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(56) Documents cited
GB 2055905 A EP 0294081 A2 EP 0224092 A2
DE 2631318 A US 4351641 A
"Textile Printing", ed. L.W.C. Miles, Dyers Company Publications Trust, 1981, pages 114–5, 128
Book Pap., Natl. Tech. Conf. -AATCC (1983), pages 306–13, "Xanthan Gum in Textile Printing Appli.'
Journal of the Society of Dyers and Colourists vol. 97 June (1981), pages 262–274

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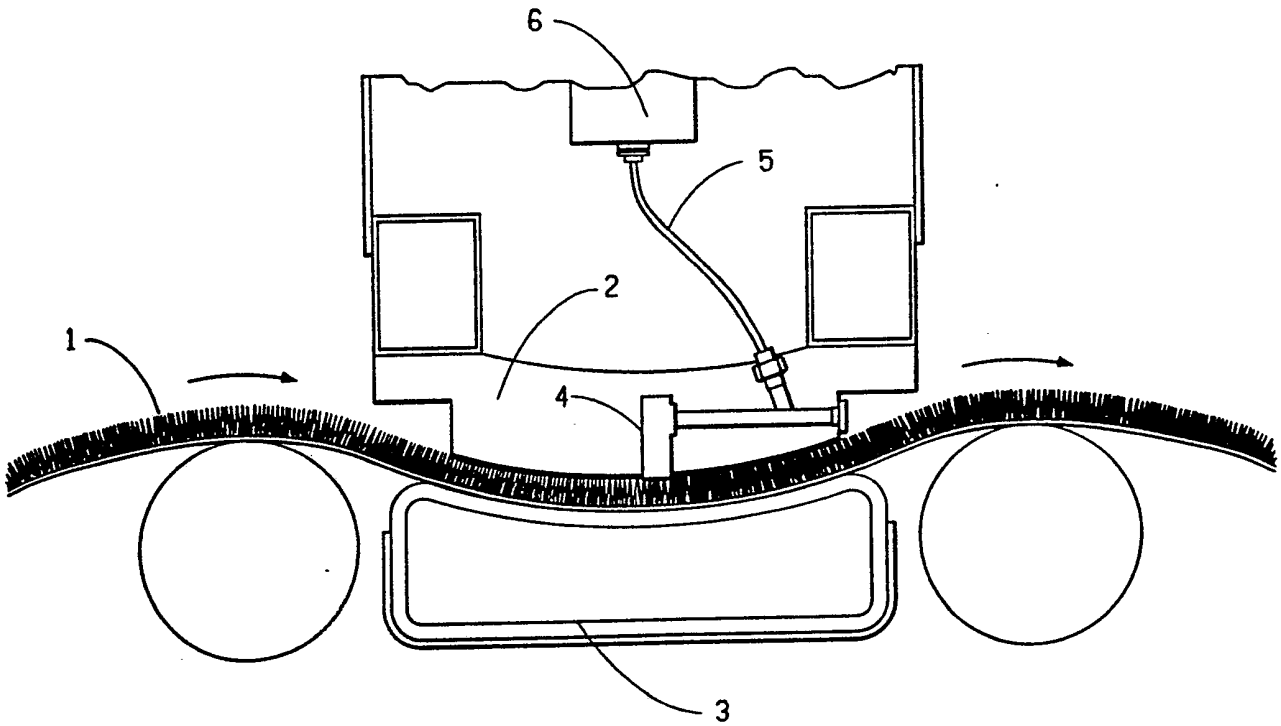
(54) Dyeing of pile fabrics aided by xanthan gum

(57) A method for improving the color uniformity of pile fabrics dyed continuously in a device which injects dye solution under pressure into the pile through a slot distributor extending across substantially the full width of the moving pile fabric. The dye solution is thixotropic and contains xanthan gum.



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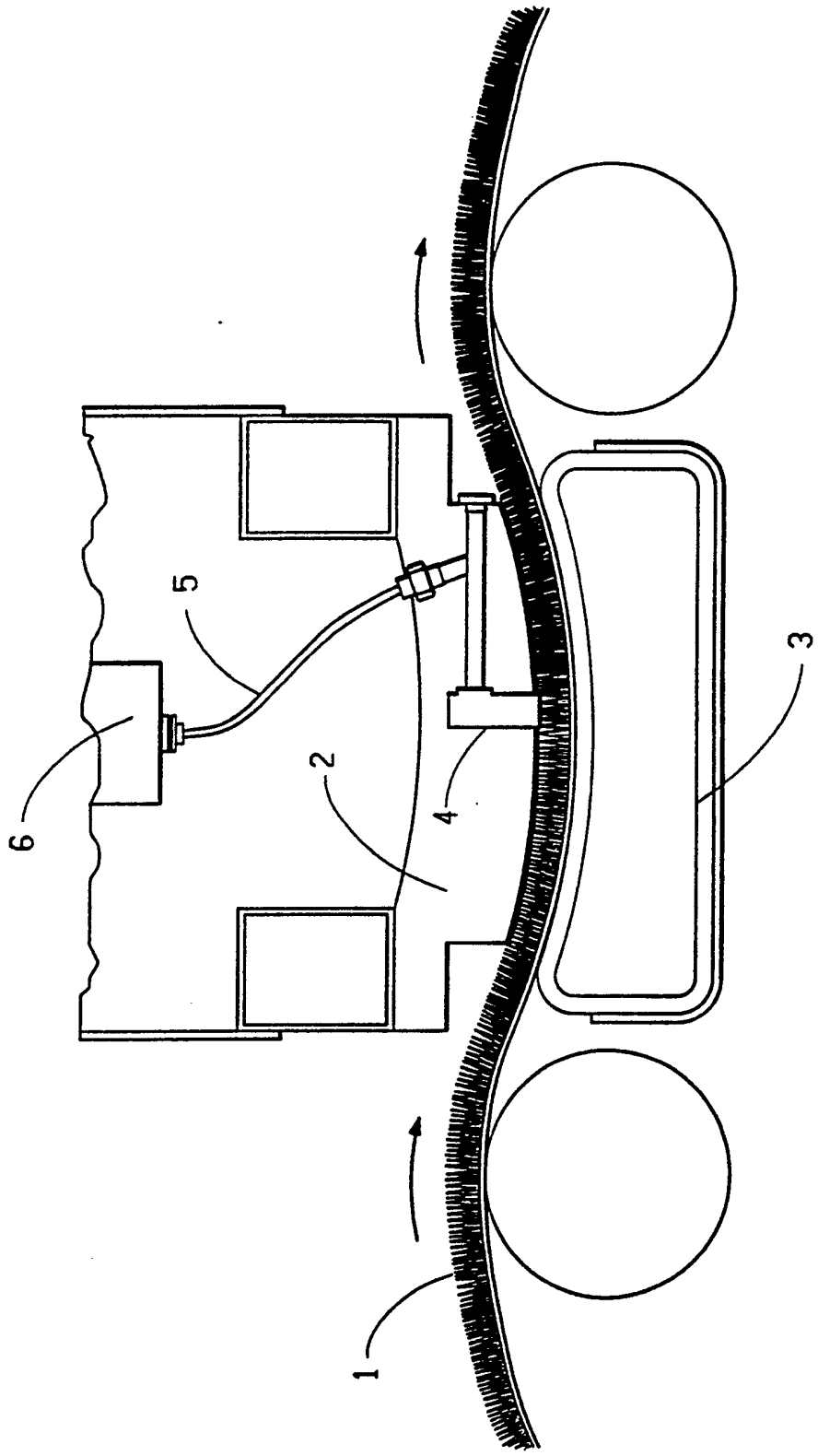
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TITLE

Dyeing of Pile Fabrics

Background of the Invention

This invention relates to a method for improving the color uniformity of pile fabrics dyed continuously in a device which injects dye solution under pressure into the pile through a slot distributor extending across substantially the full width of the moving pile fabric. More particularly, it relates to dyeing on a Kusters "Fluidyer" device or similar device.

The early technology of dyeing on such continuous devices favored using low viscosity dye solutions to facilitate the penetration of dye uniformly between yarn tufts, within individual tufts and also along the full length of tufts down to the backing. While the use of low viscosity solutions does indeed assist in promoting the uniform placement of dye initially within the pile, the low viscosity also permits the dye to drain away from certain locations and to concentrate in other regions as the pile fabric travels to and through the subsequent heat setting operation where the dye becomes fixed by steaming. Dye is particularly likely to be lost from the edges of the pile fabric and the resulting dye nonuniformity may be easily noticed as a streak when two pieces of carpet are joined in the across machine direction.

One approach to overcoming the above problem is that disclosed in Tymon U.S. Patent No. 4,351,641, which describes increasing the dye solution viscosity to inhibit migration of a dyestuff combination. In particular, a known

thickener, guar gum, is employed according to the patent to provide a dye solution viscosity of about 300 to 1,000 centipoises (Brookfield viscometer). However, it has been found that while the higher viscosity does help to reduce dye migration during the travel of the pile fabric between the injection and heat setting operations, it also can tend to impede the uniform placement of the dye in the pile fabric initially.

Summary of the Invention

It has now been discovered that both the uniform initial placement of the dye solution in a pile fabric and reduced dye migration after placement may be achieved by employing an additive to the dye solution which provides thixotropy to the solution; that is, a relatively low solution viscosity under the high shear conditions existing during the injection of the dye solution into the pile fabric under high pressure, and a significantly higher solution viscosity while the dye solution is substantially at rest immediately following injection and prior to heat setting.

More particularly, the invention relates to a method for producing a continuous dyed pile fabric using a Kusters or similar dye applicator by injecting an aqueous dye solution under pressure into the fabric and thereafter heatsetting the fabric, the improvement, for enhancing the uniformity of the shade obtained, comprising using a thixotropic aqueous dye solution. The thickener employed to give such thixotropy is xanthan gum, and it may be used alone or in addition to other thickeners. The xanthan gum is advantageously present in the dye solution in an amount of at least about 0.01 weight percent.

Description of the Drawing

The figure shows schematically one form of an apparatus suitable for the practice of the present invention.

Pile fabric 1 having the backing side down and the pile yarn side up passes below applicator head 2 and is pressed against applicator head 2 by air pressure within elastomeric bladder 3. Aqueous dye solution is metered under pressure from distributor 6 via multiple feed lines 5 to injection slot 4 which extends across the width of the pile fabric to within about 1/4 inch of the maximum width of the fabric. The darkened zone of pile fabric 1 indicates the portion which has received dye as it passes through the apparatus.

Detailed Description of the Invention

The effect of shear rate on the viscosity of aqueous solutions of derivitized guar and xanthan gums respectively are shown in Table I. The guar gum concentration is 2.6 grams per liter and the xanthan gum concentration is 2.0 grams per liter. Measurements are made using a Brookfield viscometer.

Table I

Shear Rate Sec.$^{-1}$	Viscosity Centipoise	
	Guar	Xanthan
88	89	111
132	74	76
176	66	63
220	60	53
264	56	46
308	53	40
352	50	36

It can be seen that at low shear rates xanthan solutions have a much higher viscosity than guar, roughly equal viscosity at intermediate shear, and a lower viscosity at high shear.

The present invention overcomes dye nonuniformity problems by rendering the dye liquor thixotropic with xanthan gum. This tends to reduce the physical movement of the dye when at a low shear, thus keeping the dye where it has been precisely metered and thereby achieving a more uniform coloration. In test after test, a correlation was found between uniform coloration of the carpet with increasing viscosity of the dye liquor. But a limiting factor in simply trying to increase viscosity is that flow problems are encountered in the Kusters "Fluidyer", most notably uneven flow tends to occur with increasing viscosity and non-uniform dyeing results.

This invention provides for improved uniform coloration of a pile fabric when dyed continuously by a Kusters "Fluidyer" or similar apparatus which injects dye solution under pressure through a slot distributor across essentially the full width of the moving pile fabric. In general, the steps involve:

(a) Passing a pile fabric through the device without prewetting.

(b) Applying one or more dyes from an aqueous dye solution to the pile side of the fabric. A thickener comprising xanthan gum is used to render the dye solution thixotropic.

(c) Steaming to fix the dye or dyes on the pile fabric.

(d) Washing to remove residual chemicals and unfixed dyes.

The method of the invention is applicable to conventional dyes such as acid, cationic or disperse dyes or mixtures thereof. The dyes should be selected to be compatible with the xanthan gum thickener.

Example

This example illustrates the practice of the invention using a Kusters "Fluidyer".

The carpet to be dyed is a 5/32 gauge 28 oz./yd.^{2} cut pile Saxony carpet made from a bulked continuous filament nylon yarn (Du Pont 1245 denier 2-ply type 497A BCF). The dye liquor is at room temperature of about 75°F and at a pH of 6, and the viscosities tested are in the range of 1-100 centipoises. The viscosities are measured using a Brookfield viscometer, #1 spindle at 70°F. About 350% by weight of dye is injected into the pile fabric, based upon the fabric. Dye ingredients are as follows:

Ingredients	Weight % in Dye Solution			
	A	B	C	D
Tectilion orange 3G V200	0.016	0.016	0.016	0.016
Tectilion red 2B V200	0.008	0.008	0.008	0.008
Tectilion blue 4R V200	0.01	0.01	0.01	0.01
Derivitized guar gum	--	0.02	0.01	--
Xanthan gum	--	--	0.01	0.022
Karawet Doss wetting agent	0.01	0.01	0.01	0.01
Monosodium phosphate	0.01	0.01	0.01	0.01
Brookfield viscosity	1.0	32.5	62.5	102.5

About 50 yds. of carpets are dyed with each solution. The carpet dyed with solution B shows a one unit improvement in uniformity over A, whereas carpet C shows a 2 unit improvement over carpet A and carpet D shows about a 2.5 unit improvement over carpet A.

CLAIMS:

1. In a method for producing a continuous dyed pile fabric using a Kusters dye applicator by injecting an aqueous dye solution under pressure through a slot distributor into the fabric and thereafter heatsetting the fabric, the improvement for enhancing the uniformity of the shade obtained comprising using a thixotropic aqueous dye solution containing xanthan gum.

2. Method according to Claim 1 wherein the thixotropic aqueous dye solution contains at least about 0.01 weight percent xanthan gum.

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