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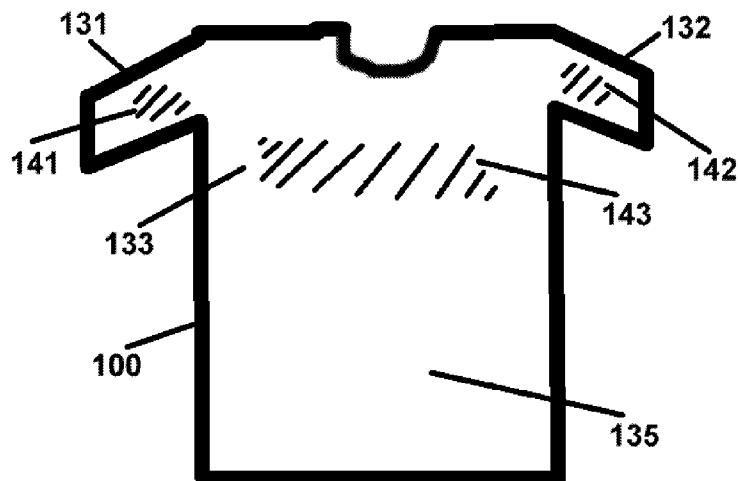


Fig. 1

(57) Abstract: Fabric for articles of clothing, as well as garments made of such fabric, and method and system for manufacturing such fabric and garments. A fabric or garment includes active-cooling materials or substances or elements, or a formulation or composition that includes one or more active-cooling materials or mixture thereof. A garment comprises a first garment-region that contains active-cooling substance, and a second garment-region that does not contain any active-cooling substances. One suitable active-cooling substance can be a mixture of polymer emulsion, water, glycerin, and Potassium Nitrate. The active-cooling substance can be deposited on the fabric, or printed on the fabric, or sprayed or brushed on the fabric, or soaked into the fabric, or otherwise integrated into the fabric.



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**FABRIC FOR ARTICLES OF CLOTHING,  
AND METHOD AND SYSTEM OF PRODUCING SAME**

**CROSS-REFERENCE TO RELATED APPLIACATIONS**

[001] This patent application claims priority and benefit from United States provisional patent application number 62/233,654, filed on September 28, 2015, which is incorporated herein by reference in its entirety.

**FIELD OF THE INVENTION**

[002] The present invention relates to the field of articles of clothing.

**BACKGROUND**

[003] A shirt is an upper-body garment or article of clothing. A shirt worn by a person, for example, may keep a person's upper body warm, may protect the upper body from sun or rain or environmental conditions, may cover private parts (e.g., breasts) of a person, or may be used for various other purposes (e.g., as a fashion garment, or to comply with a dress-code of an organization or a profession).

[004] Other articles of clothing are worn every day worldwide; for example, pants or trousers, socks, jackets, coats, or the like.

**SUMMARY**

[005] The present invention may comprise fabrics (e.g., an active-cooling fabric), as well as various garments or articles of clothing made of such fabric(s), and methods and systems for producing them. For example, a fabric or a garment (e.g., a shirt) may comprise one or more components or materials or elements able to absorb heat or body-heat, and/or able to provide cooling or body-cooling or a cooling effect, temporarily and/or continuously.

[006] The present invention may provide other advantages and/or benefits.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[007] Fig. 1 is a schematic illustration of a front-side of a shirt, in accordance with some demonstrative embodiments of the present invention.

[008] Fig. 2 is a schematic illustration of a fabric, in accordance with some demonstrative embodiments of the present invention.

[009] Fig. 3 is a schematic illustration of a set of six deposition patterns of cooling elements or cooling substances, in accordance with some embodiments of the present invention.

[0010] Figs. 4A-4B are schematic illustrations of three diagrams which may be used for selective deposition (or selective integration, or selective embedding) of cooling materials onto or into a garment, in accordance with some demonstrative embodiments of the present invention.

### **DETAILED DESCRIPTION OF THE PRESENT INVENTION**

[0011] The present invention may comprise fabrics (e.g., an active-cooling fabric), as well as various garments or articles of clothing made of such fabric(s), and methods and systems for producing them. For example, a fabric or a garment (e.g., a shirt) may comprise one or more components or materials or elements able to absorb heat or body-heat, and/or able to provide cooling or body-cooling or a cooling effect, temporarily and/or continuously.

[0012] Although portions of the discussion herein and/or portions of the drawings, may relate to (or may depict), for demonstrative purposes, a shirt or a short-sleeve shirt or a sports shirt, the present invention is not limited in this regard; and embodiments of the present invention may comprise, and may be used in conjunction with, other types of garments or articles of clothing, for example, long-sleeve shirt, medium-sleeve shirt, sleeveless or sleeve-less shirts, sweatshirts, vests, dresses, form-fitting shirts or clothes, loose shirts or clothes, T-shirts or Tee-shirts, sport shirts, sports shirts, performance shirts, athletic shirts, polo shirt, rugby shirt, Henley shirt, Jersey shirt, baseball shirt, a shirt having a collar, a collared shirt, a shirt without a collar, a collar-less shirt, a shirt having a hood, a “hoodie” garment or “hoody” garment or hooded shirt or hooded sweatshirt, camp shirt, dress shirt, A-shirt, singlet, camisole, tunic, a night shirt, a night gown, a pajama shirt, a “onesie” garment or a “diaper shirt” for babies or toddlers or infants, a jacket, a coat, outerwear, pants, trousers, underwear, lingerie, socks, stockings, hats, fabric-based wristbands, head-band garments, short pants, long pants, sports pants, tights, leggings, and/or other suitable garments.

[0013] The present invention comprises technology which may deliver measurable cooling of a fabric or a garment or article-of-clothing. The cooling or active-cooling may be provided for a significant length of time (e.g., 2 or 3 or 5 hours; or more than 2 hours; or more than 1 hour); or may be provided for shorter time periods (e.g., for 20 or 40 or 60 minutes).

[0014] The cooling may be triggered and/or facilitated and/or enhanced by moisture absorption and/or sweat absorption. The cooling mechanism may be based by utilizing a composite of soluble substances with a negative heat of solution (NHS), encased in or

embedded-in or woven-into or incorporated into or otherwise integrated into a vapor permeable polymer or other suitable material or fabric(s).

[0015] In accordance with some demonstrative embodiments of the present invention, such substances having NHS may include one or more (or a combination or mixture) of the following material(s): Ammonium Chloride, Potassium Chloride, Ammonium Bromide, Potassium Bromide, Ammonium Nitrate, Silver Nitrate, Silver Nitrite, Sodium Nitrate, Potassium nitrate, Potassium nitrite, Sodium acetate trihydrate, Sodium thiosulfate, and/or polysaccharides.

[0016] In some embodiments, a single NHS substance may be exclusively used in a single fabric or garment. In other embodiments, two or more NHS substances may be mixed together, and may be used as a mixture with one single fabric or one single garment. In yet other embodiments, one or more regions or areas of a garment (e.g., sleeves region) may comprise a first NHS substance; whereas one or more other regions or areas of that garment (e.g., the chest region) may comprise a second NHS substance (or, a mixture of two or more NHS substances). In still other embodiments, one or more regions or areas of a garment (e.g., sleeves region) may comprise a first mixture of two-or-more NHS substances; whereas one or more other regions or areas of that garment (e.g., the chest region) may comprise a second mixture (e.g., a different mixture) of NHS substances. In some embodiments, different regions or parts or areas of a single garment, may comprise different NHS substance(s), or different ratios of mixing together the same set of multiple NHS substances, or different amounts of quantities or doses of such NHS substances, or different spreading properties or spreading characteristics of such NHS substance(s), or different spreading pattern(s) of such NHS substance(s).

[0017] In accordance with some demonstrative embodiments of the present invention, the polymer may comprise, for example, emulsions of aliphatic and/or aromatic polyether and/or polyester polyurethanes; for example, Noveon® Estane® series of material(s), or materials which comprise or may be similar to Lubrizol® polyurethanes or to Noveon® thermoplastic polyurethane (TPU), or the chemical equivalents of these materials, or the generic or non-branded equivalent of these materials, or other suitable materials.

[0018] In accordance with some demonstrative embodiments of the present invention, the composite may be applied or added or woven-into or mixed-with or incorporated-into or embedded-on to a carrier substrate, such as a fabric. Such fabrics may include or may be, for example, cotton, polyester, polyamide, polyolefin, elastomer, silk, wool, leather, natural fabrics, synthetic fabrics, and/or their blends and/or mixtures.

[0019] In a demonstrative embodiment of the present invention, the composite may be prepared or produced, for example, by mixing the following four components (denoted A, B, C and D) by utilizing the following proportions or ratios:

[0020] (A) Polymer emulsion, in the range of 20% to 90% of the composite; or in the range of 30% to 80% of the composite; or in the range of 40% to 70% of the composite; or in the range of 50% to 60% of the composite;

[0021] (B) Water, in the range of 0% to 49% of the composite; or in the range of 0% to 40% of the composite; or in the range of 3% to 35% of the composite; or in the range of 3% to 30% of the composite; or in the range of 5% to 30% of the composite; or in the range of 5% to 25% of the composite; or in the range of 10% to 25% of the composite; or in the range of 10% to 20% of the composite; or in the range of 10% to 15% of the composite;

[0022] (C) Glycerine and/or polyglycol, in the range of in the range of 0% to 49% of the composite; or in the range of 0% to 40% of the composite; or in the range of 3% to 35% of the composite; or in the range of 3% to 30% of the composite; or in the range of 5% to 30% of the composite; or in the range of 5% to 25% of the composite; or in the range of 10% to 25% of the composite; or in the range of 15% to 25% of the composite; or in the range of 10% to 20% of the composite;

[0023] (D) a single NHS substance, or a mixture of two NHS substances, or a mixture of three NHS substances, or a mixture of four-or-more NHS substances, in the range of 0% to 55% of the composite; or in the range of 0% to 50% of the composite; or in the range of 5% to 50% of the composite; or in the range of 5% to 40% of the composite; or in the range of 5% to 30% of the composite; or in the range of 10% to 35% of the composite; or in the range of 10% to 30% of the composite; or in the range of 15% to 25% of the composite; or in the range of 10% to 20% of the composite.

[0024] In some demonstrative embodiments, the total percent of solid(s) in the composite may be in the range of 10% to 90%; or in the range of 20% to 80%; or in the range of 25% to 75%; or in the range of 30% to 70%; or in the range of 25% to 67%; or in the range of 33% to 67%; or in the range of 40% to 60%.

[0025] In some demonstrative embodiments, viscosity of the composite may be in the range of 100 to 15,000 centipoise; or in the range of 200 to 12,000 centipoise; or in the range of 500 to 10,000 centipoise; or in the range of 700 to 8,000 centipoise; or in the range of 1,000 to 5,000 centipoise; or in the range of 2,000 to 4,000 centipoise.

[0026] In some embodiments, the composite may contain other suitable "thickener" or "thickening material" for textile printing, for example, an acrylic thickener, an acrylic-based

thickener, a vinyl thickener, a vinyl-based thickener, a cellulose derivative thickener, and/or a naturally derived thickener, and/or a combination of multiple such thickeners; with the purpose of achieving a particular or desired viscosity. Additionally or alternatively, the composite may comprise or may contain a dispersing agent for textile printing, such as an anionic dispersant, a cationic dispersant, or a nonionic dispersant, for the purpose of increasing the stability of the composite over time. Other suitable materials may be used.

[0027] In some embodiments, the fabric or garment (or garment-region, such as sleeve, back-side, chest-side) may comprise only one single NHS; and such single NHS may be, for example, potassium nitrate.

[0028] Other suitable materials and/or ratios may be used.

[0029] In some embodiments, a printing process may be utilized to apply the composite to fabrics and/or garments, by using one or more textile printing techniques. Additionally or alternatively, the cooling elements or cooling materials or cooling mixture(s) may be applied or added to (or embedded into, or integrated into) a fabric or a garment by utilizing one or more other methods, for example, coating, spraying, padding, foam application, hot melt systems, ultra-violet (UV) curing methods or curable systems, soaking, mixing, gluing, bonding, brushing (e.g., the materials are deposited as a coating being brushed onto a fabric or garment), welding, ultrasonic welding, mechanical connection, inter-weaving, pressure, stitching, sewing, weaving, inter-weaving, bonding elements, or the like.

[0030] Optionally, the cooling element may be manufactured or produced as a stand-alone or autonomous cooling element, which may then be added (e.g., as a sticker or as a patch) by an end-user or by a professional (e.g., a tailor, or a clothes manufacturer) to existing fabric(s) and/or to existing garment(s). In some embodiments, the cooling elements or cooling substances or cooling mixture(s) may be deposited onto or into a fabric or a garment, or may be sprayed or coated or brushed thereon or therein, or may be injected into the fabric or garment, or may otherwise be mixed or added to the fabric or garment.

[0031] In some embodiments, the cooling elements or cooling substances or cooling mixture(s) may be inserted into an internal layer of a fabric or a garment (e.g., as a filling within a layer of the fabric that is “sandwiched” or trapped between two or more other layers, and which does not directly touch the human body, and does not directly touch the air or environment that surrounds the external side of the garment or fabric). In some embodiments, the cooling elements or cooling substance(s) or cooling mixture(s) may be deposited or added or coated by utilizing ribs, rims, protrusions, craters, tunnels, channels, rail-shaped elements, dots, linear elements, or other suitable three-dimensional or two-

dimensional elements that may be deposited on or within or under a layer of fabric. Other suitable deposition or coating or connection or integration methods may be used.

[0032] In some embodiments, the materials may be applied to, or printed on, or woven onto, or otherwise integrated into: (a) only the external side or the external surface of the fabric or garment, which does not directly touch the skin of the wearer; (b) only the internal side or the internal surface of the fabric or the garment, which directly touches the skin of the wearer; (c) both the internal and external sides or the fabric or garment; (d) only a middle layer of the fabric or garment, which neither directly touches the skin of the wearer, nor is it directly exposed to air or environment; (e) only a single layer of fabric, if the fabric is made of two-or-more layers; (f) all the layers of a fabric, if the fabric is made of two-or-more layers; (g) only some, and not all, of the layers of a fabric that is formed of multiple layers; (h) only a single layer of a fabric that is formed of multiple layers. Other suitable deposition methods or regions may be used, in order to achieve desired results of cooling effect(s) in different regions of a fabric or a garment, or in different types of garments.

[0033] In a demonstrative embodiment, a printing process may be utilized to deposit 5% to 80% (or 10% to 70%; or 20% to 60%; or 30% to 60%; or 33% to 67%; or 40% to 60%; or 40% to 51%; or at least 51%) solids add-on on the fabric surface (or garment, or garment-region) in a pre-defined pattern or open pattern.

[0034] Reference is made to Fig. 1, which is a schematic illustration of a front-side of a shirt 100, in accordance with some demonstrative embodiments of the present invention. In shirt 100, the left sleeve 131 may comprise an active-cooling region 141, in which cooling material(s) are integrated into the fabric. Similarly, the right sleeve 132 may comprise an active-cooling region 142, in which cooling material(s) are integrated into the fabric. Optionally, the chest area 133 of shirt 100 may comprise an active-cooling region 144, in which the cooling material(s) are integrated into the fabric. Other regions or areas of shirt 100, such as the stomach area 135, lack or do not contain any cooling material(s) therein or in their fabric.

[0035] Reference is made to Fig. 2, which is a schematic illustration of a fabric 200, in accordance with some demonstrative embodiments of the present invention. Fabric 200 may be utilized for manufacturing of shirts and other suitable garments or clothes. In fabric 200, some particular areas 201 and 202 comprise cooling material(s); whereas other areas (such as areas 203 and 204) of fabric 200 lack or do not contain any cooling material(s). Fabric 200 may enable to manufacture a garment in which particular regions or areas are selectively cooled by the cooling substance(s); whereas other garment areas or garment regions are not.

[0036] Reference is made to Fig. 3, which is a schematic illustration of a set of several deposition patterns 301-307 of cooling elements or cooling substances, in accordance with some embodiments of the present invention. In deposition patterns 301-307, the black lines or black elements (e.g., circles, hollow circles, filled circles, boxes, filled boxes, hollow boxes, triangles, hollow triangles, filled triangles, or the like) indicate deposition of cooling material(s) into or onto a fabric or a garment; whereas, areas that are white indicate regions of the fabric or garment that does not contain cooling material(s), or regions of the fabric or garment into which (or onto which) cooling materials are not deposited. In some embodiments, active cooling material(s) may be deposited or integrated or embedded, on or in or into the garment or the fabric, in a selective automated manner, and/or using repetitive pattern(s), or using non-repetitive patterns, and/or using pseudo-random patterns or schemes; or by using only filled patterns or shapes, or by using only non-hollow patterns or shapes, or by using only hollow (e.g., circumferential) shapes or patterns; or by using a pre-defined scheme that combines both hollow and non-hollow shapes; or in accordance with a pre-defined scheme that deposits or creates a first type of active cooling material shape (e.g., only hollow items, or only circumferential items) at a first garment-region and that also creates a second, different, type of active cooling materials shape (e.g., only non-hollow items, or only filled items) at a second, different, garment-region; such schemes and patterns are not merely ornamental, but rather, they are functional patterns that in accordance with the present invention achieve a particular active cooling function of a fabric or of a garment or of (or at) particular garment region(s), or that enable a first garment-region to have a first, increased, level of active cooling functionality (e.g., using higher density of patterns, or using filled and non-hollow patterns), while also enabling a second garment-region of the same garment to have a second (e.g., reduced) level of active cooling (e.g., by using lower density of patterns, or by using non-filled and hollow patterns) or to lack active cooling entirely (e.g., by avoiding or skipping deposition of active cooling materials at a certain region). Deposition patterns 301-307 are only some demonstrative non-limiting examples of deposition patterns of cooling elements or cooling substance(s), in accordance with some embodiments of the present invention; and other suitable patterns or structures may be used.

[0037] In some embodiments, the pattern and/or each cooling element may be a generally continuous array or matrix; a symmetrical pattern; a rectangular pattern; a square-pattern; a perfect polygon pattern; a circular or circle pattern; an oval; a triangle; a zigzag pattern; a dove-tail pattern; or the like. In other embodiments, the pattern and/or each cooling element may be a generally dis-continuous pattern; a non-symmetrical pattern; "U" shaped; "n"



shaped; “L” shaped; “X” shaped; or the like. Other suitable shapes or patterns may be used, for the entire deposited pattern, and/or for each particular and/or discrete cooling element or cooling region by itself.

[0038] In some embodiments, the coverage of deposited materials (or otherwise integrated active-cooling materials) on the fabric or garment may be, for example, in the range of 1% to 66% of the fabric surface (or the garment surface); or in the range of 3% to 51%; or in the range of 5% to 50%; or in the range of 5% to 49%; or in the range of 10% to 40%; or in the range of 10% to 33%; or in the range of 15% to 25%.

[0039] In some embodiments, the dry-weight add-on of the deposited material(s) may be, for example, in the range of 10 to 200 gr/m<sup>2</sup>; or in the range of 20 to 150 gr/m<sup>2</sup>; or in the range of 40 to 120 gr/m<sup>2</sup>; or in the range of 50 to 100 gr/m<sup>2</sup>. Other suitable ranges may be used.

[0040] Optionally, after the printing or coating or deposition, the fabric or garment may be cured; for example, by using a curing element or heating element producing heat in the range of 120 to 180 degrees Celsius; for a period of 1 to 10 minutes, or a period of 3 to 7 minutes. Other suitable temperatures may be used, and other heating time-periods may be used.

[0041] The following are some demonstrative non-limiting examples of particular embodiments of the present invention; other suitable materials and/or ratios may be used.

[0042] Example A:

Formulation:

Polymer emulsion	60%
Water	12%
Glycerine	12%
Potassium nitrate	16%
Total:	100%
Total % solids in formulation	50%

[0043] Example B:

The formulation of Example A is printed or otherwise deposited or coated on a 160 gr/m<sup>2</sup> nylon fabric, for example, by using a screen printing process. Coverage is 25%. Add-on is 30 gr/m<sup>2</sup>. Fabric is cured at 160 degrees Celsius for 3 minutes.

[0044] Example C:

The formulation of Example A is printed or otherwise deposited or coated on a 150 gr/m<sup>2</sup> polyester / Elastane fabric, for example, by using a screen printing process. Coverage is 16%. Add-on is 25 gr/m<sup>2</sup>. Fabric is cured at 160 degrees Celsius for 3 minutes.

[0045] Example D:

The formulation of Example A is printed or otherwise deposited or coated on a 160 gr/m<sup>2</sup> cotton / Elastane fabric, for example, using a screen printing process. Coverage is 30%. Add-on is 55 gr/m<sup>2</sup>. Fabric is cured at 160 degrees Celsius for 3 minutes.

[0046] Example E:

The formulation of Example A is printed on or otherwise deposited or coated on a 160 gr/m<sup>2</sup> nylon / Elastane fabric using a screen printing process. Coverage is 25%. Add-on is 30 gr/m<sup>2</sup>. Fabric is cured at 160C for 3 minutes.

[0047] In a demonstrative experiment, in accordance with Example E above, embodiments of the invention showed effective cooling of a wearer (and/or of a garment worn by a wearer), of approximately 1.0 or 1.5 or 2.0 degrees Celsius, upon initiation of sweating by the wearer (e.g., after 5 to 10 minutes of wearing); as measured using infra-red thermo-camera scans, demonstrated herein. For comparison purposes, the fabrics of Examples E and D are measured with deposition and without deposition (the “control”) of the formulation of Example A.

[0048] In a demonstrative experiment, temperature measurements (and heat images) were taken with regard to four items. Item #1 demonstrates temperature measurement of a bare back of a human; Item #2 demonstrates temperature measurement of the back side of the human who wears a shirt made of base nylon / Elastane fabric as in Example E above but without any deposition of the Formulation of Example A above, thereby demonstrating a “control” fabric or shirt; and Items #3 and #4 demonstrate temperature measurement at two different areas of the back of a human who wears a shirt made of nylon / Elastane fabric as in Example E. With regard to Item #1, Bare Back, the measured temperature was 33.7 degrees Celsius. With regard to Item #2, Polyamide Untreated, the measured temperature was 32.3 degrees Celsius. With regard to Item #3, Polyamide Treated, first location: the measured temperature was 30.8 degrees Celsius. With regard to Item #4, Polyamide Treated, second location: the measured temperature was 30.0 degrees Celsius.

[0049] Example F:

The formulation of Example A is printed or otherwise coated or deposited on a 150 gr/m<sup>2</sup> polyester / Elastane fabric, for example, by using a screen printing process. Coverage is 16%. Add-on is 25 gr/m<sup>2</sup>. Fabric is cured at 160 degrees Celsius for 3 minutes.

[0050] In a demonstrative experiment, in accordance with Example F, embodiments of the invention showed effective cooling of a wearer (and/or of a garment worn by a wearer), of approximately 1.0 or 1.5 or 2.0 degrees Celsius, upon initiation of sweating by the wearer (e.g., after 5 to 10 minutes of wearing); as measured using infra-red thermo-camera scans.

[0051] In another demonstrative experiment, four other items were tested and measured, denoted Items #5 to #8. Item #5 and Item #6 measured temperature at two different areas of a human back that is clothed with a shirt made of the base polyester / Elastane fabric of Example F, but without any deposition of the Formulation of Example A, thereby demonstrating a “control” fabric or shirt. Item #7 and item #8 measured temperatures at two different areas of the human back that is clothed with a shirt formed of the polyester / Elastane fabric of Example F.

[0052] With regard to Item #5, Polyester Untreated; the measured temperature was 31.9 degrees Celsius. With regard to Item #6, Polyester Untreated; the measured temperature was 31.6 degrees Celsius. With regard to Item #7, Polyester Treated; the measured temperature was 30.5 degrees Celsius. With regard to Item #8, Polyester Treated; the measured temperature was 30.2 degrees Celsius.

[0053] Example G:

A demonstrative implementation, the fabric of Example F was tested using Guarded Sweating Hot Plate, in accordance with American Society for Testing and Materials – ASTM F1868 Test Method. Following a calibrated moisture pulse, the total energy absorption / transmission of the treated fabric was 999 kW\*sec/m<sup>2</sup> over a period of 30 minutes following said moisture pulse.

[0054] In accordance with some embodiments of the present invention, a fabric or a garment may comprise, in particular areas or regions or patterns thereof, a formulation of materials comprising: Polymer emulsion, in a range of 40% to 60% of the formulation; water, in a

range of 0 to 12% of the formulation; Glycerin, in a range of 10% to 15% of the formulation; and Potassium Nitrate, in a range of 15% to 20% of the formulation.

[0055] In accordance with some embodiments of the present invention, a fabric or a garment may comprise, in particular areas or regions or patterns thereof, a formulation of materials comprising: Polymer emulsion, being 60% of the formulation; water, being 5% of the formulation; Glycerin, being 15% of the formulation; and Potassium Nitrate, being 20% of the formulation.

[0056] In accordance with some embodiments of the present invention, a fabric or a garment may comprise, in particular areas or regions or patterns thereof, a formulation of materials comprising: Polymer emulsion, being 60% of the formulation; no water, or under 1 percent of water; Glycerin, being 13% of the formulation; Potassium Nitrate, being 17% of the formulation; and other auxiliaries.

[0057] It is clarified that the terms “auxiliary” or “auxiliaries”, in the formulation(s) of the present invention, may comprise one or more materials or substances or additives that may be formulated alongside (or, together with) the active ingredient of the formulation, for one or more purposes or to enable one or more characteristics or features, for example, long-term stabilization, thickening, emulsification, enhancing solubility, prevention of aggregation over the expected shelf-life, or the like. Such auxiliaries in the formulation(s) of the present invention may further comprise or may be, for example, one or more surfactants or compounds that lower the surface tension (or interfacial tension) between two liquids or between a liquid and a solid, or that assist in dispersion; a thickener to control flow during printing and/or deposition; and/or an anti-foaming agent to enable rapid mixing without generating foam or while preventing generation of foam.

[0058] In accordance with some embodiments of the present invention, a fabric or a garment may comprise, in particular areas or regions or patterns thereof, a formulation of materials comprising: Polymer emulsion, being 55% of the formulation; water, being 5% of the formulation; Glycerin, being 10% of the formulation; Potassium Nitrate, being 20% of the formulation; and other auxiliaries, being 10% of the formulation.

[0059] In accordance with some embodiments of the present invention, a fabric or a garment may comprise, in particular areas or regions or patterns thereof, a formulation of materials comprising: Polymer emulsion, being at least 50% of the formulation; water, being at least 1% of the formulation; Glycerin and Potassium Nitrate, being (together) at least 15% and not more than 33 percent of the formulation; and optionally, other auxiliaries. In some embodiments, the Glycerin and Potassium Nitrate (together) are 15 percent of the

formulation; or are 18 percent of the formulation; or are 20 percent of the formulation; or are 22 percent of the formulation; or are 25 percent of the formulation; or are 27 percent of the formulation; or are 30 percent of the formulation; or are 33 percent of the formulation. In some embodiments, the Glycerin and Potassium Nitrate (together) are in the range of 10 to 33 percent of the formulation; or are in the range of 10 to 30 percent of the formulation; or are in the range of 12 to 28 percent of the formulation; or are in the range of 15 to 26 percent of the formulation; or are in the range of 18 to 25 percent of the formulation; or are in the range of 20 to 24 percent of the formulation.

[0060] It is noted that the various ratios, percentage values, quantities, and materials, are not merely random or arbitrary values or ranges; but rather, they reflect particular values or ranges that the Applicants have experimented with and hand-picked and selected, and/or have realized that they are beneficial or advantageous to various garments or fabrics.

[0061] Reference is made to Figs. 4A and 4B, which are schematic illustrations of three diagrams 401-403 which may be used for selective deposition (or selective integration, or selective embedding) of cooling materials onto (or onto) a garment, in accordance with some demonstrative embodiments of the present invention. Diagram 401 demonstrates the anterior of a human; diagram 402 demonstrates the posterior of a human; and diagram 403 demonstrates a Sweat Rate Chart which may be used for selecting in which regions of the garment to deposit the active cooling material(s), and/or to determine in which regions of the garment the deposition should exist or should not exist or should be intensified or should be diluted, and/or to determine which regions of the garment should have increased or crowded depositions (or conversely, no depositions, or few depositions per area, or less-crowded or more-scattered depositions). The sweat rate values (or ranges) are shown, for demonstrative purposes, in units of: grams per meter-square of body surface area per hour; or " $\text{g} / (\text{m}^2 \text{h})$ "; or " $\text{g m}^{-2} \text{h}^{-1}$ "; however, other suitable units may be used to indicate sweat rate or sweat production or sweat accumulation, which in turn may be used for determining garment-regions that should include or exclude active cooling substances, and/or which may be used for determining density of intensity of deposition (or integration, or embedding) or active cooling material(s) onto or into garment-regions.

[0062] In a demonstrative implementation, for example, upper-back area has the greatest sweat rate (values of 1197 and 840); the central-back and lower-back areas have an increased sweat rate (values of 1148, 856, and 750 or 742); the front-shoulders and back-shoulders area have an increased sweat rate (values of 656), as so does the neck area (value of 622); and the

front chest area has sweat rate of 546 and 498; whereas the arms, hands, legs, hips, and other body parts have other, less significant, sweat areas.

[0063] In some embodiments, active cooling material(s) are deposited on, or into, or are integrated or embedded in, only garment-regions that are indicated with sweat rate(s) of at least 1,000; or only in garment-regions that are indicated with sweat rate(s) of at least 950; or only in garment-regions that are indicated with sweat rate(s) of at least 900; or only in garment-regions that are indicated with sweat rate(s) of at least 850; or only in garment-regions that are indicated with sweat rate(s) of at least 800; or only in garment-regions that are indicated with sweat rate(s) of at least 750; or only in garment-regions that are indicated with sweat rate(s) of at least 700; or only in garment-regions that are indicated with sweat rate(s) of at least 650; or only in garment-regions that are indicated with sweat rate(s) of at least 600; or only in garment-regions that are indicated with sweat rate(s) of at least 550; or only in garment-regions that are indicated with sweat rate(s) of at least 500; or only in garment-regions that are indicated with sweat rate(s) of at least K, wherein K is a pre-defined positive number; or only in garment-regions that are indicated with sweat rate(s) that are within a pre-defined range of values (e.g., between M and N, wherein M and N are two, different, positive numbers).

[0064] In some embodiments, active cooling materials are deposited on, or integrated or embedded in or within, only garment-regions that have a sweat rate that is greater than K; whereas other garment-regions lack (or, are devoid of) such active cooling materials.

[0065] In some embodiments, active cooling materials are deposited on, or integrated or embedded in or within, only garment-regions that have a sweat rate that is within a pre-defined range of values; whereas other garment-regions lack (or, are devoid of) such active cooling materials.

[0066] In some embodiments, active cooling material(s) are deposited in a first intensity or density or concentration or quantity or crowdedness-level or deposited-patterns-per-area in a first garment-region that has a first sweat rate (K1); and, active cooling material(s) are deposited in a second, lower, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area in a second garment-region that has a second sweat rate (K2) that is smaller than the first sweat rate (K1).

[0067] In some embodiments, the greater the sweat rate value, the higher the intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area of the active cooling material(s) in the corresponding garment region; and, the smaller the sweat rate value, the smaller the intensity or density or quantity or concentration or crowdedness-

level or deposited-patterns-per-area of the active cooling material(s) in the corresponding garment region.

[0068] In some embodiments, for example, active cooling material(s) are deposited or integrated into the upper-back region of a garment, at a first, greater, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N2; whereas active cooling material(s) are deposited or integrated into the arms regions of the garment, at a second, lower, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N1; such that N2 is greater than N1.

[0069] In some embodiments, for example, active cooling material(s) are deposited or integrated into the upper-back region of a garment, at a first, greater, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N2; whereas active cooling material(s) are deposited or integrated into the front chest region of the garment, at a second, lower, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N1; such that N2 is greater than N1.

[0070] In some embodiments, for example, active cooling material(s) are deposited or integrated into the upper-back region of a garment, at a first, greater, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N2; whereas active cooling material(s) are deposited or integrated into the shoulders regions of the garment, at a second, lower, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N1; such that N2 is greater than N1.

[0071] In some embodiments, for example, active cooling material(s) are deposited or integrated into the upper-back region of a garment, at a first, greater, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N2; whereas active cooling material(s) are deposited or integrated into the armpits regions of the garment, at a second, lower, intensity or density or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N1; such that N2 is greater than N1.

[0072] In some embodiments, for example, active cooling material(s) are deposited or integrated into both the upper-back and lower-back regions of a garment, at a first, greater, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N2; whereas active cooling material(s) are deposited or integrated into the shoulders regions (and/or the front chest region, and/or the arms regions) of the garment, at a

second, lower, intensity or density or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N1; such that N2 is greater than N1.

[0073] In some embodiments, for example, active cooling material(s) are deposited or integrated into the shoulders regions of a garment, at a first, greater, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N2; whereas active cooling material(s) are deposited or integrated into the arms regions of the garment, at a second, lower, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N1; such that N2 is greater than N1.

[0074] In some embodiments, for example, active cooling material(s) are deposited or integrated into the hip regions of a garment, at a first, greater, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N2; whereas active cooling material(s) are deposited or integrated into the thigh regions of the garment, at a second, lower, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N1; such that N2 is greater than N1.

[0075] In some embodiments, for example, active cooling material(s) are deposited or integrated into the hip regions of a garment, at a first, greater, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N2; whereas active cooling material(s) are deposited or integrated into the leg regions of the garment, at a second, lower, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N1; such that N2 is greater than N1.

[0076] In some embodiments, for example, active cooling material(s) are deposited or integrated into the thigh regions of a garment, at a first, greater, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N2; whereas active cooling material(s) are deposited or integrated into the leg regions of the garment, at a second, lower, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N1; such that N2 is greater than N1.

[0077] In some embodiments, for example, active cooling material(s) are deposited or integrated into the inner-thigh regions of a garment (e.g., the garment regions that cover the inner side of the thighs, which face towards each other), at a first, greater, intensity or density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N2; whereas active cooling material(s) are deposited or integrated into the outer-thigh regions of the garment (e.g., the garment that cover the outer portions of the thighs, which face externally from the body and externally from each other), at a second, lower, intensity or



density or quantity or concentration or crowdedness-level or deposited-patterns-per-area denoted N1; such that N2 is greater than N1.

[0078] The present invention may comprise a fabric or a garment. The fabric or garment may be coated with a composite or solution or mixture of cooling materials. Additionally or alternatively, a fabric or garment may have printed thereon, a composite or solution or mixture of cooling materials. Additionally or alternatively, a fabric or garment may integrally comprise therein, a composite or solution or mixture of cooling materials.

[0079] Some embodiments comprise a garment having at least a first region and a second region; wherein the first region of the garment comprises a first type of composite described herein, and wherein the second region of the garment has a second (different) type of composite described herein.

[0080] Some embodiments comprise a garment having at least a first region and a second region; wherein the first region of the garment comprises a particular type of composite having a particular set of components described herein; wherein the second region of the garment has the same first type of composite but at different quantities (or different ratios or proportions) of the particular set of components.

[0081] Some embodiments comprise a garment having a continuous array of cooling elements, that are printed-on or coated-on or brushed-on or deposited-on or integrated-into a fabric.

[0082] Some embodiments comprise a garment having a dis-continuous array of cooling elements, that are printed-on or coated-on or brushed-on or deposited-on or integrated-into a fabric.

[0083] Some embodiments may comprise a system and a method for producing such fabric or garment.

[0084] Some embodiments of the present invention may comprise, or may utilize, an automated or semi-automated or partially-automated process or system, or a machine-implemented process or system, or a computerized process or system, in order to produce the shirt or garment described herein and/or any particular component(s) or region(s) of such shirts or garments. Such system or process may utilize for example, a programmable knitting machine, a computerized knitting machine, a computer, a processor, a controller, an Integrated Circuit (IC), logic units, memory units, storage units, input units (e.g., keyboard, touch-screen, mouse, touch-pen, stylus), output units (e.g., monitor, screen, touch-screen), a power source, wired communication links, wireless communication links, an Operating System (OS), drivers, applications, as well as other suitable hardware components and/or

software modules; which may be general-purpose components, or may be specific components that may be particularly tailored to achieve the particular goals or to perform the particular operations described herein. In some embodiments, the system or method may utilize a non-generic computer or a non-general-purpose computer, or may use a dedicated non-computer device (e.g., a dedicated programmable knitting machine or knitting system). The system may comprise, for example, a mixing module or unit, a printing unit or module, a coating module or unit, a brushing module or unit, a spraying module or unit, one or more containers for materials and substances, one or more selectors or feeding units able to select and/or measure and/or prepare materials at desired quantity, or the like.

[0085] Some or all of the operations of such method(s) may be performed automatically or partially-automatically or semi-automatically, by a suitable machine or production line or manufacturing line; which may comprise, for example, robotic arms, automated knitting machine or sewing machine, machine-controllable clothes-making machine or device, conveyor belt(s), and/or other modules or units. Optionally, a computerized platform or a computer may be used, to control and/or manage the production of one or more components or of the entire product or a portion thereof. In some implementations, such computer or computing device may comprise, for example, a processor, a logic circuit, an integrated circuit, an input unit (keyboard, mouse, stylus), an output unit (e.g., screen or monitor), memory unit, storage unit, wireless communication modules, wired communication modules, power source, operating system, drivers, applications, and/or other suitable hardware components and/or software modules.

[0086] The present invention includes a garment comprising: a first garment-region made of a fabric that comprises an active-cooling substance; a second, different, garment region that lacks any active-cooling substance.

[0087] In some embodiments, the first garment-region comprises a coating layer of said active-cooling substance.

[0088] In some embodiments, the first garment-region comprises a patterned deposition layer of said active-cooling substance.

[0089] In some embodiments, the first garment-region comprises said active-cooling substance that is integrated within said fabric of the first garment-region.

[0090] In some embodiments, the first garment-region comprises said active-cooling substance that is located at least at an inner side of the first garment-region that touches a human wearer.

[0091] In some embodiments, the first garment-region comprises said active-cooling substance that is located exclusively at an inner side of the first garment-region that touches a human wearer, and is not located on an external side of the first garment-region that does not touch the human wearer.

[0092] In some embodiments, the first garment-region comprises a coating layer of said active-cooling substance which comprises Potassium Nitrate.

[0093] In some embodiments, the first garment-region comprises a patterned deposition layer of said active-cooling substance which comprises Potassium Nitrate.

[0094] In some embodiments, the first garment-region comprises said active-cooling substance that is integrated within said fabric of the first garment-region, wherein said active-cooling substance comprises Potassium Nitrate.

[0095] In some embodiments, the first garment-region comprises a coating layer of said active-cooling substance which comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by weight.

[0096] In some embodiments, the first garment-region comprises a coating layer of said active-cooling substance which comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by volume.

[0097] In some embodiments, the first garment-region comprises a patterned deposition layer of said active-cooling substance which comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by weight.

[0098] In some embodiments, the first garment-region comprises a patterned deposition layer of said active-cooling substance which comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by volume.

[0099] In some embodiments, the first garment-region comprises said active-cooling substance that is integrated within said fabric of the first garment-region, wherein said active-cooling substance comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by weight.

[00100] In some embodiments, the first garment-region comprises said active-cooling substance that is integrated within said fabric of the first garment-region, wherein said active-cooling substance comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by volume.

[00101] In some embodiments, the first garment-region comprises said active-cooling substance which is a formulation comprising: polymer emulsion, being 40 to 60 percent of said formulation; water, being 0 to 12 percent of said formulation; glycerin, being 10 to 15

percent of said formulation; Potassium Nitrate, being 15 to 20 percent of said formulation; one or more other materials, being the remainder percentage of said formulation.

[00102] In some embodiments, the first garment-region comprises said active-cooling substance which is a formulation comprising: polymer emulsion, being 60 percent of said formulation; water, being less than 1 percent of said formulation; glycerin, being 13 percent of said formulation; Potassium Nitrate, being 17 percent of said formulation; one or more other materials, being the remainder percentage of said formulation.

[00103] In some embodiments, the first garment-region comprises said active-cooling substance which is a formulation comprising: polymer emulsion, being 55 percent of said formulation; water, being 5 percent of said formulation; glycerin, being 10 percent of said formulation; Potassium Nitrate, being 20 percent of said formulation; one or more other materials, being the remainder percentage of said formulation.

[00104] In some embodiments, the first garment-region comprises a first particular active-cooling substance; wherein a third garment-region of said garment, comprises a second, different, particular active-cooling substance.

[00105] In some embodiments, the first garment-region comprises a first particular active-cooling substance which comprise a first particular percentage of Potassium Nitrate; wherein a third garment-region of said garment, comprises a second, different, particular active-cooling substance which comprises a second, different, percentage of Potassium Nitrate.

[00106] In some embodiments, the first garment-region comprises a first mixture of two-or-more active-cooling materials that are mixed at a first ratio; wherein a third garment-region of said garment, comprises a second, different, mixture of same said two-or-more active-cooling materials that are mixed at a second, different, ratio.

[00107] In some embodiments, the first garment-region comprises a first mixture of two-or-more active-cooling materials; wherein a third garment-region of said garment, comprises a second, different, mixture of two-or-more active-cooling materials; wherein at least one material is part of the first mixture and is not part of the second mixture.

[00108] In some embodiments, the first garment-region comprises a continuous pattern of cooling elements that are formed of said active-cooling substance, and that are printed-on or coated-on or brushed-on or deposited-on said fabric.

[00109] In some embodiments, the first garment-region comprises a set of discrete cooling elements that are formed of said active-cooling substance, and that are printed-on or coated-on or brushed-on or deposited-on said fabric.

[00110] In some embodiments, the garment is a shirt; wherein the first garment-region which comprises the active-cooling substance is a garment-region selected from the group consisting of: sleeve region, armpit region, chest region, back region.

[00111] In some embodiments, the first garment-region comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00112] In some embodiments, the first garment-region is an upper-back region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region which is a lower-back region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00113] In some embodiments, the first garment-region is an upper-back region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region which is a chest region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00114] In some embodiments, the first garment-region is an upper-back region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region which is a shoulder-covering region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00115] In some embodiments, the first garment-region is an upper-back region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region which is an armpit-covering region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00116] In some embodiments, the first garment-region is an upper-back region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region which is a sleeve region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00117] In some embodiments, the first garment-region is a chest region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the

garment comprises a third garment-region is a shoulder-covering region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00118] In some embodiments, the first garment-region is a chest region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region is an armpit-covering region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00119] In some embodiments, the first garment-region is a chest region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region is a stomach-covering region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00120] In some embodiments, the first garment-region is a hip region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region is a thigh region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00121] In some embodiments, the first garment-region is a hip region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region is a leg region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00122] In some embodiments, the first garment-region is a thigh region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region is a leg region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00123] In some embodiments, wherein the first garment-region is an outer-thigh region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region is an inner-thigh region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00124] In some embodiments, the first garment-region is an inner-hip region and comprises said active-cooling substance at a first density of material-deposited-per-area; wherein the garment comprises a third garment-region is an outer-hip region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

[00125] In some embodiments, the first garment-region comprises said active-cooling substance that is integrated therein as multiple, filled, non-hollow patterned items that provide a first level of active cooling; wherein the garment comprises a third garment-region

which comprises said active-cooling substance that is integrated therein as multiple, non-filled, hollow patterned items that provide a second level of active cooling that is smaller than said first level of active cooling.

[00126] In some embodiments, an entirety of said garment comprises said active-cooling substance that is integrated therein only as multiple, filled, non-hollow patterned items, and lacks any hollow, non-filled, patterned items of said active-cooling substance.

[00127] In some embodiments, a method comprises: producing a fabric which comprises at least one region that contains an active-cooling substance.

[00128] In some embodiments, the producing comprises: depositing a pattern of said active-cooling substance onto said fabric.

[00129] In some embodiments, the producing comprises: spraying said active-cooling substance onto said fabric.

[00130] In some embodiments, the producing comprises: brushing said active-cooling substance onto said fabric.

[00131] In some embodiments, the producing comprises: soaking said fabric in a formulation that comprises said active-cooling substance.

[00132] In some embodiments, the producing comprises: depositing a pattern of said active-cooling substance onto said fabric, wherein 15 to 20 percent of said active-cooling substance is Potassium Nitrate.

[00133] In some embodiments, the producing comprises: spraying said active-cooling substance onto said fabric, wherein 15 to 20 percent of said active-cooling substance is Potassium Nitrate.

[00134] In some embodiments, the producing comprises: brushing said active-cooling substance onto said fabric, wherein 15 to 20 percent of said active-cooling substance is Potassium Nitrate.

[00135] In some embodiments, the producing comprises: soaking said fabric in a formulation that comprises said active-cooling substance, wherein 15 to 20 percent of said formulation is Potassium Nitrate.

[00136] The present invention includes fabric for articles of clothing, as well as garments made of such fabric, and method and system for manufacturing such fabric and garments. For example, a fabric or garment includes active-cooling materials or substances or elements, or a formulation or composition that includes one or more active-cooling materials or mixture thereof. For example, a garment comprises a first garment-region that contains active-cooling substance, and a second garment-region that does not contain any

active-cooling substances. One suitable active-cooling substance can be a mixture of polymer emulsion, water, glycerin, and Potassium Nitrate. The active-cooling substance can be deposited on the fabric, or printed on the fabric, or sprayed or brushed on the fabric, or soaked into the fabric, or otherwise integrated into the fabric.

[00137] Functions, operations, components and/or features described herein with reference to one or more embodiments, may be combined with, or may be utilized in combination with, one or more other functions, operations, components and/or features described herein with reference to one or more other embodiments, or vice versa.

[00138] While certain features of some embodiments have been illustrated and described herein, many modifications, substitutions, changes, and equivalents may occur to those skilled in the art. Accordingly, the claims are intended to cover all such modifications, substitutions, changes, and equivalents.



## CLAIMS

What is claimed is:

1. A garment comprising:  
a first garment-region made of a fabric that comprises an active-cooling substance;  
a second, different, garment region that lacks any active-cooling substance.
2. The garment of claim 1, wherein the first garment-region comprises a coating layer of said active-cooling substance.
3. The garment of claim 1, wherein the first garment-region comprises a patterned deposition layer of said active-cooling substance.
4. The garment of claim 1, wherein the first garment-region comprises said active-cooling substance that is integrated within said fabric of the first garment-region.
5. The garment of claim 1, wherein the first garment-region comprises said active-cooling substance that is located at least at an inner side of the first garment-region that touches a human wearer.
6. The garment of claim 1, wherein the first garment-region comprises said active-cooling substance that is located exclusively at an inner side of the first garment-region that touches a human wearer, and is not located on an external side of the first garment-region that does not touch the human wearer.
7. The garment of claim 1, wherein the first garment-region comprises a coating layer of said active-cooling substance which comprises Potassium Nitrate.
8. The garment of claim 1, wherein the first garment-region comprises a patterned deposition layer of said active-cooling substance which comprises Potassium Nitrate.

9. The garment of claim 1, wherein the first garment-region comprises said active-cooling substance that is integrated within said fabric of the first garment-region, wherein said active-cooling substance comprises Potassium Nitrate.
10. The garment of claim 1, wherein the first garment-region comprises a coating layer of said active-cooling substance which comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by weight.
11. The garment of claim 1, wherein the first garment-region comprises a coating layer of said active-cooling substance which comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by volume.
12. The garment of claim 1, wherein the first garment-region comprises a patterned deposition layer of said active-cooling substance which comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by weight.
13. The garment of claim 1, wherein the first garment-region comprises a patterned deposition layer of said active-cooling substance which comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by volume.
14. The garment of claim 1, wherein the first garment-region comprises said active-cooling substance that is integrated within said fabric of the first garment-region, wherein said active-cooling substance comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by weight.
15. The garment of claim 1, wherein the first garment-region comprises said active-cooling substance that is integrated within said fabric of the first garment-region, wherein said active-cooling substance comprises a formulation, wherein Potassium Nitrate is 15 to 20 percent of said formulation by volume.

16. The garment of claim 1, wherein the first garment-region comprises said active-cooling substance which is a formulation comprising:
  - polymer emulsion, being 40 to 60 percent of said formulation;
  - water, being 0 to 12 percent of said formulation;
  - glycerin, being 10 to 15 percent of said formulation;
  - Potassium Nitrate, being 15 to 20 percent of said formulation;
  - one or more other materials, being the remainder percentage of said formulation.
  
17. The garment of claim 1, wherein the first garment-region comprises said active-cooling substance which is a formulation comprising:
  - polymer emulsion, being 60 percent of said formulation;
  - water, being less than 1 percent of said formulation;
  - glycerin, being 13 percent of said formulation;
  - Potassium Nitrate, being 17 percent of said formulation;
  - one or more other materials, being the remainder percentage of said formulation.
  
18. The garment of claim 1, wherein the first garment-region comprises said active-cooling substance which is a formulation comprising:
  - polymer emulsion, being 55 percent of said formulation;
  - water, being 5 percent of said formulation;
  - glycerin, being 10 percent of said formulation;
  - Potassium Nitrate, being 20 percent of said formulation;
  - one or more other materials, being the remainder percentage of said formulation.
  
19. The garment of claim 1, wherein the first garment-region comprises a first particular active-cooling substance;
  - wherein a third garment-region of said garment, comprises a second, different, particular active-cooling substance.

20. The garment of claim 1, wherein the first garment-region comprises a first particular active-cooling substance which comprise a first particular percentage of Potassium Nitrate;  
wherein a third garment-region of said garment, comprises a second, different, particular active-cooling substance which comprises a second, different, percentage of Potassium Nitrate.
21. The garment of claim 1, wherein the first garment-region comprises a first mixture of two-or-more active-cooling materials that are mixed at a first ratio;  
wherein a third garment-region of said garment, comprises a second, different, mixture of same said two-or-more active-cooling materials that are mixed at a second, different, ratio.
22. The garment of claim 1, wherein the first garment-region comprises a first mixture of two-or-more active-cooling materials;  
wherein a third garment-region of said garment, comprises a second, different, mixture of two-or-more active-cooling materials;  
wherein at least one material is part of the first mixture and is not part of the second mixture.
23. The garment of claim 1, wherein the first garment-region comprises a continuous pattern of cooling elements that are formed of said active-cooling substance, and that are printed-on or coated-on or brushed-on or deposited-on said fabric.
24. The garment of claim 1, wherein the first garment-region comprises a set of discrete cooling elements that are formed of said active-cooling substance, and that are printed-on or coated-on or brushed-on or deposited-on said fabric.
25. The garment of claim 1, wherein the garment is a shirt;  
wherein the first garment-region which comprises the active-cooling substance is a garment-region selected from the group consisting of: sleeve region, armpit region, chest region, back region.

26. The garment of claim 1,  
wherein the first garment-region comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
27. The garment of claim 1,  
wherein the first garment-region is an upper-back region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region which is a lower-back region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
28. The garment of claim 1,  
wherein the first garment-region is an upper-back region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region which is a chest region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
29. The garment of claim 1,  
wherein the first garment-region is an upper-back region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region which is a shoulder-covering region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
30. The garment of claim 1,  
wherein the first garment-region is an upper-back region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region which is an armpit-covering region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

31. The garment of claim 1,  
wherein the first garment-region is an upper-back region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region which is a sleeve region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
32. The garment of claim 1,  
wherein the first garment-region is a chest region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region is a shoulder-covering region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
33. The garment of claim 1,  
wherein the first garment-region is a chest region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region is an armpit-covering region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
34. The garment of claim 1,  
wherein the first garment-region is a chest region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region is a stomach-covering region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
35. The garment of claim 1,  
wherein the first garment-region is a hip region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region is a thigh region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.

36. The garment of claim 1,  
wherein the first garment-region is a hip region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region is a leg region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
37. The garment of claim 1,  
wherein the first garment-region is a thigh region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region is a leg region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
38. The garment of claim 1,  
wherein the first garment-region is an outer-thigh region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region is an inner-thigh region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
39. The garment of claim 1,  
wherein the first garment-region is an inner-hip region and comprises said active-cooling substance at a first density of material-deposited-per-area;  
wherein the garment comprises a third garment-region is an outer-hip region which comprises said active-cooling substance at a second, lower, density of material-deposited-per-area.
40. The garment of claim 1, wherein the first garment-region comprises said active-cooling substance that is integrated therein as multiple, filled, non-hollow patterned items that provide a first level of active cooling;  
wherein the garment comprises a third garment-region which comprises said active-cooling substance that is integrated therein as multiple, non-filled, hollow patterned items that provide a second level of active cooling that is smaller than said first level of active cooling.

41. The garment of claim 1, wherein an entirety of said garment comprises said active-cooling substance that is integrated therein only as multiple, filled, non-hollow patterned items, and lacks any hollow, non-filled, patterned items of said active-cooling substance.
42. A method comprising:  
producing a fabric which comprises at least one region that contains an active-cooling substance.
43. The method of claim 42, wherein the producing comprises:  
depositing a pattern of said active-cooling substance onto said fabric.
44. The method of claim 42, wherein the producing comprises:  
spraying said active-cooling substance onto said fabric.
45. The method of claim 42, wherein the producing comprises:  
brushing said active-cooling substance onto said fabric.
46. The method of claim 42, wherein the producing comprises:  
soaking said fabric in a formulation that comprises said active-cooling substance.
47. The method of claim 42, wherein the producing comprises:  
depositing a pattern of said active-cooling substance onto said fabric, wherein 15 to 20 percent of said active-cooling substance is Potassium Nitrate.
48. The method of claim 42, wherein the producing comprises:  
spraying said active-cooling substance onto said fabric, wherein 15 to 20 percent of said active-cooling substance is Potassium Nitrate.
49. The method of claim 42, wherein the producing comprises:  
brushing said active-cooling substance onto said fabric, wherein 15 to 20 percent of said active-cooling substance is Potassium Nitrate.



50. The method of claim 42, wherein the producing comprises:  
soaking said fabric in a formulation that comprises said active-cooling substance,  
wherein 15 to 20 percent of said formulation is Potassium Nitrate.

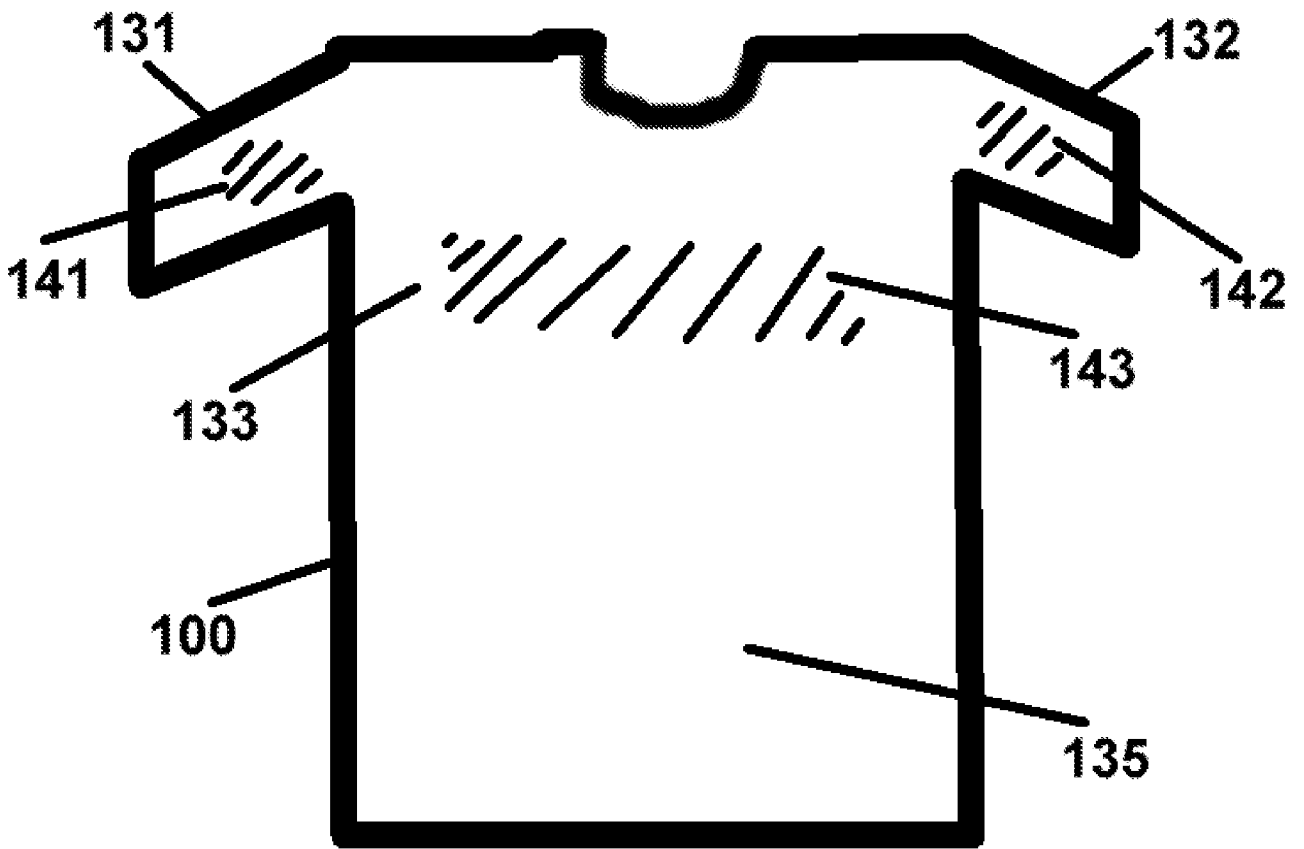


Fig. 1

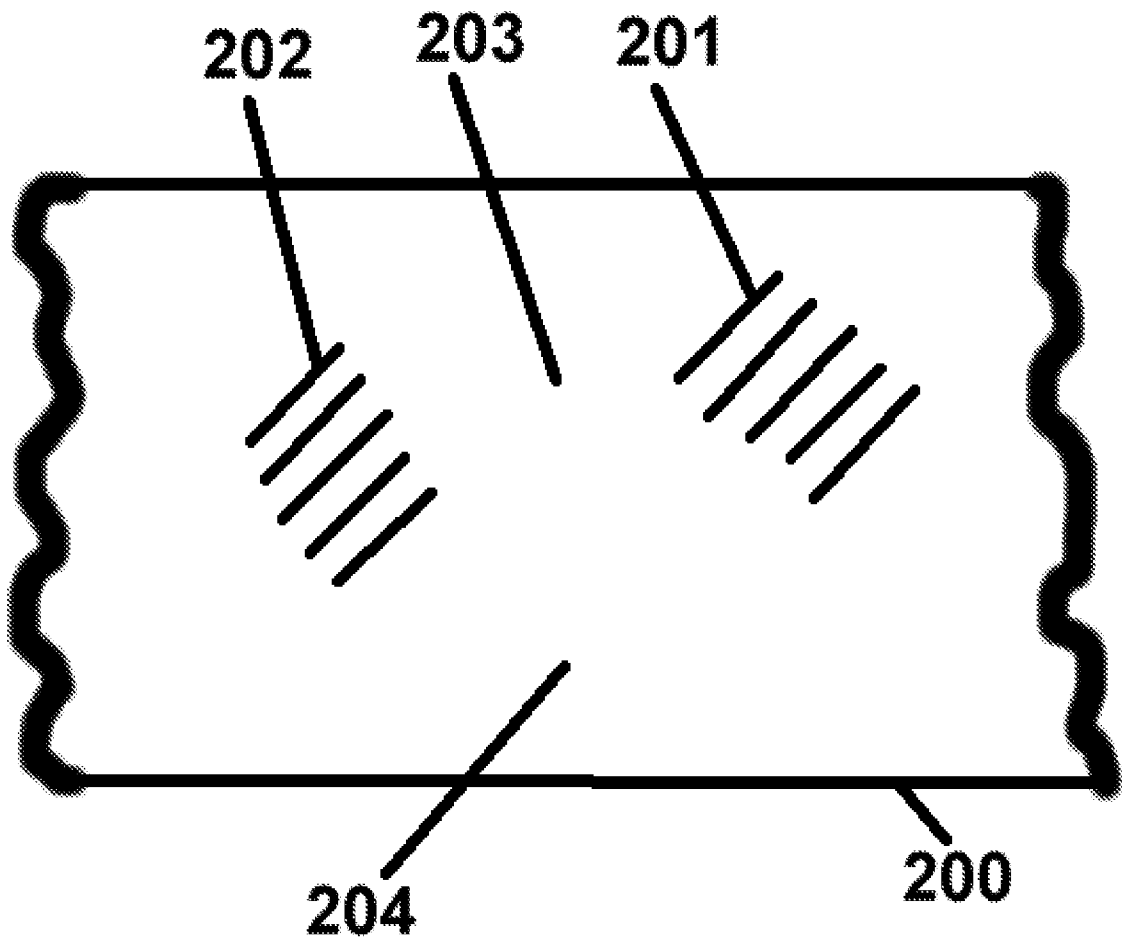


Fig. 2

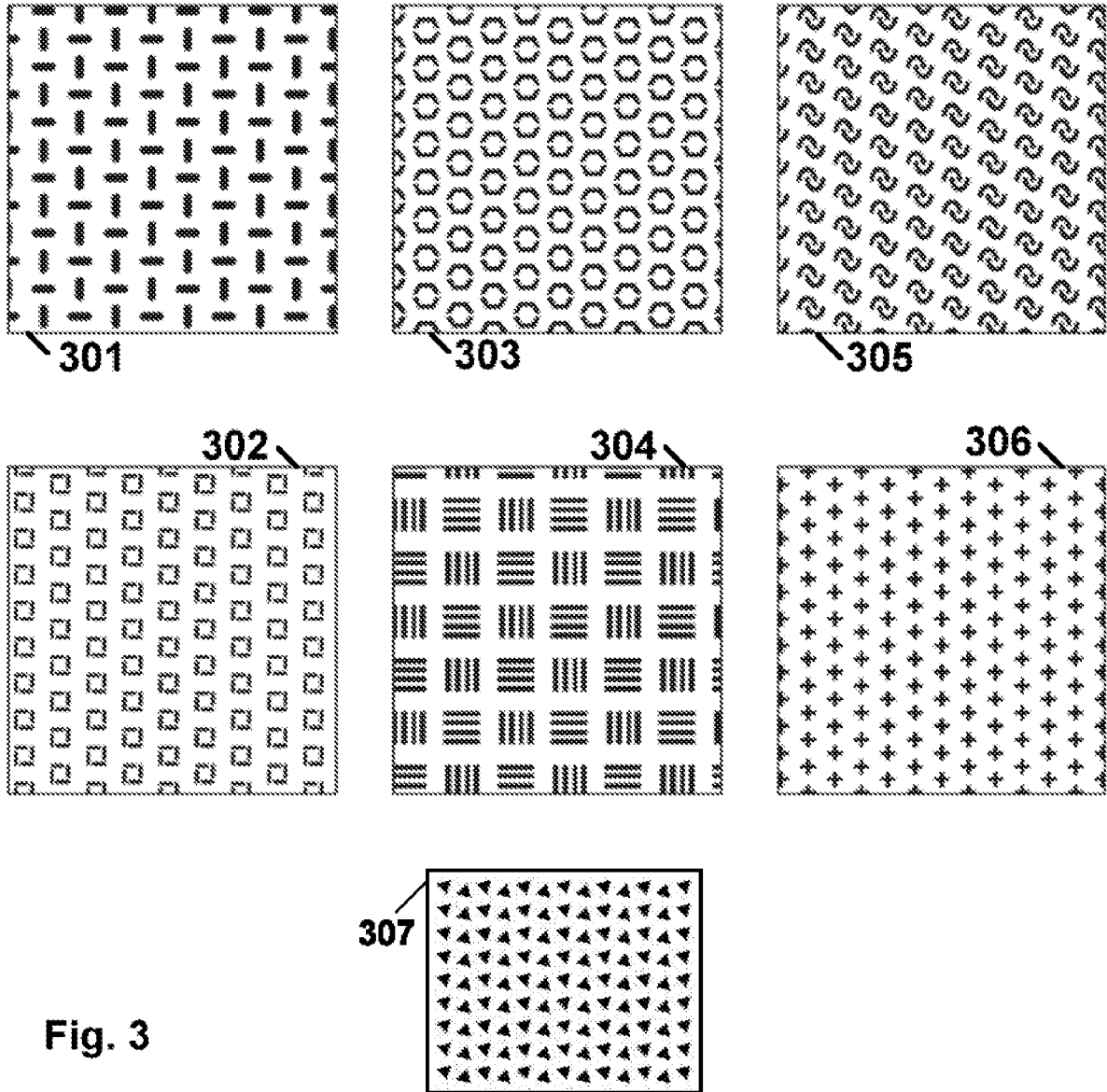


Fig. 3

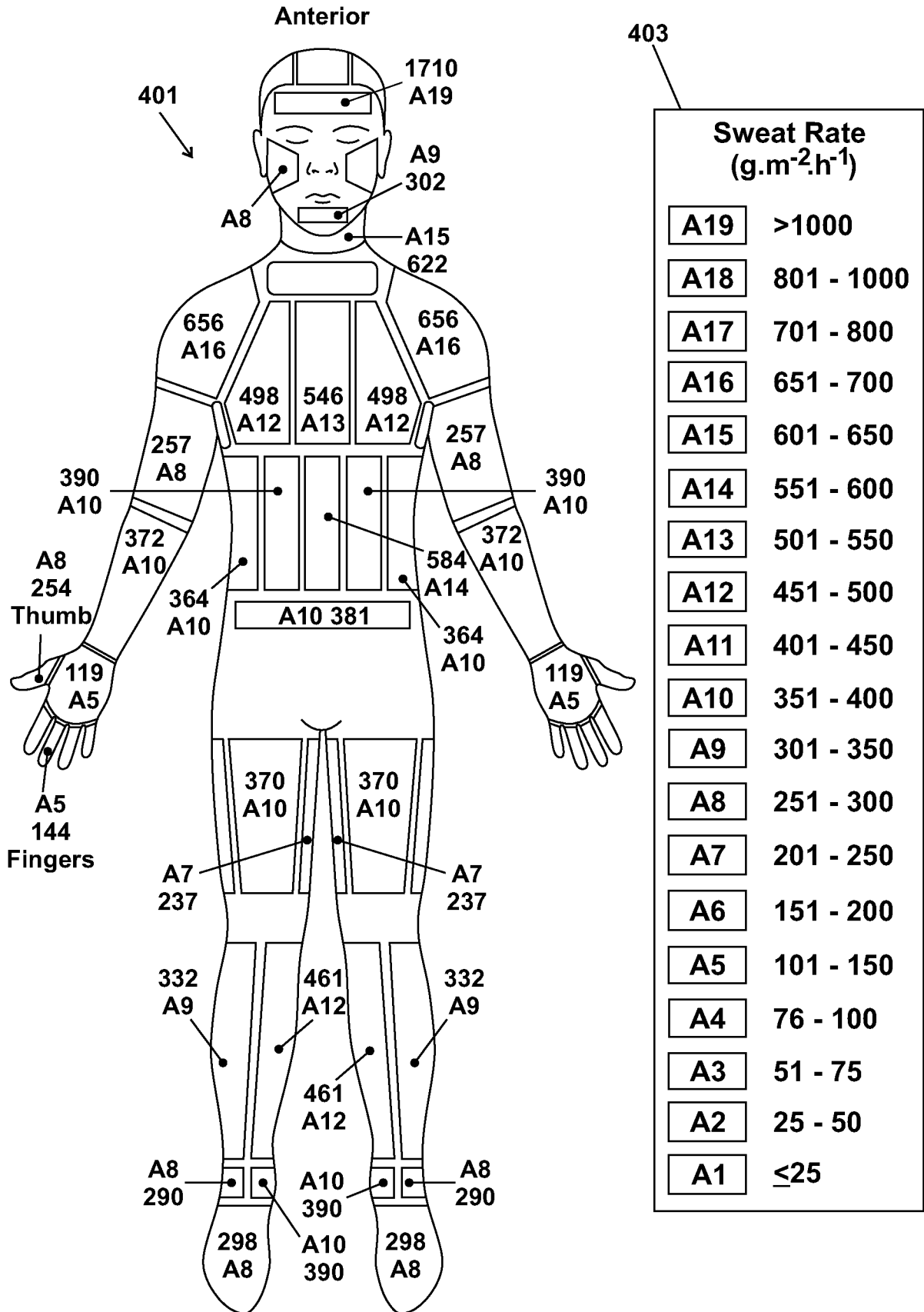
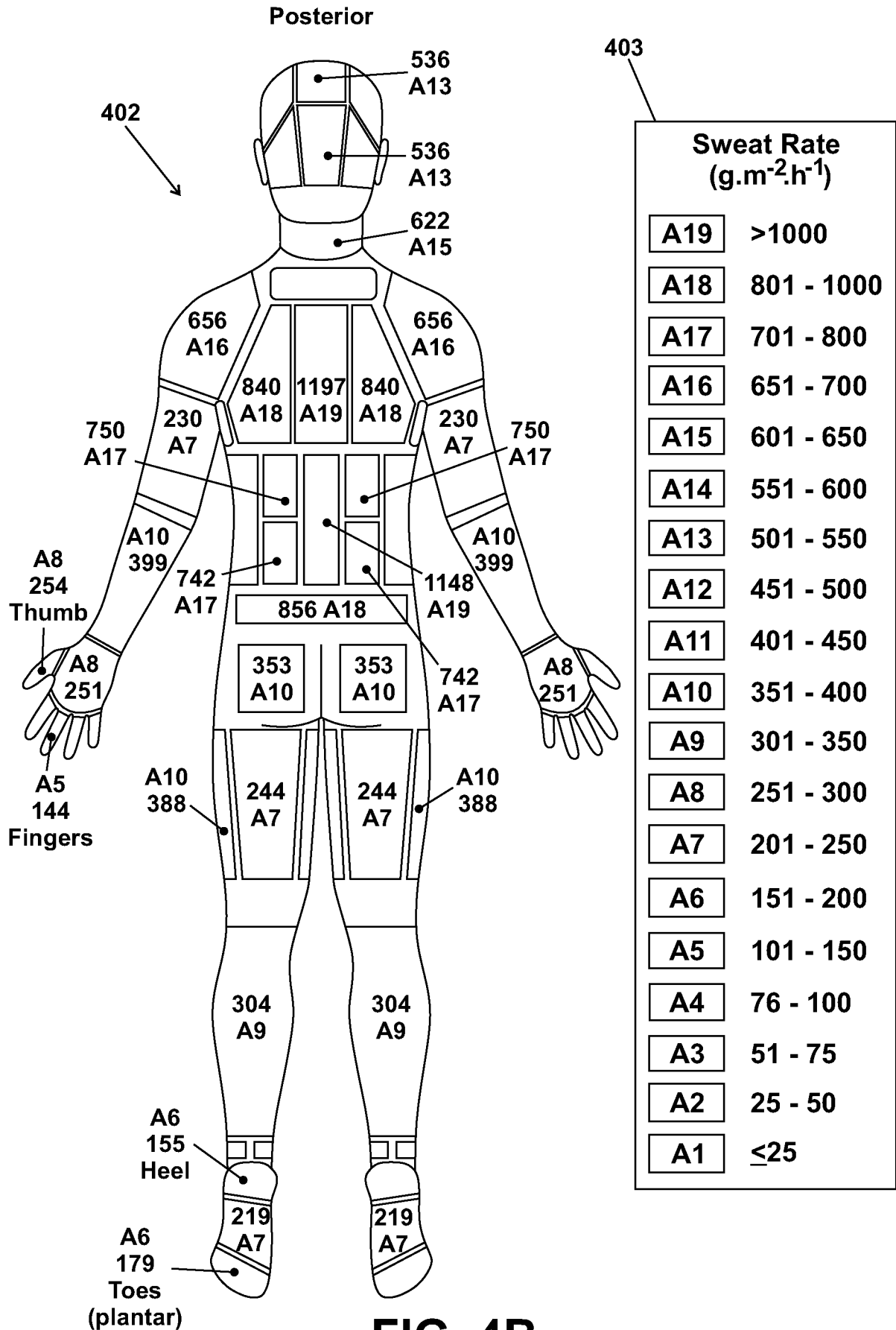


FIG. 4A



**FIG. 4B**

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/IB2016/055569

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC (2016.01) A41D 13/005, A61F 7/00, A62B 17/00, A41D 31/00, B32B 3/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
 IPC (2016.01) A41D 13/005, A61F 7/00, A41D 31/00, A62B 17/00, B32B 3/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 Databases consulted: Esp@cenet, Google Patents, Google Scholar, PatBase  
 Search terms used: delta; galil; fabric; garment; cooling; substance; element; potassium; nitrate; several; parts; body; different; patterns; percent; coolant; composition; formulation; glycerin; glycerol; A41D13/005

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CA 2743734 A1 UNIV JAMES COOK?[AU] 22 May 2009 (2009/05/22) the whole document	1-18,42-50
Y	the whole document	19-41
Y	US 2013133353 A1 COLUMBIA SPORTSWEAR NA INC?[US]; COLUMBIA SPORTSWEAR NA INC?[US] 30 May 2013 (2013/05/30) the whole document	19-41
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A	US 2005242319 A1 GOODRICH CORPORATION 03 Nov 2005 (2005/11/03) the whole document	10-18

Further documents are listed in the continuation of Box C.  See patent family annex.

\* Special categories of cited documents:  
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 "E" earlier application or patent but published on or after the international filing date  
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  
 "O" document referring to an oral disclosure, use, exhibition or other means  
 "P" document published prior to the international filing date but later than the priority date claimed  
 "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art  
 "&" document member of the same patent family

Date of the actual completion of the international search 21 Dec 2016	Date of mailing of the international search report 28 Dec 2016
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Name and mailing address of the ISA: Israel Patent Office Technology Park, Bldg.5, Malcha, Jerusalem, 9695101, Israel Facsimile No. 972-2-5651616	Authorized officer KATZ Nina  Telephone No. 972-2-5651779
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