum Test

25 The pile height retention is calculated as follows:

pile height after 5,000 cycles

pile height retention = -----

30 x100% pile height before test

35 Example

- 7 -

component yarns: one 2400 denier acid dyeable nylon BCF
yarn, one 2400 cationically dyeable nylon BCF yarn and
four 1100 denier poly(trimethylene terephthalate) BCF
5 yarns. A control combined yarn was formed by commingling
the same yarns, substituting four 1100 denier
poly(ethylene terephthalate) BCF yarns for the four
poly(trimethylene terephthalate) yarns.

The example and control yarns were tufted into
10 32 ounce loop pile carpets on a 5/32 inch gauge tufting
machine. The carpets were then dyed on a continuous
Kuster range dyer (available from the Zima Corporation,
Spartanburg, South Carolina). The dyestuffs were sprayed
onto the carpet before steaming for dye fixation. The
15 following dye formulations and conditions were used:

acid dyes Tectilon (available from Ciba-Geigy AG,
Basel Switzerland)

20	orange 3G	0.075%
	red 2B	0.075%
	blue 4R	0.075%

cationic dyes Sevron (available from Crompton & Knowles
25 Colors Incorporated, Charlotte, NC)

	yellow 3RL	0.0025%
	red YCN	0.0063%
	blue AN	0.0188%

30 disperse dyes Intrasil (available from Crompton &
Knowles Colors Incorporated)

35	red QE	0.05%
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The dye liquor was applied at 450 to 500% wet
pick up. The pH of the dye liquor was adjusted to 6-6.5.
The dwell time in the steam was 3.8 minutes.

The resulting carpets included attractive three color aesthetics. The carpets were subjected to the Vetterman Drum Test for 5,000 cycles. The samples were
5 conditioned in a 70 degree F, 65% relative humidity room for 24 hours. The pile height was measured for each carpet before and after the test. The percent recovery of each carpet was calculated from the pile height measurements using the above formula.

10

	<u>pile height (inches)</u>		<u>pile height retention (%)</u>
	before test	after test	
Example	0.344	0.313	91
Control	0.375	0.189	50

IT IS CLAIMED:

1. A multicolor flooring article comprising
5 combined yarns, each of the combined yarns comprising at least an acid dyeable nylon multifilament yarn, at least a cationically dyeable nylon multifilament yarn and at least a poly(trimethylene terephthalate) multifilament yarn wherein the flooring article is dyed at least three
10 different colors in a carrier-free bath containing a combination of acid dye, cationic dye and disperse dye.
2. The multicolor flooring article of claim 1,
comprising a pile height retention of at least 85% when
15 subjected to the Vetterman Drum Test.
3. The multicolor flooring article of claim 2,
comprising a pile height retention of at least 90% when
subjected to the Vetterman Drum Test.
20
4. The multicolor flooring article of claim 1,
wherein the combined yarns are combined by cable
twisting.
- 25 5. The multicolor flooring article of claim 1,
wherein the combined yarns are combined by commingling with high pressure air.
6. The multicolor flooring article of claim 1,
30 wherein each yarn of the combined yarns is dyed one of at least three different colors and differ in color from two of the other multifilament yarns of the combined yarn.
7. The multicolor flooring article of claim 1,
35 comprises a carpet.
8. A process for making a multicolor flooring article comprising the steps of:

- a. combining at least an acid dyeable nylon multifilament yarn, at least a cationically dyeable nylon multifilament yarn and at least a
5 poly(trimethylene terephthalate) multifilament yarn forming a combined yarn;
- b. making a flooring article using the combined yarn; and
- c. dyeing the flooring article at least three
10 different colors in a carrier free dye bath using acid dyes, cationic dyes and disperse dyes.
9. The process of claims 8, wherein the combining
15 step comprises cable twisting or commingling with high pressure air.
10. The process of claim 8, wherein each multifilament yarn of the combined yarn is dyed one of the three different colors and differ in color from two
20 of the other multifilament yarns of the combined yarn.
11. The process of claim 8, wherein the making step comprises tufting or weaving.
- 25 12. The process of claim 8, wherein the multicolor flooring article comprises a carpet.

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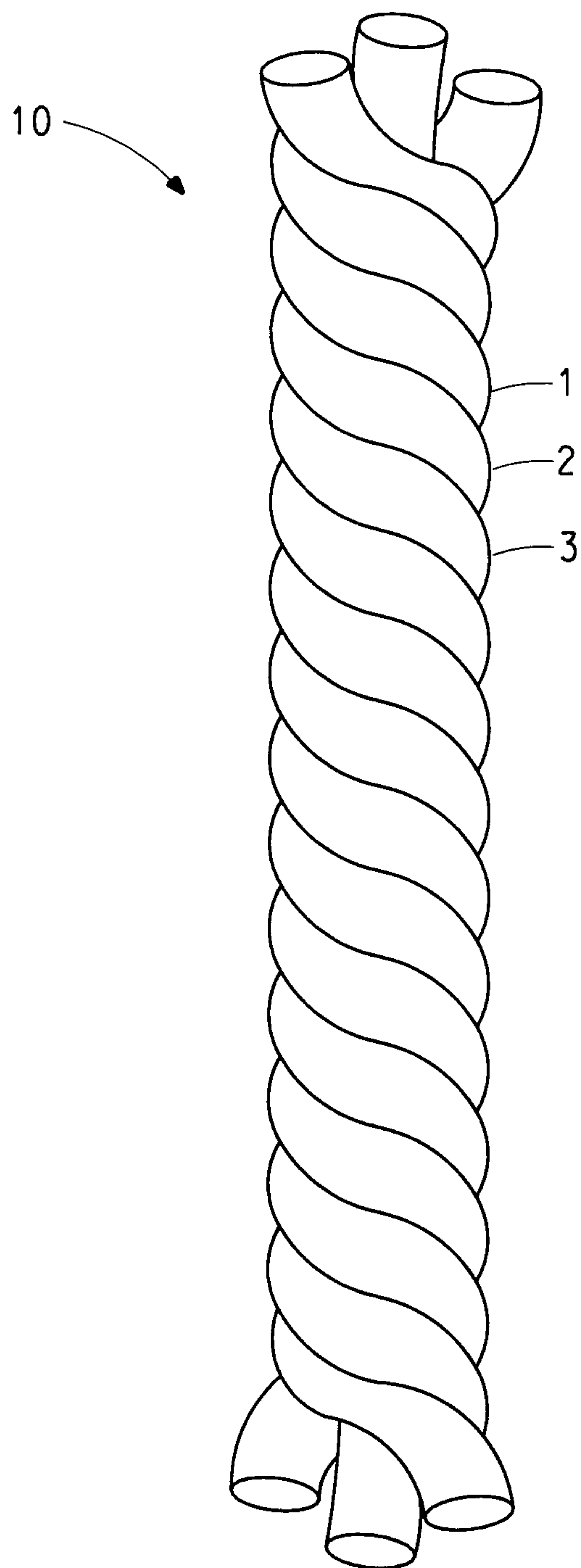


FIG. 1

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