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(54) METHOD FOR PRINTING CARPETS

VERFAHREN ZUM DRUCKEN VON TEPPICHEN

PROCÉDÉ D'IMPRESSION DE TAPIS

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Description

TECHNICAL FIELD

[0001] A method is provided herein for applying several inks on a carpet.

TECHNOLOGICAL BACKGROUND OF THE INVENTION

[0002] Printing is a commonly used technique by which textiles such as mats and carpets are coloured by means of ink. An ink typically comprises a dye and a solvent, or a dye and water.

[0003] In general, printing techniques for carpets can be divided into two categories: process printing and spot printing.

[0004] In process printing each colour is built up on the carpet itself from a limited set of primary colours, for example RGB and/or CMYK. Inks are typically transparent, and by printing several primary colours on top of one another it is possible to produce colour combinations. To obtain a dark colour it is often even necessary to print several layers of the same primary colour on top of one another. Efficiency is relatively low in process printing.

[0005] In spot printing, a separate ink is provided for each colour in a design to be printed, for example by combining several dyes manually beforehand to produce a coloured ink. Just a single colour is applied on each spot. Typically, colours are manufactured on the basis of Pantone reference numbers. The accuracy and reproducibility between different batches is relatively low in spot printing.

[0006] The colour will still depend on factors such as the height of the carpet, orientation of the pile (direction of the pile, pile lay), glossy or matt fibres, deep-pile or low-pile carpet, loops or tufts, extruded yarn or spun yarn, thick or thin. For each type, separate reference numbers may exist for describing the colour US-A1-2014/212618 teaches a method for applying ink on a carpet comprising two regions. There is a need for systems and methods that allow printed carpets to be produced more quickly. There is a need for systems and methods that allow printed carpets to be produced more easily, wherein the settings and design are easier to adjust. There is a need for systems and methods that allow printed carpets to be produced more stably, so that reproducibility is increased. There is a need for systems and methods that allow printed carpets to be produced more cheaply, wherein for example the costs of raw materials remain limited. There is a need for systems and methods that allow printed carpets to be produced with improved quality, for example AZO certificate, hard-wearing printed carpet, with sufficient depth of penetration of the ink. There is a need for systems and methods that allow printed carpets to be produced for which less calibration is required. There is a need for systems and methods that allow productivity to be increased based on existing ma-

chines.

[0007] There is thus a need for a method for dyeing textiles that offers a solution to one or more of the aforementioned problems.

SUMMARY

[0008] The invention and preferred embodiments thereof offer a solution for one or more of the above needs.

[0009] In particular, the present invention provides a method for applying inks on a carpet, the carpet comprising at least one first region and one second region, and the method comprising the following steps:

- applying a first ink in the first region and the second region; and
- applying a second ink in the second region;

wherein the first ink and the second ink are different, preferably wherein the first ink and the second ink each have a different hue;

wherein the inks are applied with a textile printer that comprises a printhead, preferably an inkjet printer; and wherein the printhead moves at a speed v during application of the first ink in the first region, and wherein the printhead moves at a speed that is greater than the speed v during application of the first ink and of the second ink in the second region.

[0010] In some embodiments the second ink is also applied in a third region.

[0011] In some embodiments it is carried out with a machine designed for spot printing, but wherein the first ink and the second ink are applied on top of one another in the second region as in process printing.

[0012] In some embodiments the first ink and/or the second ink are applied in just one movement.

[0013] In some embodiments the first ink and/or the second ink is an acid ink, preferably with a pH of at most 6.0, preferably at most 5.0, preferably at most 4.0. Moreover, the pH values of the first ink and of the second ink are preferably equal, differing by at most 2.0, preferably at most 1.0, preferably at most 0.5.

[0014] In some embodiments the first ink and the second ink comprise one or more surfactants and/or dispersants, preferably as colour affine agents.

[0015] In some embodiments the first and second inks are fixed after applying the second ink.

[0016] In some embodiments fixing takes place by conversion of acid ink to basic ink.

[0017] In some embodiments the first ink is applied before the second ink, the first ink has a viscosity that is higher than the viscosity of the second ink, and the first ink is applied with a pressure that is lower than the pressure at which the second ink is applied.

[0018] In some embodiments fixing takes place through evaporation of one or more surfactants and/or

dispersants.

[0019] In some embodiments fixing takes place by means of steam.

[0020] In some embodiments the carpet comprises a pile, wherein the pile comprises polyamide, polyacrylate, polyolefin, or cotton; and wherein the pile preferably comprises polyamide, more preferably nylon.

[0021] In some embodiments the first ink and/or the second ink comprise a dye and water, and optionally one or more additives.

[0022] In some embodiments the printhead moves at a speed $n \cdot v$ during application of the first ink and of the second ink in the second region, wherein n is equal, to within 10%, to the number of inks that are applied in the second region; and wherein preferably the difference between the flow rates at which the different inks are applied on the carpet is less than 50%, preferably less than 20%, preferably less than 10%.

[0023] In some embodiments the inks are applied at a certain draw-off speed, and wherein the difference between the draw-off speeds of the different inks is less than 50%, preferably less than 20%, preferably less than 10%.

DESCRIPTION OF THE FIGURES

[0024]

FIG. 1 is a schematic representation of the width of a textile roll over a run in four different situations.

FIG. 2 is a schematic representation of the set of colours that may be built up by means of four inks in a method according to the present invention.

FIG. 3, 4, and 5 illustrate a primary backing with pile, on which 2 inks are applied. The problem of insufficient mixing is shown schematically in **FIG. 3 and 4**.

FIG. 5 shows a solution according to one embodiment of the invention.

DETAILED DESCRIPTION

[0025] As used in the rest of the text, the singular forms "a", "an" comprise both the singular and the plural unless the context is clearly otherwise.

[0026] The terms "comprise", "comprises" as used hereinafter are synonymous with "inclusively", "include" or "contain", "contains" and are inclusive or open and do not exclude additional, unnamed members, elements or steps of a method. The terms "comprise", "comprises" include the term "contain".

[0027] The recital of numerical values using numerical ranges comprises all values and fractions in these ranges, as well as the stated limits.

[0028] The term "about", as used when reference is made to a measurable value such as a parameter, an amount, a duration, and so on, is intended to include

variations of $\pm 10\%$ or less, preferably $\pm 5\%$ or less, more preferably $\pm 1\%$ or less, and even more preferably $\pm 0.1\%$ or less, of and from the specified value, in so far as the variations are applicable in order to function in the disclosed invention. It should be understood that the value to which the term "about" refers per se was also disclosed.

[0029] All documents cited in the present specification are included herein in their entirety by reference.

[0030] Unless defined otherwise, all terms disclosed in the invention, including technical and scientific terms, have the meaning as they are normally understood by a person skilled in the art. As further guidance, definitions are included for further explanation of terms that are used in the description of the invention.

[0031] A method is provided herein for applying ink on a carpet, said carpet comprising at least one first region and one second region, and the method comprising the following steps:

- applying a first ink in the first region and the second region; and
- applying a second ink in the second region;

wherein the first ink and the second ink are different, preferably wherein the first ink and the second ink each have a different hue.

[0032] The concept "hue" (Dutch: "tint") as used herein refers to the concept from colorimetry. In particular, the concept "hue" refers to the extent to which an electromagnetic stimulus that is observed by the human eye may be described as whether or not it is like red, green, blue, or yellow. The concept "hue" is well known in the prior art. The concept "hue" may for example be understood as the "hue" coordinate in the HSL (hue-saturation-lightness) colour space.

[0033] The concept "carpet" as used herein refers to a substrate that comprises a pile, the substrate being selected from the list comprising mats, carpets, and artificial grass.

[0034] In some embodiments, application of the first ink in the second region and application of the second ink in the second region take place simultaneously.

[0035] In some embodiments the second ink is also applied in a third region. In this way, 3 different regions can already be coloured differently with 2 inks.

[0036] The method is preferably carried out with a machine and/or inks set up for spot printing, but the first ink and the second ink are applied on top of one another just as in process printing. In some embodiments the first ink and the second ink are made up beforehand, preferably made up manually beforehand. They are preferably made up on the basis of a Pantone reference. In some embodiments the first ink and the second ink are not primary colours. Primary colours are to be understood as colour combinations such as RGB and CMYK.

[0037] By using inks from spot printing in a machine

designed for spot printing, it is not necessary to build up several layers of the same ink. The inks that are made up beforehand in spot printing are typically darker than the inks used in process printing.

[0038] In some embodiments the first ink is applied in just one movement. In some embodiments the second ink is applied in just one movement. In some embodiments the first ink is applied in just one movement, and the second ink is applied in just one movement.

[0039] A very large number of colours may thus be applied on a piece of fabric quickly and efficiently with a limited number of inks. With 2 inks, for example just 2 movements are sufficient for 3 different colours. With 3 inks, for example just 3 movements are sufficient for 7 different colours. If some inks are applied simultaneously in one region, application can be carried out in fewer movements, and may be carried out in just 1 movement.

[0040] Preferably the first and second inks are fixed after applying the second ink. This ensures that the first ink and the second ink can penetrate the pile well, and mix before being fixed. If the inks are each fixed individually before mixing takes place, the pile will be two-coloured instead of being of one colour.

[0041] In fact, assurance of single-coloured pile is often desired in the printing of carpets. This may be challenging when more than one ink, for example a first ink and a second ink, are printed in the same place. In the present text, the term "ink" also comprises the terms colour or dye. In particular, to obtain single-coloured pile, cold fixation of the ink that is printed first should be avoided until all inks have been applied in that place on the substrate. When, for example, a part of a carpet is printed with two inks, and when cold fixation of a first ink occurs before the second ink is applied, the two inks do not mix equally, so that development of other colour mixtures depends on the specific process conditions, for example it depends on the order in which the first ink and the second ink are applied, and it depends on the amount of time that elapses between application of the first ink and of the second ink. This may not be easy to control. For example, the time between application of the first ink and of the second ink depends *inter alia* on the position on the carpet where the inks are applied.

[0042] The fixation of inks on a substrate can be described using nomenclature that has similarities with electric charges. In particular, an ink or a substrate may have a "+" or a "-" characteristic. When ink and substrate have an identical characteristic, no fixation occurs (by analogy with electric repulsion between like charges). When ink and substrate have a different characteristic, fixation occurs (by analogy with electric attraction between opposite charges). For example, when a substrate has a "+" characteristic, and when an ink has a "-" pole, these 2 poles attract one another. Controlled application of colours on a substrate comprises the controlled occurrence of this "attraction". Material properties that can be described with "+" and "-" may for example be selected from the list comprising: hydrophobicity, polarity, electric

charge, acid-base character, redox character, specific pairs of reactive chemical groups, and combinations thereof.

[0043] The problem of cold fixation of previously applied colours can be solved by means of chemicals and/or by means of mechanical interventions. Particular chemicals and/or mechanical set-ups are used, depending on the precise substrate and depending on the production process. Some chemical and mechanical techniques for obtaining single-coloured pile, even though printing uses more than one ink in one and the same place, are discussed below.

[0044] In particular, in some embodiments cold fixation is counteracted by applying a transparent ink or coating on the substrate. In other words the transparent ink or coating decreases the finish of the substrate. In some embodiments the transparent ink or coating comprises ionic aids. The term "colour affine agents" means an additive in colorants that opposes mixing. Fixation then usually occurs as a result of a higher temperature. The term "yarn affine agents" means an additive in yarn that opposes mixing. Fixation then usually occurs as a result of a higher temperature.

[0045] In some embodiments a "-" coating is applied on the substrate. When a "-" coating is applied on a substrate, the substrate also acquires a "-" characteristic. Inks that also have a "-" characteristic are then fixed less quickly on the substrate, which after treatment has also become "-". In some embodiments the "-" coating is removed from the substrate when the substrate is heated. Through removal of the "-" coating, the substrate again acquires a "+" character, and the "-" inks are fixed on the substrate, and migrate into the substrate during fixation. For example, as a result of a temperature rise, the affine product may evaporate, so that now fixation does occur. In alternative embodiments a "+" coating is applied on the substrate, which preferably has a "-" characteristic. Cold fixation of inks with a "+" characteristic may be counteracted in a similar way.

[0046] In alternative embodiments, inks with a "-" characteristic are modified temporarily to display a "+" characteristic.

[0047] In some embodiments this modification is achieved by altering the pH of the ink. The pH of an ink can be adjusted during preparation of the ink by means of an acid (e.g. citric acid) or salt (e.g. common salt) or base. For example, the pH of an ink may be adjusted with acids, which are used for adjusting the viscosity of the ink (e.g. citric acid). Viscosity can also be modified with unblocking agents (e.g. NaOH). Moreover, the pH of an ink can be adjusted after preparation of the ink by means of pH modifiers, such as citric acid or NaOH. The viscosity can be adjusted with a salt without altering the pH.

[0048] In some embodiments the pH of an ink is adjusted by increasing the pH until the dyes in the ink become basic, in other words until the dyes in the inks are converted into their conjugated base, so that the ink ac-

quires a "+" characteristic. When this ink is used in combination with a substrate that has a "+" characteristic, fixation is counteracted. This ensures that different inks that are applied on the substrate successively are mixed well. When the substrate and the inks are heated after applying the inks, the pH of the ink decreases. When the pH of the inks decreases, they become acid again, and the inks acquire a "-" characteristic again. A colour typically only fixes if it is acid, and does not fix if it is basic. The substrate keeps its "+" characteristic, so that the mixed inks with "-" characteristic fix on the "+" substrate.

[0049] In some embodiments use is made of a suitable selection of base pigments that are tailored to one another. This facilitates good mixing of the different inks. Base pigments that are tailored to one another (e.g. RGB) have one and the same or mutually tuned trichromy. Trichromy is the colour theory whereby each colour can be reproduced on the basis of 3 primary colours. Base pigments with one and the same trichromy have identical "draw-off speeds". For example, for a composite colour (beige), it may be that the individual colours (red, yellow, and blue) have a different draw-off speed. For example, if red draws off more quickly, the beige will have a red sheen. The resultant mixtures fix in a more regular manner in the substrate, which ensures greater evenness of the final inks on the substrate. Preferably the draw-off speeds or K-factors (K or K') differ from one another by at most 10%, preferably at most 8%, preferably at most 5%, for example at most 2%, for example at most 1%. Preferably the draw-off speeds or K-factors (K or K') differ from one another by at most 2.0, preferably at most 1.0, preferably at most 0.5, for example at most 0.2, for example at most 0.1.

[0050] The above has been a detailed discussion of how cold fixation can be avoided by means of suitable chemicals. Alternatively or additionally, in some embodiments mechanical techniques are used in order to obtain identical colours when different inks are printed on top of one another. In particular, mechanical techniques are used in order to obtain better, more uniform mixing of the inks.

[0051] Thus, in some embodiments a first ink and a second ink are applied on a substrate, wherein the first ink has a higher viscosity than the second ink. Usually a viscosity of 200 to 250 cP is used. Preferably the first ink has an increased viscosity of 250 to 400 cP. Preferably the second ink has an increased viscosity of 100 to 200 cP. In some embodiments the viscosity of the first ink is at least 10% higher than the viscosity of the second ink, preferably at least 20%, preferably at least 40%, preferably at least 50%, preferably at least 80%, preferably at least 100%, preferably at least 200%, preferably at least 300%, preferably at least 400%.

[0052] In this way, the first ink as it were still "lies" on the substrate instead of being cold-fixed in the substrate. The second ink is preferably applied on top of the first ink without mechanical aid (e.g. at a standard pressure of 1.2 bar) and with a somewhat higher pressure. In this

case the second ink will "bleed out" over the first ink. The mechanical aid may be expressed as the pressure at which the dye is injected onto the substrate. In some embodiments the first ink is applied with a pressure of at most 1.2 bar, for example at most 1.1 bar, for example at most 1.0 bar, for example at most 0.9 bar, for example at most 0.8 bar. In some embodiments the second ink is applied with a pressure of at least 1.3 bar, for example at most 1.4 bar, for example at most 1.5 bar, for example at most 0.6 bar, for example at most 1.8 bar, for example at most 2.0 bar. In some embodiments the second ink is applied with a pressure of at least 0.1 bar more than the pressure of the first ink, for example at least 0.2 bar, for example at least 0.4 bar, for example at least 0.6 bar, for example at least 0.8 bar, for example at least 1.0 bar, for example at least 1.2 bar. In some embodiments the second ink is applied with a pressure of at least 10% higher than the pressure of the first ink, for example at least 20% higher, for example at least 40% higher, for example at least 60% higher, for example at least 80% higher, for example at least 100% higher, for example at least 120% higher.

[0053] Alternatively or additionally, in some embodiments a first ink and a second ink are applied on a substrate, wherein the first ink has a higher viscosity than the second ink, and wherein the first ink is applied on the substrate with a somewhat lower pressure than the pressure at which the second ink is applied. Preferred forms are combinations as described above. As before, the first ink still "lies" on the substrate. The second ink has a somewhat lower viscosity than the first ink, and is applied with a somewhat higher pressure than the first ink. As a result the second ink is "injected" through the first ink, into the substrate. In this way a "vortex" arises in the first ink, so that mechanical mixing takes place and the mixed inks are fixed in the substrate together. Preferably the first and second inks are acid inks, preferably with a pH of at most 6.0, preferably at most 5.0, preferably at most 4.0.

[0054] In some embodiments the acid inks are converted to basic inks during fixation after application. In some embodiments the basic inks have a pH of at least 8.0, preferably a pH of at least 9.0, preferably a pH of at least 10.0, preferably a pH of at least 11.0, preferably a pH of at least 12.0.

[0055] In some embodiments the first ink has a pH of at least 5.5, preferably at least 6.0, preferably at least 7.0, preferably at least 8.0, preferably at least 9.0, preferably at least 10.0, preferably at least 11.0. In some embodiments the second ink has a pH of at most 5.5, preferably at most 5.0, preferably at most 4.5, preferably at most 4.0, preferably at most 3.5, preferably at most 3.0. In some embodiments the first ink has a pH that is at least 0.5 higher than the second ink, preferably at least 1.0, preferably at least 2.0, preferably at least 3.0, preferably at least 4.0, preferably at least 5.0.

[0056] Conversion of acid inks to basic inks allows the first ink and the second ink to be mixed after applying

both inks, and fixed beforehand. In this way, the pile of the second region, where both inks were applied, is nevertheless one-coloured instead of two-coloured.

[0057] In some embodiments, application of the colours is carried out on the basis of a pH difference, as described above. In some embodiments application of the colours is carried out on the basis of a viscosity difference, as described above. In some embodiments application of the colours is carried out on the basis of a pressure difference, as described above.

[0058] In some embodiments application of the colours is carried out on the basis of a pH difference and a viscosity difference, as described above. In some embodiments application of the colours is carried out on the basis of a viscosity difference and a pressure difference, as described above. In some embodiments application of the colours is carried out on the basis of a pressure difference and a pH difference, as described above. In some embodiments application of the colours is carried out on the basis of a pH difference and a viscosity difference and a pressure difference, as described above.

[0059] In some embodiments the first ink and the second ink comprise one or more surfactants (also known as surface-active substances) and/or dispersants. Preferably these surfactants and/or dispersants are used as colour affine agents. A surface-active or interfacially active substance, also called tenside or surfactant (from surface-active agent), is a substance that can lower the surface tension of a liquid. A liquid with lowered surface tension can form large surfaces more easily. This has the result that the liquid forms foam more easily.

[0060] In some embodiments the first ink and the second ink comprise a total amount of surfactant and dispersant from at least 0.001 g/l to at most 100.0 g/l, preferably from at least 0.01 g/l to at most 50.0 g/l, preferably from at least 0.1 g/l to at most 20.0 g/l, preferably from at least 0.2 g/l to at most 10.0 g/l, preferably from at least 0.5 g/l to at most 5.0 g/l, preferably from at least 1.0 g/l to at most 2.5 g/l.

[0061] In some embodiments the one or more surfactants and/or dispersants are anionic or cationic or non-ionic surfactants and/or dispersants, preferably anionic surfactants and/or dispersants.

[0062] In some embodiments the one or more surfactants and/or dispersants comprise one or more ingredients selected from the list comprising: a fatty alcohol polyglycol ether, a fatty alcohol ether phosphate, an ethoxylate, a fatty amine polyglycol ether, a sulphonate (preferably an aromatic sulphonate), an alkyl polyglycol ether, a carboxylic acid ester.

[0063] In some embodiments the one or more surfactants and/or dispersants comprise an enzyme, preferably pectinase. In some embodiments the one or more surfactants and/or dispersants comprise an emulsifier. In some embodiments the one or more surfactants and/or dispersants comprise an anticease agent. In some embodiments the one or more surfactants and/or dispersants comprise a sequestering agent.

[0064] Examples of suitable surfactants or dispersants are the SARABID additives, for example selected from the list comprising: SARABID 200 LL, SARABID DLO CONC, SARABID IPD, SARABID IPF, SARABID IPM, SARABID LDR, and SARABID MIP, SARABID OL, SARABID PAW, SARABID PF, SARABID SBF-N, SARABID VAT, all available from CHT Benzema.

[0065] In some embodiments, fixing takes place through evaporation of the one or more surfactants and/or dispersants. The evaporation of the surfactants and/or dispersants allows the first ink and the second ink to be fixed beforehand, to allow them to mix after application of both inks. In this way, the pile of the second region, where both inks were applied, is still one-coloured instead of two-coloured.

[0066] Fixing preferably takes place by means of steam. In some embodiments the steam has a temperature of at least 80°C and at most 130°C, preferably at least 90°C and at most 110°C, preferably at least 95°C and at most 105°C, preferably at least 97°C and at most 99°C.

[0067] Fixing with steam is extremely suitable for converting acid inks to basic inks.

[0068] A carpet typically comprises pile fibres that are anchored in a backing material. In some embodiments the pile comprises polyamide, polyacrylate, polyolefin (such as polypropylene or polyethylene), or cotton. More preferably the pile comprises polyamide, most preferably nylon.

[0069] In some embodiments the pile has a length from at least 1.0 mm to at most 30.0 mm, preferably from 2.0 mm to 15.0 mm, more preferably from 3.0 mm to 9.0 mm.

[0070] In some embodiments the carpet is unbacked or backed, preferably unbacked. The carpet is preferably tufted or woven, more preferably tufted.

[0071] The ink preferably comprises a dye and a solvent or water, more preferably a dye and water, and optionally one or more additives. In some embodiments the inks are acid inks, preferably water-based acid inks.

[0072] In some embodiments the inks are acid inks, preferably water-based acid inks, and the pile comprises polyamide, preferably nylon.

[0073] In some embodiments the inks are applied on the carpet in pixels.

[0074] The concept "pixel" as used herein refers to a convex part of a carpet in which one or more inks may be applied. A pixel is generally located in a grid of several pixels. The number of pixels is preferably expressed in dpi. In some embodiments the design is applied in at least 16 dpi, more preferably at least 25 dpi. In some embodiments the design is applied in at most 2400 dpi, preferably at most 1200 dpi, preferably at most 600 dpi, preferably at most 600 dpi, preferably at most 76 dpi, for example 50 dpi. In some embodiments the design is applied in at least 16 dpi and at most 2400 dpi, more preferably at least 25 dpi and at most 76 dpi.

[0075] Designs can be made on carpets efficiently in this way.

[0076] In some embodiments the characteristic size of the pixels is at least 0.01 mm, preferably at least 0.10 mm, more preferably 0.20 mm to 2.00 mm, preferably about 1.00 mm. A design of 40 cm x 60 cm will then have 400 x 600 pixels.

[0077] In some embodiments the pixels are circular. In some embodiments the pixels are rectangular. In some embodiments the pixels are square. However, the pixels may also have other shapes.

[0078] In particular, the characteristic size of a rectangular or square pixel is equal to the length of the diagonal of the pixel. The characteristic length of a circular pixel is equal to the diameter of the pixel. Similar definitions apply to pixels with other shapes.

[0079] In some embodiments the method is carried out by means of a textile printer that comprises a printhead. The printhead may comprise X colours, with Y jets per colour. In some embodiments the printhead comprises at least 2 and at most 16 colours, preferably at least 3 and at most 12 colours, preferably at least 7 and at most 9 colours, for example 8 colours. In some embodiments each colour has at least 32 and at most 128 jets, preferably 64 jets. An example of a textile printer that comprises a printhead is the HSV 400 from Zimmer.

[0080] In some embodiments the inks are applied by inkjet printing. This is a very efficient way of applying of inks.

[0081] In some embodiments the inks are applied with a pick-up rate of at least 2.0 and at most 5.0, preferably about 3.0. With a pick-up rate of 3.0, 100g of yarn requires 300g of ink.

[0082] In some embodiments the pH of the inks is the same, to within a deviation of pH value of at most 2.0, preferably at most 1.0, preferably at most 0.5. The draw-off speed of inks may depend on their pH. In particular, acids commonly have a higher draw-off speed than bases. Thus, a similar pH of the inks may help to obtain a similar draw-off speed.

[0083] In some embodiments the difference between the draw-off speeds of the different inks is less than 50%, preferably less than 10%. Preferably these percentages are expressed relative to the average of the draw-off speeds of the different inks.

[0084] In this way, the carpet can be dyed uniformly over the thickness of the carpet. This may in particular be critical for deep-pile carpets.

[0085] In some embodiments the printhead moves at a speed v during application of ink in the first region, and the printhead moves at a speed that is greater than the speed v during application of ink in the second region.

[0086] This may improve the uniformity of the ink applied.

[0087] In some embodiments the printhead moves at a speed $n \cdot v$ during application of ink in the second region, where the speed $n \cdot v$ is n times greater than the speed v , and where n is equal, to within 10%, to the number of inks that are applied in the second region.

[0088] In this way the lightness of the second region

can be made to be about the same as the lightness of the first region.

[0089] Preferably the inks have a light colour. Starting from light colours, it is possible to build up darker colours by printing different inks with light colours on top of one another. This gives designers extra freedom.

[0090] In some embodiments the lightness of the ink is greater than 5, preferably greater than 7, more preferably greater than 8, when an ink is applied as a single layer on the carpet; wherein the lightness of the ink is defined according to the Munsell colour system.

[0091] In some embodiments the method comprises the following step: applying the first ink, the second ink, and a third ink in a fourth region; wherein the first ink, the second ink, and the third ink each have a different hue. In this way, with 3 inks it is already possible for 7 different regions to be coloured differently.

[0092] In this way, a great many colours can be printed with just a limited number of inks.

[0093] In some embodiments the method comprises the following step: applying the first ink, the second ink, a third ink, and a fourth ink in a fifth region; wherein the first ink, the second ink, the third ink, and the fourth ink each have a different hue. In this way, with 4 inks it is already possible for 15 different regions to be coloured differently.

[0094] In this way, the range of colours that can be printed with only a limited number of inks becomes even more extensive.

[0095] In some embodiments the difference between the flow rates at which the different inks are applied on the carpet is less than 50%, preferably less than 20%, preferably less than 10%. Preferably these percentages are expressed relative to the average flow rate at which the different inks are applied.

[0096] This may improve the efficiency of a method according to the present invention.

[0097] Certain elements of the present invention are explained in more detail on the basis of the following specific embodiments. These may be combined with each other, and with the embodiments as described above.

Specific embodiment 1. Method for applying ink on a carpet, the carpet comprising at least one first region and one second region, and the method comprising the following steps:

- applying a first ink in the first region and in the second region; and
- applying a second ink in the second region;

wherein the first ink and the second ink are different, preferably wherein the first ink and the second ink each have a different hue.

Specific embodiment 2. Method according to specific embodiment 1, wherein the second ink is also ap-

plied in a third region.

Specific embodiment 3. Method according to one of the specific embodiments 1 or 2, wherein application of the first ink in the second region and application of the second ink in the second region take place simultaneously.

Specific embodiment 4. Method according to one of the specific embodiments 1 to 3, wherein the method is carried out with a machine designed for spot printing, but wherein the first ink and the second ink are applied on top of one another in the second region as in process printing.

Specific embodiment 5. Method according to one of the specific embodiments 1 to 4, wherein the first ink is applied in just one movement.

Specific embodiment 6. Method according to one of the specific embodiments 1 to 5, wherein the second ink is applied in just one movement.

Specific embodiment 7. Method according to one of the specific embodiments 1 to 6, wherein the first ink is an acid ink, preferably with a pH of at most 6.0, preferably at most 5.0, preferably at most 4.0.

Specific embodiment 8. Method according to one of the specific embodiments 1 to 7, wherein the second ink is an acid ink, preferably with a pH of at most 6.0, preferably at most 5.0, preferably at most 4.0.

Specific embodiment 9. Method according to one of the specific embodiments 1 to 8, wherein the first ink and the second ink comprise one or more surfactants and/or dispersants, preferably as colour affine agents.

Specific embodiment 10. Method according to specific embodiment 9, wherein the first ink and the second ink comprise a total amount of surfactant and dispersant from at least 0.001 g/l to at most 100.0 g/l, preferably from at least 0.01 g/l to at most 50.0 g/l, preferably from at least 0.1 g/l to at most 20.0 g/l, preferably from at least 0.2 g/l to at most 10.0 g/l, preferably from at least 0.5 g/l to at most 5.0 g/l, preferably from at least 1.0 g/l to at most 2.5 g/l.

Specific embodiment 11. Method according to one of the specific embodiments 9 or 10, wherein the one or more surfactants and/or dispersants are anionic or cationic or non-ionic surfactants and/or dispersants, preferably anionic surfactants and/or dispersants.

Specific embodiment 12. Method according to one of the specific embodiments 9 to 11, wherein the one

or more surfactants and/or dispersants comprise a fatty alcohol polyglycol ether.

Specific embodiment 13. Method according to one of the specific embodiments 9 to 12, wherein the one or more surfactants and/or dispersants comprise a fatty alcohol ether phosphate.

Specific embodiment 14. Method according to one of the specific embodiments 9 to 13, wherein the one or more surfactants and/or dispersants comprise an ethoxylate.

Specific embodiment 15. Method according to one of the specific embodiments 9 to 14, wherein the one or more surfactants and/or dispersants comprise a fatty amine polyglycol ether.

Specific embodiment 16. Method according to one of the specific embodiments 9 to 15, wherein the one or more surfactants and/or dispersants comprise a sulphonate, preferably an aromatic sulphonate.

Specific embodiment 17. Method according to one of the specific embodiments 9 to 16, wherein the one or more surfactants and/or dispersants comprise an alkyl polyglycol ether.

Specific embodiment 18. Method according to one of the specific embodiments 9 to 17, wherein the one or more surfactants and/or dispersants comprise a carboxylic acid ester.

Specific embodiment 19. Method according to one of the specific embodiments 9 to 18, wherein the one or more surfactants and/or dispersants comprise an enzyme, preferably pectinase.

Specific embodiment 20. Method according to one of the specific embodiments 9 to 19, wherein the one or more surfactants and/or dispersants comprise an emulsifier.

Specific embodiment 21. Method according to one of the specific embodiments 9 to 20, wherein the one or more surfactants and/or dispersants comprise an antirelease agent. Specific embodiment 22. Method according to one of the specific embodiments 9 to 21, wherein the one or more surfactants and/or dispersants comprise a sequestering agent.

Specific embodiment 23. Method according to one of the specific embodiments 9 to 22, wherein the one or more surfactants are selected from the list comprising: SARABID 200 LL, SARABID DLO CONC, SARABID IPD, SARABID IPF, SARABID IPM, SARABID LDR, and SARABID MIP, SARABID OL, SARABID PAW, SARABID PF, SARABID SBF-N,

SARABID VAT.

Specific embodiment 24. Method according to one of the specific embodiments 1 to 23, wherein the first and second inks are fixed after application of the second ink. 5

Specific embodiment 25. Method according to specific embodiment 24, wherein fixing takes place through conversion of acid ink to basic ink. 10

Specific embodiment 26. Method according to specific embodiment 25, wherein the basic ink has a pH of at least 8.0, preferably a pH of at least 9.0, preferably a pH of at least 10.0, preferably a pH of at least 11.0, preferably a pH of at least 12.0. 15

Specific embodiment 27. Method according to one of the specific embodiments 24 to 26, wherein fixing takes place through evaporation of one or more surfactants and/or dispersants. 20

Specific embodiment 28. Method according to one of the specific embodiments 24 to 27, wherein fixing takes place by means of steam. 25

Specific embodiment 29. Method according to specific embodiment 28, wherein the steam has a temperature of at least 80°C and at most 130°C, preferably at least 90°C and at most 110°C, preferably at least 95°C and at most 105°C, preferably at least 97°C and at most 99°C. 30

Specific embodiment 30. Method according to one of the specific embodiments 1 to 29, wherein the carpet comprises a pile, and wherein the pile comprises polyamide, polyacrylate, polyolefin, or cotton. 35

Specific embodiment 31. Method according to specific embodiment 30, wherein the pile comprises polyamide, preferably nylon. 40

Specific embodiment 32. Method according to one of the specific embodiments 30 or 31, wherein the pile has a length from at least 1.0 mm to at most 30.0 mm, preferably from 2.0 mm to 15.0 mm, more preferably from 3.0 mm to 9.0 mm. 45

Specific embodiment 33. Method according to one of the specific embodiments 1 or 32, wherein the first ink comprises a dye and water, and optionally one or more additives. 50

Specific embodiment 34. Method according to one of the specific embodiments 1 or 33, wherein the second ink comprises a dye and water, and optionally one or more additives. 55

Specific embodiment 35. Method according to one of the specific embodiments 1 or 34, wherein the inks are applied in at least 16 dpi, more preferably at least 25 dpi.

Specific embodiment 36. Method according to one of the specific embodiments 1 or 35, wherein the inks are applied in at most 2400 dpi, preferably at most 1200 dpi, preferably at most 600 dpi, preferably at most 600 dpi, preferably at most 76 dpi, for example 50 dpi.

Specific embodiment 37. Method according to one of the specific embodiments 1 or 36, wherein the inks are applied in pixels with a characteristic size preferably from 0.20 mm to 2.00 mm, preferably about 1.00 mm.

Specific embodiment 38. Method according to one of the specific embodiments 1 or 37, wherein the inks are applied with a textile printer that comprises a printhead, preferably an inkjet printer.

Specific embodiment 39. Method according to specific embodiment 38, wherein the printhead comprises at least 2 and at most 16 colours, preferably at least 3 and at most 12 colours, preferably at least 7 and at most 9 colours, for example 8 colours.

Specific embodiment 40. Method according to one of the specific embodiments 38 or 39, wherein the printhead comprises at least 32 jets and at most 128 jets, preferably 64 jets, for each colour.

Specific embodiment 41. Method according to one of the specific embodiments 38 to 40, wherein the printhead moves at a speed v during application of ink in the first region, and wherein the printhead moves at a speed that is greater than the speed v during application of the first ink and of the second ink in the second region.

Specific embodiment 42. Method according to specific embodiment 41, wherein the printhead moves with a speed $n \cdot v$ during application of the first ink and of the second ink in the second region, and wherein n is equal, to within 10%, to the number of inks that are applied in the second region.

Specific embodiment 43. Method according to one of the specific embodiments 1 to 42, wherein the inks are applied with a pick-up rate of at least 2.0 and at most 5.0, preferably about 3.0.

Specific embodiment 44. Method according to one of the specific embodiments 1 to 43, wherein the pH values of the first ink and of the second ink are the same, to within a deviation of pH value of at most

2.0, preferably at most 1.0, preferably at most 0.5

Specific embodiment 45. Method according to one of the specific embodiments 1 to 44, wherein the inks are applied at a certain draw-off speed, and wherein the difference between the draw-off speeds of the different inks is less than 50%, preferably less than 20%, preferably less than 10%.

Specific embodiment 46. Method according to one of the specific embodiments 1 to 45, wherein the difference between the flow rates at which the different inks are applied on the carpet is less than 50%, preferably less than 20%, preferably less than 10%.

EXAMPLES

Example 1

[0098] Fig. 1 is a schematic representation of the width of a textile roll over a run in four different situations, in which over one run, printing is effected in a first ink with a first colour (K1), a second ink with a second colour (K2), and/or a third ink with a third colour (K3). A textile roll is an oblong piece of textile that comprises a longitudinal direction and a transverse direction. The textile is longer in the longitudinal direction than in the transverse direction. A run is a part of a textile roll and extends over the transverse direction of the textile roll. In the longitudinal direction of the textile roll the run has a width of 1 pixel. The textile roll is printed using a textile printer that comprises a printhead.

[0099] In situation 1) a whole run is printed in ink 1 (K1). The printhead moves with a speed V. In situation 2) a part of the run is printed in ink 1 (K1) and a part of the run is printed in ink 2 (K2). The printhead also moves with a speed V. In situation 3) a part of the run is printed in ink 1 (K1), and a part of the run is printed in both ink 1 and ink 2 (K1+K2) at the same time. In the part of the run that is only printed with ink 1 (K1), the printhead moves at a speed V. In the part of the run that is printed with ink 1 and 2 (K1+K2) at the same time, the printhead moves at a speed 2V.

[0100] In situation 3, a part of the run is printed in ink 1 (K1), and a part of the run is printed in ink 1, ink 2, and ink 3 (K1+K2+K3) at the same time. In the part of the run that is only printed with ink 1 (K1), the printhead moves at a speed V. In the part of the run that is printed with inks 1, 2, and 3 (K1+K2+K3), the printhead moves at a speed 3V.

Example 2

[0101] In a further example, reference is made to Fig. 2. Fig. 2 shows how a great many colours can be obtained by means of only four inks 1, 2, 3, and 4. The four inks each have a different hue.

[0102] Firstly, inks 1 to 4 can be printed individually,

which already gives four possible colours. Then simultaneous printing of two inks gives six further colours (1+2, 2+3, 3+4, 1+3, 2+4, and 1+4). Furthermore, simultaneous printing of four different inks gives access to four additional colours (1+3+4, 2+3+4, 3+2+1, and 4+1+2). Finally, printing four inks together provides a final extra colour (1+2+3+4). Thus, 15 different colours can be printed with just four different inks.

Example 3

[0103] FIG. 3, 4, and 5 illustrate a primary backing with pile, on which 2 inks are applied. The problem of insufficient mixing is shown schematically in FIG. 3 and 4. FIG. 5 shows a solution according to one embodiment of the invention.

[0104] The following steps are illustrated in FIG. 3:

- a) nothing applied yet;
- b) the first colour penetrates to the primary backing; and there is insufficient penetration of the second colour; and
- c) in the end result the pile has only the first colour (dark) at the bottom and a mixture of both colours (grey) at the top.

[0105] The following steps are illustrated in FIG. 4:

- a) nothing applied yet;
- b) the first colour penetrates to the primary backing; and there is insufficient penetration of the second colour; and
- c) in the end result the pile has only the first colour (light) at the bottom and a mixture of both colours (grey) at the top.

[0106] The following steps are illustrated in FIG. 5:

- a) nothing applied yet;
- b) the first colour is applied with a colour affine agent, and does not yet penetrate to the primary backing;
- c) the second colour does not contain any affine agents, and penetrates through the first colour; and
- d) in the end result the pile has an equal mixture of both colours (grey) everywhere.

[0107] Steps b) and c) in FIG. 5 may for example be carried out by subjecting the first colour to a lower mechanical pressure (e.g. 1 bar) and subjecting the second colour to a higher mechanical pressure (e.g. 2 to 4 bar). As a result, the second colour penetrates mechanically

through the first colour. This may also be effected by a viscosity difference or a pH difference (or a combination of 2 or all 3), as described above.

Claims

1. Method for applying ink on a carpet, the carpet comprising at least one first region and one second region, and the method comprising the following steps:

- applying a first ink in the first region and in the second region; and
- applying a second ink in the second region;

wherein the first ink and the second ink are different, preferably wherein the first ink and the second ink each have a different hue;
wherein the inks are applied with a textile printer that comprises a printhead, preferably an inkjet printer; and, **characterized in that** the printhead moves at a speed v during application of the first ink in the first region, and wherein the printhead moves at a speed that is greater than the speed v during application of the first ink and of the second ink in the second region.

2. Method according to Claim 1, wherein the second ink is also applied in a third region.

3. Method according to Claim 1 or 2, wherein the method is carried out with a machine designed for spot printing, but wherein the first ink and the second ink are applied on top of one another in the second region as in process printing.

4. Method according to any one of Claims 1 to 3, wherein the first ink and/or the second ink are applied in just one movement.

5. Method according to any one of Claims 1 to 4, wherein the first ink and/or the second ink is an acid ink, preferably with a pH of at most 6.0, preferably at most 5.0, preferably at most 4.0; and wherein the pH of the first ink and of the second ink are preferably the same, differing by at most 2.0, preferably at most 1.0, preferably at most 0.5.

6. Method according to any one of Claims 1 to 5, wherein the first ink and the second ink comprise one or more surfactants and/or dispersants, preferably as colour affine agents.

7. Method according to any one of Claims 1 to 6, wherein the first and second inks are fixed after application of the second ink.

8. Method according to Claim 7, wherein fixing takes

place through conversion of acid ink to basic ink.

9. Method according to Claim 7 or 8, wherein the first ink is applied before the second ink, wherein the first ink has a viscosity that is higher than the viscosity of the second ink, and wherein the first ink is applied at a pressure that is lower than the pressure at which the second ink is applied.

10. Method according to any one of Claims 7 to 9, wherein fixing takes place through evaporation of one or more surfactants and/or dispersants.

11. Method according to any one of Claims 7 to 10, wherein fixing takes place by means of steam.

12. Method according to any one of Claims 1 to 11, wherein the carpet comprises a pile; wherein the pile comprises polyamide, polyacrylate, polyolefin, or cotton; and wherein the pile preferably comprises polyamide, more preferably nylon.

13. Method according to any one of Claims 1 to 12, wherein the first ink and/or the second ink comprise a dye and water, and optionally one or more additives.

14. Method according to any one of Claims 1 to 13, wherein the printhead moves with a speed $n \cdot v$ during application of the first ink and of the second ink in the second region, and wherein n is equal, to within 10%, to the number of inks that are applied in the second region; and wherein preferably the difference between the flow rates at which the different inks are applied on the carpet is less than 50%, preferably less than 20%, preferably less than 10%.

15. Method according to any one of Claims 1 to 14, wherein the inks are applied at a certain draw-off speed, and wherein the difference between the draw-off speeds of the different inks is less than 50%, preferably less than 20%, preferably less than 10%.

Patentansprüche

1. Verfahren zum Auftragen von Druckfarbe auf einen Teppich, wobei der Teppich mindestens einen ersten Bereich und einen zweiten Bereich umfasst und das Verfahren die folgenden Schritte umfasst:

- Auftragen einer ersten Druckfarbe im ersten Bereich und im zweiten Bereich; und
- Auftragen einer zweiten Druckfarbe im zweiten Bereich;

wobei die erste Druckfarbe und die zweite Druckfar-

be unterschiedlich sind, vorzugsweise wobei die erste Druckfarbe und die zweite Druckfarbe einen unterschiedlichen Farbton (Hue) aufweisen, wobei die Druckfarben mit einem Textildrucker, der einen Druckkopf umfasst, vorzugsweise einem Tintenstrahldrucker, aufgetragen werden; und **dadurch gekennzeichnet, dass**

der Druckkopf sich während des Auftragens der ersten Druckfarbe im ersten Bereich mit einer Geschwindigkeit v bewegt und wobei der Druckkopf sich während des Auftragens der ersten Druckfarbe und der zweiten Druckfarbe im zweiten Bereich mit einer Geschwindigkeit bewegt, die größer als die Geschwindigkeit v ist.

2. Verfahren nach Anspruch 1, wobei die zweite Druckfarbe auch in einem dritten Bereich aufgetragen wird.
3. Verfahren nach Anspruch 1 oder 2, wobei das Verfahren mit einem für das Spot-Drucken ausgelegten Gerät ausgeführt wird, aber wobei die erste Druckfarbe und die zweite Druckfarbe im zweiten Bereich wie im Prozessdrucken übereinander aufgetragen werden.
4. Verfahren nach einem der Ansprüche 1 bis 3, wobei die erste Druckfarbe und/oder die zweite Druckfarbe in nur einer Bewegung aufgetragen werden.
5. Verfahren nach einem der Ansprüche 1 bis 4, wobei die erste Druckfarbe und/oder die zweite Druckfarbe eine saure Druckfarbe ist, vorzugsweise mit einem pH-Wert von höchstens 6,0, vorzugsweise höchstens 5,0, vorzugsweise höchstens 4,0; und wobei die pH-Werte der ersten Druckfarbe und der zweiten Druckfarbe vorzugsweise gleich sind oder um höchstens 2,0, vorzugsweise höchstens 1,0, vorzugsweise höchstens 0,5 abweichen.
6. Verfahren nach einem der Ansprüche 1 bis 5, wobei die erste Druckfarbe und die zweite Druckfarbe ein oder mehrere Tenside und/oder Dispergiermittel umfassen, vorzugsweise als farbauffine Mittel.
7. Verfahren nach einem der Ansprüche 1 bis 6, wobei die erste und die zweite Druckfarbe nach dem Auftragen der zweiten Druckfarbe fixiert werden.
8. Verfahren nach Anspruch 7, wobei das Fixieren durch Umwandlung von saurer Druckfarbe zu basischer Druckfarbe erfolgt.
9. Verfahren nach Anspruch 7 oder 8, wobei die erste Druckfarbe vor der zweiten Druckfarbe aufgetragen wird, wobei die erste Druckfarbe eine Viskosität aufweist, die höher als die Viskosität der zweiten Druckfarbe ist, und wobei die erste Druckfarbe bei einem Druck aufgetragen wird, der niedriger ist als der

Druck, bei dem die zweite Druckfarbe aufgetragen wird.

10. Verfahren nach einem der Ansprüche 7 bis 9, wobei das Fixieren durch Verdampfung einer oder mehrerer Tenside und/oder Dispergiermittel erfolgt.
11. Verfahren nach einem der Ansprüche 7 bis 10, wobei das Fixieren mittels Dampf erfolgt.
12. Verfahren nach einem der Ansprüche 1 bis 11, wobei der Teppich einen Flor umfasst; wobei der Flor Polyamid, Polyacrylat, Polyolefin oder Baumwolle umfasst; und wobei der Flor bevorzugt Polyamid, bevorzugter Nylon umfasst.
13. Verfahren nach einem der Ansprüche 1 bis 12, wobei die erste Druckfarbe und/oder die zweite Druckfarbe einen Farbstoff und Wasser und optional ein oder mehrere Additive umfassen.
14. Verfahren nach einem der Ansprüche 1 bis 13, wobei der Druckkopf sich während des Auftragens der ersten Druckfarbe und der zweiten Druckfarbe im zweiten Bereich mit einer Geschwindigkeit $n \cdot v$ bewegt, und wobei n , auf innerhalb von 10 %, gleich der Anzahl der Druckfarben ist, die im zweiten Bereich aufgetragen werden; und wobei vorzugsweise die Differenz zwischen den Volumenströmen, mit denen die unterschiedlichen Druckfarben auf dem Teppich aufgetragen werden, kleiner als 50 %, vorzugsweise kleiner als 20 %, vorzugsweise kleiner als 10 % ist.
15. Verfahren nach einem der Ansprüche 1 bis 14, wobei die Druckfarben mit einer bestimmten Abzugsgeschwindigkeit aufgetragen werden und wobei die Differenz zwischen den Abzugsgeschwindigkeiten der unterschiedlichen Druckfarben kleiner als 50 %, vorzugsweise kleiner als 20 %, vorzugsweise kleiner als 10 % ist.

Revendications

1. Procédé pour l'application d'encre sur un tapis, le tapis comprenant au moins une première zone et une deuxième zone, et le procédé comprenant les étapes suivantes :

- l'application d'une première encre dans la première zone et dans la deuxième zone ; et
- l'application d'une seconde encre dans la deuxième zone ;

dans lequel la première encre et la seconde encre sont différentes, de préférence dans lequel la première encre et la seconde encre ont chacune une

- teinte différente ;
dans lequel les encres sont appliquées avec une imprimante pour textiles qui comprend une tête d'impression, de préférence une imprimante à jet d'encre ; et **caractérisé en ce que** la tête d'imprimante se déplace à une vitesse v pendant l'application de la première encre dans la première zone, et dans lequel la tête d'impression se déplace à une vitesse qui est plus grande que la vitesse v pendant l'application de la première encre et de la seconde encre dans la deuxième zone.
2. Procédé selon la revendication 1, dans lequel la seconde encre est également appliquée dans une troisième zone.
 3. Procédé selon la revendication 1 ou 2, dans lequel le procédé est effectué avec une machine conçue pour l'impression par points, mais dans lequel la première encre et la seconde encre sont appliquées l'une par-dessus l'autre dans la deuxième zone comme en impression en couches.
 4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel la première encre et/ou la seconde encre sont appliquées en un seul déplacement.
 5. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel la première encre et/ou la seconde encre sont des encres acides, de préférence ayant un pH d'au maximum 6,0, de préférence d'au maximum 5,0, de préférence d'au maximum 4,0 ; et dans lequel les pH de la première encre et de la seconde encre sont de préférence les mêmes, différant d'au maximum 2,0, de préférence d'au maximum 1,0, de préférence d'au maximum 0,5.
 6. Procédé selon l'une quelconque des revendications 1 à 5, dans lequel la première encre et la seconde encre comprennent un ou plusieurs tensioactifs et/ou dispersants, de préférence sous forme d'agents d'affinité pour les couleurs.
 7. Procédé selon l'une quelconque des revendications 1 à 6, dans lequel les première et seconde encres sont fixées après application de la seconde encre.
 8. Procédé selon la revendication 7, dans lequel le fixage a lieu par conversion d'encre acide en encre basique.
 9. Procédé selon la revendication 7 ou 8, dans lequel la première encre est appliquée avant la seconde encre, dans lequel la première encre a une viscosité qui est supérieure à la viscosité de la seconde encre, et dans lequel la première encre est appliquée à une pression qui est inférieure à la pression à laquelle la seconde encre est appliquée.
 10. Procédé selon l'une quelconque des revendications 7 à 9, dans lequel le fixage a lieu par évaporation d'un ou plusieurs tensioactifs et/ou dispersants.
 11. Procédé selon l'une quelconque des revendications 7 à 10, dans lequel le fixage a lieu au moyen de vapeur d'eau.
 12. Procédé selon l'une quelconque des revendications 1 à 11, dans lequel le tapis comprend un poil ; dans lequel le poil comprend un polyamide, un polyacrylate, une polyoléfine ou du coton ; et dans lequel le poil comprend de préférence un polyamide, plus préférentiellement du nylon.
 13. Procédé selon l'une quelconque des revendications 1 à 12, dans lequel la première encre et/ou la seconde encre comprennent un colorant et de l'eau, et éventuellement un ou plusieurs additifs.
 14. Procédé selon l'une quelconque des revendications 1 à 13, dans lequel la tête d'impression se déplace avec une vitesse $n \cdot v$ pendant l'application de la première encre et de la seconde encre dans la deuxième zone, et dans lequel n est égal, à plus ou moins 10 %, au nombre d'encres qui sont appliquées dans la deuxième zone ; et dans lequel de préférence la différence entre les débits auxquels les différentes encres sont appliquées sur le tapis est inférieure à 50 %, de préférence inférieure à 20 %, de préférence inférieure à 10 %.
 15. Procédé selon l'une quelconque des revendications 1 à 14, dans lequel les encres sont appliquées à une certaine vitesse de retrait, et dans lequel la différence entre les vitesses de retrait des différentes encres est inférieure à 50 %, de préférence inférieure à 20 %, de préférence inférieure à 10 %.

Figures

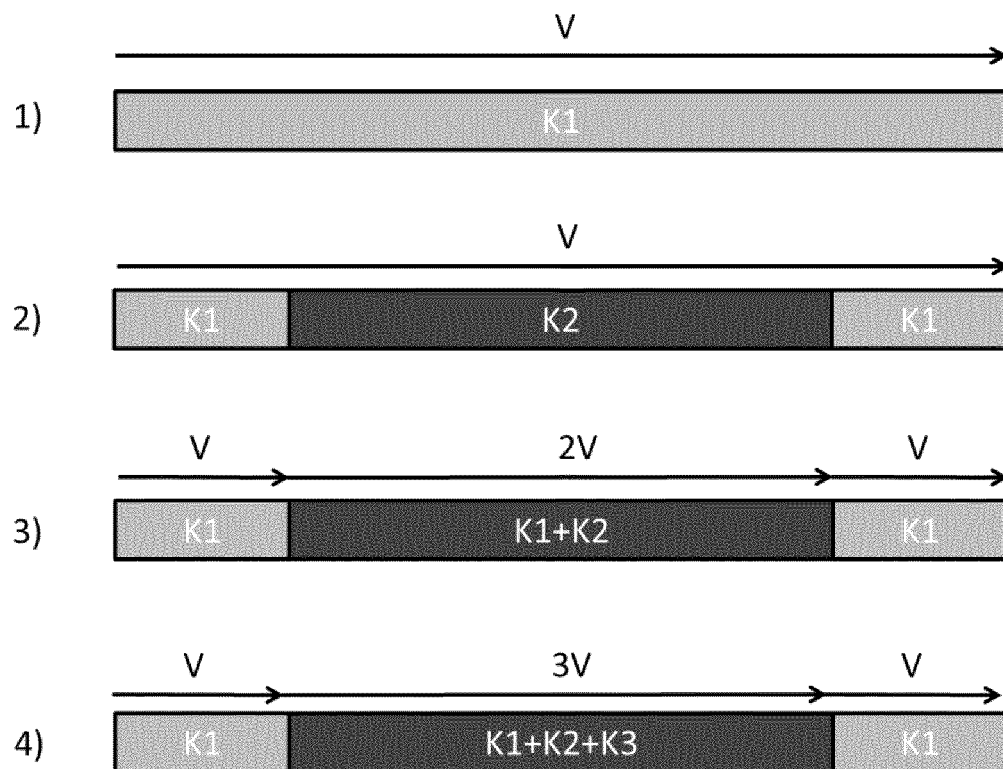


FIG. 1

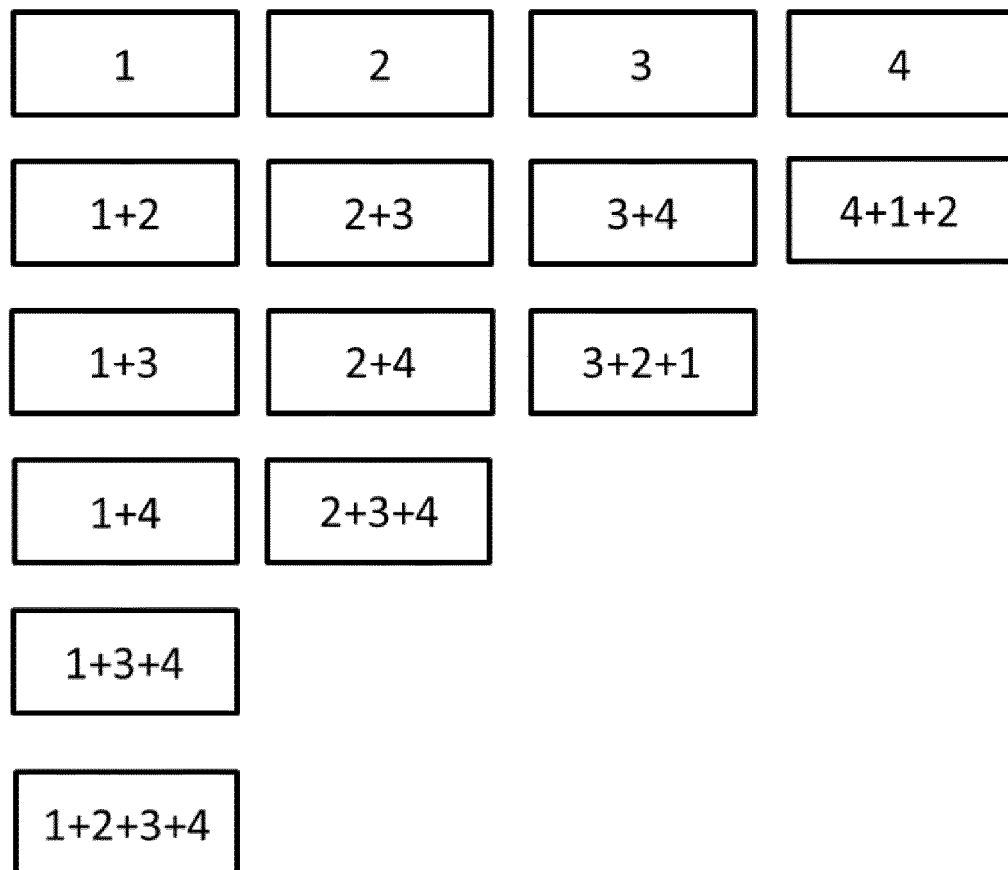


FIG. 2

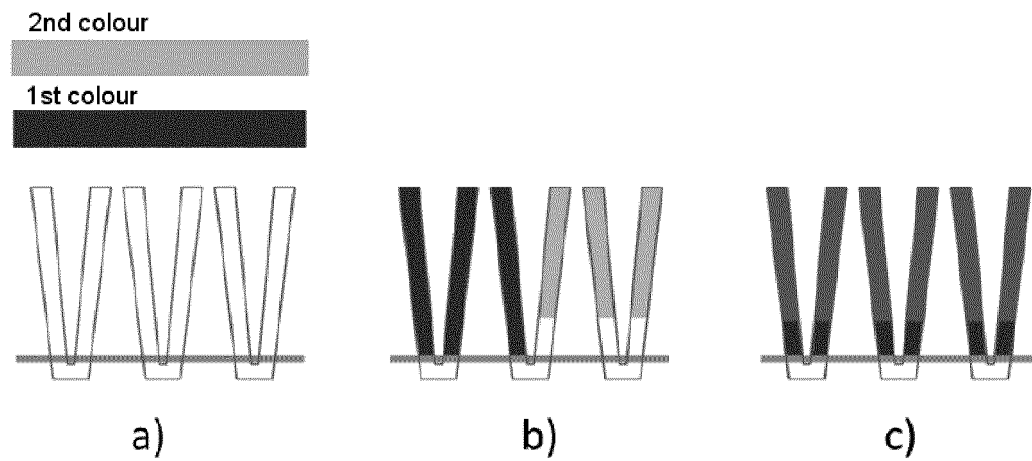


FIG. 3

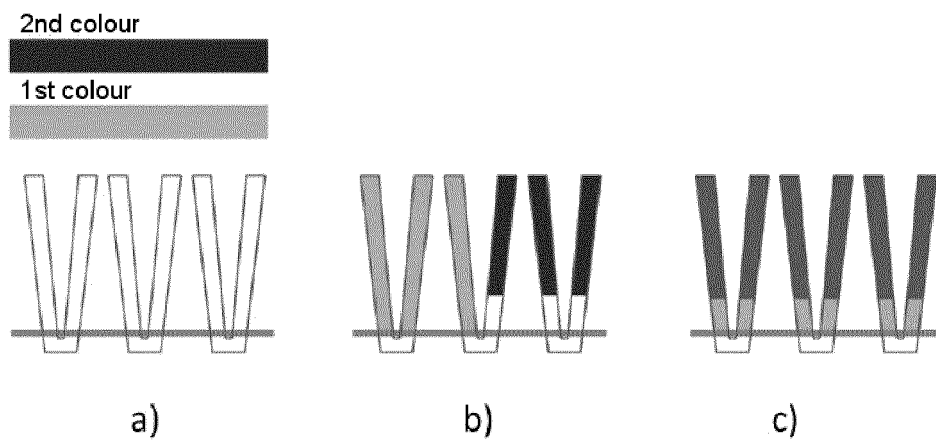


FIG. 4

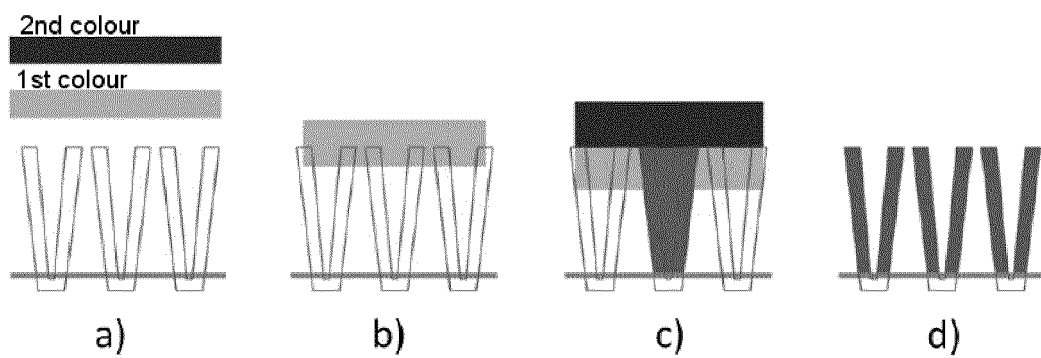


FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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