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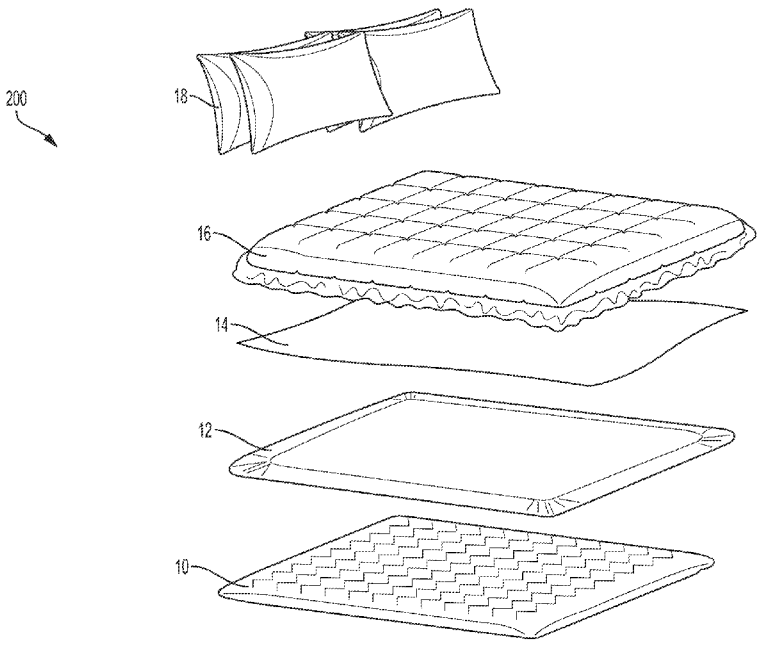


FIG. 2

(57) Abstract: The present invention relates to the field of sleep improvement technology, including, hut not limited to the use of such technology in the hospitality industry. Specifically, the invention relates to a sleep system including a set of textile products that, based on their composition, construction, and relative positioning with one other, can improve the quality and comfort of the sleep environment, including over an extended period of time. The invention further relates to a sleep system that can be incorporated with existing mattresses and/or decorative bedding. Additionally, the invention includes methods of improving the sleep environment using the inventive sleep system.

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SLEEP COMFORT SYSTEM

FIELD OF TECHNOLOGY

[0001] The present invention relates to the field of sleep improvement technology, including, but not limited to the use of such technology in the hospitality industry. Specifically, the invention relates to a sleep system including a set of textile products that, based on their composition, construction, and relative positioning with one other, can improve the quality and comfort of the sleep environment, including over an extended period of time. The invention further relates to a sleep system that can be incorporated with existing mattresses and/or decorative bedding. Additionally, the invention includes methods of improving the sleep environment using the inventive sleep system.

BACKGROUND

[0002] Scientists have observed that many critical functions take place during sleep. During deep sleep, the body repairs muscles and tissues as well as cellular damage, releases growth hormones, reduces blood pressure and thus cardiovascular work, boosts the immune system, and replenishes energy reserves. During REM sleep, the brain processes, stores, and organizes information, assisting in memory and learning. Long periods of sleep are needed to obtain sufficient deep sleep and REM sleep to maintain such functions.

[0003] Significant research has been undertaken to identify which conditions are necessary to both fall asleep and remain asleep. The conditions associated with the "sleep chamber" in particular have been studied at length. The "sleep chamber" is the space formed between the sheet that is placed on top of the mattress/mattress topper (hereinafter a "fitted sheet") and the flat sheet that covers a person when they are lying in bed. Both the layers of bedding below and above the sleep chamber affect the conditions within the chamber and impact the quality and comfort of sleep. While a person is at rest, the heat and water vapor emitted from the human body significantly increase the temperature and relative humidity of the sleep chamber over time.

[0004] Ideally, conditions in the sleep chamber would keep the temperature at or below human body temperature and maintain a relative humidity of 65% or less throughout the sleep period. Unfortunately, most bedding does not allow for air breathability and permeability and fails to

absorb water vapor adequately. Over time, this creates a sleep chamber that is hot, humid, and not conducive to restful sleep.

[0005] To solve the heat and humidity issues of the sleep chamber, many suggest using a new mattress that contains cooling materials and components and/or is made using construction methods that assist with air flow. Replacing a mattress, however, is a significant expense and creates mattress-related environmental waste, some of which may be toxic, particularly for memory foams. For hotels and other hospitality locations, mattress replacement may not be suitable for these reasons as well as other reasons. In particular, most hotels have an eight to ten year replacement cycle for mattresses -- since the quality, composition, and functionality of the mattresses can vary greatly with age, it may be difficult to determine which mattresses should be replaced. Additionally, in the hospitality industry, it is common to use mattress encasements that completely cover the mattress with near air-tight materials that encumber any air-flow and cooling technology that the mattress may have been designed to create. These encasements eliminate any moisture absorption which is a critical component of maintaining an optimal sleep environment within the sleep chamber.

[0006] There is a need for a sleep system that improves the comfort and quality of the sleep environment by maintaining optimal temperature and humidity conditions inside the sleep chamber. There further is a need for a sleep system that does not require the replacement of the mattress to reach the goal temperature and humidity conditions inside the sleep chamber. There also is a need for a sleep system that provides a consistent level of comfort and quality of the sleep environment regardless of the underlying mattress.

SUMMARY

[0007] The present invention encompasses embodiments of a sleep system that exhibit four key performance characteristics: air breathability/permeability; water vapor permeability; water vapor absorption; and thermal resistance.

[0008] According to one embodiment, the sleep system comprises a mattress topper component, a fitted sheet component, a flat sheet component, and a warmth/insulating layer component wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component when a person is lying in bed. The fitted sheet component of the sleep system includes any fabric or textile that is placed on top of the mattress topper component of the sleep

system. As non-limiting examples, the fitted sheet component thus may include (1) fabric or textiles laid on top of the mattress topper component, such as, for example a simple sheet; (2) fabric or textiles temporarily or permanently tailored to cover the mattress topper and/or an underlying mattress, such as by having, *inter alia*, elastic, stitching, velcro, straps, pins, or the like that provide such tailoring; and/or (2) fabric or textile that is folded, tucked, and/or draped around the mattress topper and/or an underlying mattress such as to cover the mattress topper and/or an underlying mattress.

[0009] In certain embodiments, the sleep system is designed such that the humidity within the sleep chamber is at or below 65% relative humidity when said sleep chamber is occupied with at least one human. In another embodiment, the sleep system is designed such that the humidity within the sleep chamber remains at or below 65% relative humidity for at least four hours in the presence of the at least one human.

[0010] In other embodiments, the sleep system is designed such that the temperature within the sleep chamber is at or below average human body temperature when said sleep chamber is occupied with at least one human. In one embodiment, the sleep system is designed such that the temperature within the sleep chamber is at or below average human body temperature for at least four hours in the presence of the at least one human.

[0011] In further embodiments, the sleep system is designed such that, when the sleep chamber is occupied by at least one human, the humidity within the sleep chamber is at or below 65% relative humidity and the temperature within the sleep chamber is at or below average human body temperature.

[0012] Another embodiment claims a sleep system comprising a mattress topper component, a fitted sheet component, a flat sheet component, and a warmth/insulating layer component wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component, the sleep chamber is occupied by at least one human, the humidity within the sleep chamber is at or below 65% relative humidity, and the temperature within the sleep chamber is at or below average human body temperature.

[0013] In one embodiment of the sleep system, a mattress topper component is placed substantially on top of a sleep support structure, e.g., a mattress or a mattress and box springs; a fitted sheet component is placed substantially on top of the mattress topper component; a flat

sheet component is placed substantially on top of the fitted sheet component; and a warmth/insulating layer component is placed substantially on top of the flat sheet component.

[0014] According to another embodiment, the sleep system comprises a mattress topper component, a fitted sheet component, a flat sheet component, a warmth/insulating layer component, and at least one pillowcase component wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component when a person is lying in bed. In certain embodiments, this sleep system, which includes the at least one pillowcase component, is designed such that the humidity within the sleep chamber is at or below 65% relative humidity when said sleep chamber is occupied with at least one human. In another embodiment, the sleep system that includes the at least one pillowcase component is designed such that the humidity within the sleep chamber remains at or below 65% relative humidity for at least four hours in the presence of the at least one human.

[0015] In other embodiments, the sleep system that includes the at least one pillowcase component is designed such that the temperature within the sleep chamber is at or below average human body temperature when said sleep chamber is occupied with at least one human. In one embodiment, the sleep system that includes the at least one pillowcase component is designed such that the temperature within the sleep chamber is at or below average human body temperature for at least four hours in the presence of the at least one human.

[0016] Another embodiment claims a sleep system comprising a mattress topper component, a fitted sheet component, a flat sheet component, a warmth/insulating layer component, and at least one pillowcase component wherein a sleep chamber is created between the fitted sheet component and the flat sheet component, the sleep chamber is occupied by at least one human, the humidity within the sleep chamber is at or below 65% relative humidity, and the temperature within the sleep chamber is at or below average human body temperature.

[0017] In one embodiment of the sleep system that includes the at least one pillowcase component , a mattress topper component is placed substantially on top of a sleep support structure, e.g., a mattress or a mattress and box springs; a fitted sheet component is placed substantially on top of the mattress topper component; a flat sheet component is placed substantially on top of the fitted sheet component; and a warmth/insulating layer component is placed substantially on top of the flat sheet component.

[0018] According to another embodiment, the sleep system comprises a mattress topper component, a fitted sheet component, a warmth/insulating layer component, and, optionally, at least one pillowcase component, i.e., the sleep system lacks the flat sheet component of the other sleep systems disclosed above. In this embodiment, the sleep chamber is formed between the fitted sheet component and the warmth/insulating layer component when a person is lying in bed. In certain embodiments, the sleep system that lacks the flat sheet component is designed such that the humidity within the sleep chamber is at or below 65% relative humidity when said sleep chamber is occupied with at least one human. In another embodiment, the sleep system that lacks the flat sheet component is designed such that the humidity within the sleep chamber remains at or below 65% relative humidity for at least four hours in the presence of the at least one human.

[0019] In other embodiments, the sleep system that lacks the flat sheet component is designed such that the temperature within the sleep chamber is at or below average human body temperature when said sleep chamber is occupied with at least one human. In one embodiment, the sleep system that lacks the flat sheet component is designed such that the temperature within the sleep chamber is at or below average human body temperature for at least four hours in the presence of the at least one human.

[0020] Another embodiment claims a sleep system comprising a mattress topper component, a fitted sheet component, a warmth/insulating layer component, and, optionally, at least one pillowcase component wherein a sleep chamber is created between the fitted sheet component and the warmth/insulating component, the sleep chamber is occupied by at least one human, the humidity within the sleep chamber is at or below 65% relative humidity, and the temperature within the sleep chamber is at or below average human body temperature.

[0021] In one embodiment of the sleep system that lacks the flat sheet component, a mattress topper component is placed substantially on top of a sleep support structure, e.g., a mattress or a mattress and box springs; a fitted sheet component is placed substantially on top of the mattress topper component; and a warmth/insulating layer component is placed substantially on top of the flat sheet component.

[0022] In other embodiments, the mattress topper component, the fitted sheet component, the flat sheet component, the at least one pillowcase components, and/or the warmth/insulating layer component of the inventive sleep systems are comprised of natural, man-made, or synthetic

materials, or blends of natural, man-made, and synthetic materials, including one or more of the following: cotton, silk, wool, rayon, wood cellulose, rayon made from the fibers of the beech tree (e.g., Modal®, Viscose®), rayon made from the fibers of eucalyptus trees (e.g., Tencel,® Lyocell®, Cupro®), linen, flax, hemp, jute, bamboo, any fibers of regenerated cellulosic origin, polyester, polyamide, nylon, polyvinyl chloride, polyethylene, polyethylene terephthalate, polyaramid, ethylene vinyl acetate, polyethylene vinyl acetate, and/or other synthetic fibers with moisture wicking and/or moisture absorption capabilities. In another embodiment, each of the fitted sheet component, the flat sheet component, the at least one pillowcase components, the mattress topper component, and/or the warmth/insulating layer component of the inventive sleep systems are comprised of 100% cotton fibers; 100% fibers of regenerated cellulosic origin; 100% synthetic fibers with moisture wicking and/or moisture absorption capabilities; a blend of cotton fibers and fibers of regenerated cellulosic origin; a blend of cotton fibers and synthetic fibers with moisture wicking and/or moisture absorption capabilities; a blend of fibers of regenerated cellulosic origin and synthetic fibers with moisture wicking and/or moisture absorption capabilities; or a blend of cotton fibers, fibers of regenerated cellulosic origin, and synthetic fibers with moisture wicking and/or moisture absorption capabilities.

[0023] In another embodiment, said fibers of regenerated cellulosic origin are selected from the group including rayon, rayon made from the fibers of the beech tree, Modal®, Viscose®, rayon made from the fibers of eucalyptus trees, Tencel,® Lyocell®, and Cupro,® and bamboo, and combinations thereof. In certain embodiments the fibers of regenerated cellulosic origin are rayon. In certain embodiments the fibers of regenerated cellulosic origin are rayon made from the fibers of the beech tree. In certain embodiments the fibers of regenerated cellulosic origin are made from Modal®. In certain embodiments the fibers of regenerated cellulosic origin are made from Viscose®. In certain embodiments the fibers of regenerated cellulosic origin are made from rayon made from the fibers of eucalyptus trees. In certain embodiments the fibers of regenerated cellulosic origin are made from Tencel®. In certain embodiments the fibers of regenerated cellulosic origin are made from Lyocell®. In certain embodiments the fibers of regenerated cellulosic origin are made from Cupro®. In certain embodiments the fibers of regenerated cellulosic origin are made from bamboo. In certain embodiments the fibers of regenerated cellulosic origin are made from any combination of rayon, rayon made from the

fibers of the beech tree, Modal®, Viscose®, rayon made from the fibers of eucalyptus trees, Tencel,® Lyocell®, and Cupro,® and/or bamboo.

[0024] The invention also includes a method of improving the quality and comfort of the sleep environment comprising adding a sleep system that includes a mattress topper component, a fitted sheet component, a flat sheet component, a warmth/insulating layer component, and, optionally, one or more pillowcase components, to an existing mattress, wherein all components of said sleep system promote water vapor absorption, heat dissipation, and/or air circulation. The invention further includes a method of improving the quality and comfort of the sleep environment comprising adding a sleep system that includes a mattress topper component, a fitted sheet component, a warmth/insulating layer component, and, optionally, one or more pillowcase components, to an existing mattress, wherein all components of said sleep system promote water vapor absorption, heat dissipation, and/or air circulation. The invention further includes a method of providing substantially the same sleep environment for two or more disparate mattresses using a sleep system as described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The features, nature, and advantages of the present disclosure will become more apparent from the detailed description set forth below when taken in conjunction with the drawings which correspond to the same.

[0026] FIG. 1 illustrates an example of the sleep system where the components of the system include the mattress topper component, the fitted sheet component, the flat sheet component, and the warmth/insulating layer component.

[0027] FIG. 2 illustrates an example of the sleep system where the components of the system include the mattress topper component, the fitted sheet component, the flat sheet component, the warmth/insulating layer component, and the pillowcase component.

[0028] FIG. 3 illustrates an example of the sleep system where the components of the system include the mattress topper component, the fitted sheet component, the warmth/insulating layer component, and, optionally, the one or more pillowcase components (indicated with dashed lines).

DETAILED DESCRIPTION OF EMBODIMENTS

[0029] Reference will now be made in detail to the embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings. The reference numerals used in the detailed description of the embodiment below correspond to the reference numerals used in the accompanying drawings.

[0030] The present invention encompasses embodiments of a sleep system that exhibits four key performance characteristics: air breathability/permeability; water vapor permeability; water vapor absorption; and thermal resistance. The sleep system **100** of the invention, as shown in **Fig. 1**, illustrates an exemplary, non-limiting embodiment and includes a mattress topper component **10**, a fitted sheet component **12**, a flat sheet component **14**, and a warmth/insulating layer component **16**. Alternatively, the sleep system **200** of the invention comprises a mattress topper component **10**, a fitted sheet component **12**, a flat sheet component **14**, a warmth/insulating layer component **16**, and one or more pillowcase components **18**, as shown in **Fig. 2**. The sleep system **300** of the invention, as shown in **Fig. 3**, includes a mattress topper component **10**, a fitted sheet component **12**, a warmth/insulating layer component **16**, and, optionally, one or more pillowcase components **18**.

[0031] It should be noted that while the sleep systems **100**, **200**, and **300** set forth in **Figs. 1-3** respectively depict a fitted sheet component **12** that is tailored to cover the mattress topper component and any underlying mattress by elastic, the fitted sheet component of the sleep system includes any fabric or textile that is placed on top of the mattress topper component of the sleep system. As non-limiting examples, the fitted sheet component includes (1) fabric or textiles laid on top of the mattress topper component, such as, for example a simple sheet; (2) fabric or textiles temporarily or permanently tailored to cover the mattress topper and/or an underlying mattress, such as by having, *inter alia*, elastic, stitching, velcro, straps, pins, or the like that provide such tailoring; and/or (2) fabric or textile that is folded, tucked, and/or draped around the mattress topper and/or an underlying mattress such as to cover the mattress topper and/or an underlying mattress.

[0032] Each component of the sleep systems **100**, **200**, and **300** set forth in **Figs. 1-3** respectively is made with certain fibers and with particular construction techniques that allow the system as a whole to maintain temperature within the sleep chamber at or below human body

temperature and/or maintain humidity within the sleep chamber at less than or equal to 65% relative humidity.

[0033] Preferably, the mattress topper component **10** of the sleep system **100** or **200** or 300 promotes air flow and water vapor absorption. Embodiments of the mattress topper component **10** that may be used in the present invention are disclosed in U.S. Patent Application No. 2017/0354269 A1, "Lie-Flat Mattress Pad," filed November 18, 2016 and published on December 14, 2017. Preferably the mattress topper component **10** of the present invention is made of multiple layers of fabric.

[0034] Preferably, there are at least three layers to the mattress topper component **10** of the sleep system, including a top layer, a middle layer(s) or fill material, and a bottom layer.

[0035] The top and bottom layer of the mattress topper component **10** of the sleep system preferably promote air flow and water vapor absorption; ideally, these components do not restrict air flow, heat transfer, or water vapor absorption and transfer.

[0036] The top and bottom layer of the mattress topper component **10** of the sleep system preferably comprise air-permeable fabrics. In other preferred embodiments, the top and bottom layer fabric may comprise one or more layers of natural, man-made, or synthetic materials, or blends of natural, man-made, and synthetic materials, including one or more of the following: cotton, silk, wool, rayon, wood cellulose, rayon made from the fibers of the beech tree (e.g., Modal®, Viscose®), rayon made from the fibers of eucalyptus trees (e.g., Tencel,® Lyocell®, Cupro®), linen, flax, hemp, jute, bamboo, any fibers of regenerated cellulosic origin, polyester, polyamide, nylon, polyvinyl chloride, polyethylene, polyethylene terephthalate, polyaramid, ethylene vinyl acetate, polyethylene vinyl acetate, and/or other synthetic fibers with moisture wicking and/or moisture absorption capabilities. Preferably, the top and bottom layer of the mattress topper **10** may comprise 100% cotton fibers; 100% fibers of regenerated cellulosic origin; 100% synthetic fibers with moisture wicking and/or moisture absorption capabilities; a blend of cotton fibers and fibers of regenerated cellulosic origin; a blend of cotton fibers and synthetic fibers with moisture wicking and/or moisture absorption capabilities; a blend of fibers of regenerated cellulosic origin and synthetic fibers with moisture wicking and/or moisture absorption capabilities; or a blend of cotton fibers, fibers of regenerated cellulosic origin, and synthetic fibers with moisture wicking and/or moisture absorption capabilities.

[0037] In another embodiment, said fibers of regenerated cellulosic origin are selected from the group including rayon, rayon made from the fibers of the beech tree, Modal®, Viscose®, rayon made from the fibers of eucalyptus trees, Tencel,® Lyocell®, and Cupro,® and bamboo, and combinations thereof. In certain embodiments the fibers of regenerated cellulosic origin are rayon. In certain embodiments the fibers of regenerated cellulosic origin are rayon made from the fibers of the beech tree. In certain embodiments the fibers of regenerated cellulosic origin are made from Modal®. In certain embodiments the fibers of regenerated cellulosic origin are made from Viscose®. In certain embodiments the fibers of regenerated cellulosic origin are made from rayon made from the fibers of eucalyptus trees. In certain embodiments the fibers of regenerated cellulosic origin are made from Tencel®. In certain embodiments the fibers of regenerated cellulosic origin are made from Lyocell®. In certain embodiments the fibers of regenerated cellulosic origin are made from Cupro®. In certain embodiments the fibers of regenerated cellulosic origin are made from bamboo. In certain embodiments the fibers of regenerated cellulosic origin are made from any combination of rayon, rayon made from the fibers of the beech tree, Modal®, Viscose®, rayon made from the fibers of eucalyptus trees, Tencel,® Lyocell®, and Cupro,® and/or bamboo.

[0038] In one preferred embodiment, the top and bottom layers of the mattress topper component **10** of the sleep system **100** or **200** or **300** may comprise the same fabric. In another preferred embodiment, the top and bottom layers of the mattress topper component **10** may comprise different fabrics.

[0039] As one preferred embodiment, the top and/or bottom layers of the mattress topper component **10** may comprise a micro-denier fabric, such as a woven micro-fiber polyester. As another preferred embodiment, the top and/or bottom layers of the mattress topper component **10** of the sleep system may comprise a spacer mesh/knit fabric, characterized by a mesh face with a smooth back and lofty thickness. As a preferred embodiment, the bottom layer of the mattress topper component **10** of the sleep system may comprise a micro-denier fabric and the top layer of the mattress topper component **10** may comprise a spacer mesh/knit fabric.

[0040] The middle layer(s) or fill material of the mattress topper component **10** of the sleep system preferably facilitate the movement of air and/or increases water vapor absorption. Preferably, the middle layer of the mattress topper component **10** may contain multiple component layers and comprise at least one component layer, at least two component layers, at

least three component layers, at least four component layers, at least five component layers, at least six component layers, at least seven component layers, at least eight component layers, at least nine component layers, or at least ten component layers. Preferably, the middle layer of the mattress topper component **10** comprises natural, man-made, and/or synthetic fibers capable of wicking moisture or absorbing moisture. Preferably, the middle layer of the mattress topper **10** comprises cotton, polyester, silk, wool, downs, or blends thereof. In one embodiment, the middle layer comprises of a blend of wicking polyester and down to increase the water vapor absorption. In another embodiment, the middle layer comprises down fill.

[0041] It is also preferred that the middle layer or fill material of the mattress topper component **10** add cushioning and support. The cushioning and support of the middle layer preferably lessens any discomfort arising from the underlying mattress. Preferably the cushioning and support of the middle layer helps compensate for any differences in cushioning and support between two or more disparate mattresses.

[0042] The top layer, middle layer, and bottom layer of the mattress topper component **10** are preferably secured together. In one preferred embodiment, the layers are quilted together, using straight lines or free motion, to create pockets for loft and air flow. Quilting stitches that may be used include parallel lines, horizontal lines, diagonal lines, curvilinear lines, crosshatch patterns, chevron design, onion design, geometric shapes, diamonds, triangles, squares, trapezoids, parallelograms, rectangles, hexagons, circles, ovals, spirals, zig-zags, repeating or non-repeating patterns thereof, or combination thereof. Preferably the layers of the mattress topper component **10** are secured with a chevron or diamond quilt stitch design.

[0043] In preferred embodiments, the mattress topper component **10** of the inventive sleep system **100** or **200** or **300** is of sufficient thickness to contain heat dissipating from the sleep chamber and water vapor absorption so that the underlying mattress does not need to perform such tasks. Preferably, the mattress topper component **10** may be at least one inch in thickness, at least two inches in thickness, at least three inches in thickness, at least four inches in thickness, or at least five inches in thickness.

[0044] Preferably, the fitted sheet component **12**, the flat sheet component **14**, and the one or more pillowcase components **18** of the inventive sleep system **100** or **200** or **300** promote air flow and water vapor absorption; ideally, these components do not restrict air flow, heat transfer, or water vapor absorption and transfer.

[0045] In one preferred embodiment, the fitted sheet component **12** and flat sheet component **14** of the sleep system **100** of **Fig. 1** are comprised of the same fabric. In another preferred embodiment, the fitted sheet component **12**, the flat sheet component **14**, and the one or more pillowcase components **18** of the sleep system **200** of **Fig. 2** are comprised of the same fabric. In another preferred embodiment, the fitted sheet component **12** and the one or more optional pillowcase components **18** of the sleep system **300** of **Fig. 3** are comprised of the same fabric.

[0046]

[0047] Alternatively, one preferred embodiment has the fitted sheet component **12** and flat sheet component **14** of the sleep system **100** of **Fig. 1** comprised of different fabrics.

[0048] As another preferred embodiment, the fitted sheet component **12**, flat sheet component **14**, and/or, optionally, the one or more pillowcase component **18** of the sleep system **200** of **Fig. 2** may be comprised of one, two, three, or more different fabrics. For example, the fitted sheet component **12** and the one or more pillowcase components **18** may be of the same fabric while the flat sheet component **14** is of a different fabric; the flat sheet component **14** and the one or more pillowcase components **18** may be of the same fabric while the fitted sheet component **12** is of a different fabric; the fitted sheet component **12** and flat sheet component **14** may be of the same fabric while the one or more pillowcase components **18** are of a different fabric; or the fitted sheet component **12**, flat sheet component **14**, and one or more pillowcase components **18** may all be comprised of different fabrics.

[0049] In a different preferred embodiment, the fitted sheet component **12** and the one or more optional pillowcase components **18** of the sleep system **300** of **Fig. 3** are comprised of different fabrics.

[0050] Each fabric used with the fitted sheet component **12**, flat sheet component **14**, and/or the one or more pillowcase components **18** of the sleep system **100** or **200** or **300** may have its own air flow and water vapor absorption characteristics.

[0051] Preferably, the fitted sheet component **12**, the flat sheet component **14**, and/or the one or more pillowcase components **18** of the inventive sleep system **100** or **200** or **300** preferably comprise air-permeable fabrics. In other preferred embodiments, the fabric of the fitted sheet component **12**, the flat sheet component **14**, and/or the one or more pillowcase components **18** of the sleep system may comprise one or more layers of natural or manmade materials, or blends of natural and manmade materials, including one or more of the following: cotton, silk, wool,

rayon, wood cellulose, rayon made from the fibers of the beech tree (e.g., Modal®, Viscose®), rayon made from the fibers of eucalyptus trees (e.g., Tencel,® Lyocell®, Cupro®), linen, flax, hemp, jute, bamboo, any fibers of regenerated cellulosic origin, polyester, polyamide, nylon, polyvinyl chloride, polyethylene, polyethylene terephthalate, polyaramid, ethylene vinyl acetate, polyethylene vinyl acetate, and/or other synthetic fibers with moisture wicking and/or moisture absorption capabilities. Preferably, the fitted sheet component **12**, the flat sheet component **14**, and/or the one or more pillowcase components **18** may comprise 100% cotton fibers; 100% fibers of regenerated cellulosic origin; 100% synthetic fibers with moisture wicking and/or moisture absorption capabilities; a blend of cotton fibers and fibers of regenerated cellulosic origin; a blend of cotton fibers and synthetic fibers with moisture wicking and/or moisture absorption capabilities; a blend of fibers of regenerated cellulosic origin and synthetic fibers with moisture wicking and/or moisture absorption capabilities; or a blend of cotton fibers, fibers of regenerated cellulosic origin, and synthetic fibers with moisture wicking and/or moisture absorption capabilities.

[0052] In another embodiment, said fibers of regenerated cellulosic origin are selected from the group including rayon, rayon made from the fibers of the beech tree, Modal®, Viscose®, rayon made from the fibers of eucalyptus trees, Tencel,® Lyocell®, and Cupro,® and bamboo, and combinations thereof. In certain embodiments the fibers of regenerated cellulosic origin are rayon. In certain embodiments the fibers of regenerated cellulosic origin are rayon made from the fibers of the beech tree. In certain embodiments the fibers of regenerated cellulosic origin are made from Modal®. In certain embodiments the fibers of regenerated cellulosic origin are made from Viscose®. In certain embodiments the fibers of regenerated cellulosic origin are made from rayon made from the fibers of eucalyptus trees. In certain embodiments the fibers of regenerated cellulosic origin are made from Tencel®. In certain embodiments the fibers of regenerated cellulosic origin are made from Lyocell®. In certain embodiments the fibers of regenerated cellulosic origin are made from Cupro®. In certain embodiments the fibers of regenerated cellulosic origin are made from bamboo. In certain embodiments the fibers of regenerated cellulosic origin are made from any combination of rayon, rayon made from the fibers of the beech tree, Modal®, Viscose®, rayon made from the fibers of eucalyptus trees, Tencel,® Lyocell®, and Cupro,® and/or bamboo.

[0053] In a preferred embodiment, the fitted sheet component **12**, the flat sheet component **14**, and/or the one or more pillowcase components **18** of the sleep system **100** or **200** or **300** are comprised of materials that create a natural cooling sensation and/or have a smooth and cool-to-the-touch hand/feel.

[0054] In one preferred embodiment, the fitted sheet component **12**, the flat sheet component **14**, and/or the one or more pillowcase components **18** of the sleep system **100** or **200** or **300** comprise a blend of cotton fibers and fibers of regenerated cellulosic origin. In another preferred embodiment, the fibers of regenerated cellulosic origin are selected from the group comprising rayon, rayon made from the fibers of the beech tree, Modal®, Viscose®, rayon made from the fibers of eucalyptus trees, Tencel,® Lyocell®, and Cupro,® and bamboo.

[0055] In another preferred embodiment, the fitted sheet component **12**, the flat sheet component **14**, and/or the one or more pillowcase components **18** comprise a blend of cotton and rayon made from the fibers of the beech tree (e.g., Modal®, Viscose®) or rayon made from the fibers of the eucalyptus tree (e.g., Tencel,® Lyocell®, Cupro®).

[0056] The preferred blends of cotton fibers and fibers of regenerated cellulosic origin for use with the fitted sheet component **12**, flat sheet component **14**, and/or the one or more pillowcase components **18** of the sleep system **100** or **200** or **300** may comprise: 60% cotton fibers and 40% fibers of regenerated cellulosic origin, including but not limited to rayon made from the fibers of the beech tree (e.g., Modal®, Viscose®) or rayon made from the fibers of the eucalyptus tree (e.g., Tencel,® Lyocell®, Cupro®); 70% cotton fibers and 30% fibers of regenerated cellulosic origin, including but not limited to rayon made from the fibers of the beech tree (e.g., Modal®, Viscose®) or rayon made from the fibers of the eucalyptus tree (e.g., Tencel,® Lyocell®, Cupro®); and/or 80% cotton fibers and 20% fibers of regenerated cellulosic origin, including but not limited to rayon made from the fibers of the beech tree (e.g., Modal®, Viscose®) or rayon made from the fibers of the eucalyptus tree (e.g., Tencel,® Lyocell®, Cupro®).

[0057] In other preferred embodiments, the fitted sheet component **12**, flat sheet component **12**, and/or, optionally, the one or more pillowcase components **18** of the sleep system **100** or **200** or **300** may comprise: 50% cotton fibers and 50% fibers of regenerated cellulosic origin, including but not limited to rayon made from the fibers of the beech tree (e.g., Modal®, Viscose®) or rayon made from the fibers of the eucalyptus tree (e.g., Tencel,® Lyocell®, Cupro®); 40% cotton fibers and 60% fibers of regenerated cellulosic origin, including but not limited to rayon

made from the fibers of the beech tree (e.g., Modal®, Viscose®) or rayon made from the fibers of the eucalyptus tree (e.g., Tencel,® Lyocell®, Cupro®); 30% cotton fibers and 70% fibers of regenerated cellulosic origin, including but not limited to rayon made from the fibers of the beech tree (e.g., Modal®, Viscose®) or rayon made from the fibers of the eucalyptus tree (e.g., Tencel,® Lyocell®, Cupro®), 20% cotton fibers and 80% fibers of regenerated cellulosic origin, including but not limited to rayon made from the fibers of the beech tree (e.g., Modal®, Viscose®) or rayon made from the fibers of the eucalyptus tree (e.g., Tencel,® Lyocell®, Cupro®).

[0058] Preferably, the fitted sheet component **12**, flat sheet component **14**, and, optionally, the one or more pillowcase components **18** of the sleep system **100** or **200** or **300** are constructed to promote air permeability, such as by a basketweave, plain weave, percale weave, twill weave, or sateen weave. Most preferably, the fitted sheet component **12**, flat sheet component **14**, and, optionally, the one or more pillowcase components **18** of the sleep system are constructed with a basketweave in a 2x2 construction. Preferably, the thread count of the fitted sheet component **12**, flat sheet component **14**, and, optionally, the one or more pillowcase components **18** is between 120 threads per square inch to 400 threads per square inch; the thread count may be 120 threads per square inch, 180 threads per square inch, 200 threads per square inch, 225 threads per square inch, 250 threads per square inch, 300 threads per square inch, 350 threads per square inch, and/or 400 threads per square inch.

[0059] Preferably, the warmth/insulating layer component **16** of the sleep system **100** or **200** or **300** is constructed so as to assist in water vapor absorption while still providing insulation properties.

[0060] In one preferred embodiment, the warmth/insulating layer component **16** of the sleep system **100** or **200** or **300** comprises an air permeable shell surrounding an inner absorptive fill. As preferred embodiments, the fabric air permeable shell of the warmth/insulating component **16** may be comprise one or more layers of natural, man-made, or synthetic materials, or blends of natural, man-made, and synthetic materials, including one or more of the following: cotton, silk, wool, rayon, wood cellulose, rayon made from the fibers of the beech tree (e.g., Modal®, Viscose®), rayon made from the fibers of eucalyptus trees (e.g., Tencel,® Lyocell®, Cupro®), linen, flax, hemp, jute, bamboo, any fibers of regenerated cellulosic origin, polyester, polyamide, nylon, polyvinyl chloride, polyethylene, polyethylene terephthalate, polyaramid, ethylene vinyl

acetate,=polyethylene vinyl acetate, and/or other synthetic fibers with moisture wicking and/or moisture absorption capabilities. Preferably, the shell of the warmth/insulating component **16** may comprise 100% cotton fibers; 100% fibers of regenerated cellulosic origin; 100% synthetic fibers with moisture wicking and/or moisture absorption capabilities; a blend of cotton fibers and fibers of regenerated cellulosic origin; a blend of cotton fibers and synthetic fibers with moisture wicking and/or moisture absorption capabilities; a blend of fibers of regenerated cellulosic origin and synthetic fibers with moisture wicking and/or moisture absorption capabilities; or a blend of cotton fibers, fibers of regenerated cellulosic origin, and synthetic fibers with moisture wicking and/or moisture absorption capabilities.

[0061] In another embodiment, said fibers of regenerated cellulosic origin are selected from the group including rayon, rayon made from the fibers of the beech tree, Modal®, Viscose®, rayon made from the fibers of eucalyptus trees, Tencel,® Lyocell®, and Cupro,® and bamboo, and combinations thereof. In certain embodiments the fibers of regenerated cellulosic origin are rayon. In certain embodiments the fibers of regenerated cellulosic origin are rayon made from the fibers of the beech tree. In certain embodiments the fibers of regenerated cellulosic origin are made from Modal®. In certain embodiments the fibers of regenerated cellulosic origin are made from Viscose®. In certain embodiments the fibers of regenerated cellulosic origin are made from rayon made from the fibers of eucalyptus trees. In certain embodiments the fibers of regenerated cellulosic origin are made from Tencel®. In certain embodiments the fibers of regenerated cellulosic origin are made from Lyocell®. In certain embodiments the fibers of regenerated cellulosic origin are made from Cupro®. In certain embodiments the fibers of regenerated cellulosic origin are made from bamboo. In certain embodiments the fibers of regenerated cellulosic origin are made from any combination of rayon, rayon made from the fibers of the beech tree, Modal®, Viscose®, rayon made from the fibers of eucalyptus trees, Tencel,® Lyocell®, and Cupro,® and/or bamboo.

[0062] Preferred is the use of high air flow/breathability micro-denier shell for the warmth/insulating layer component **16**, such as a microfiber polyester percale with a plain weave.

[0063] In preferred embodiments, the shell of the warmth/insulating layer component **16** of the sleep system **100** or **200** or **300** is constructed to promote air permeability, such as by a basketweave, plain weave, percale weave, twill weave, or sateen weave. Preferably, the thread

count of the shell of the warmth/insulating layer component **16** is between 120 threads per square inch to 400 threads per square inch; the thread count may be 120 threads per square inch, 180 threads per square inch, 200 threads per square inch, 225 threads per square inch, 250 threads per square inch, 300 threads per square inch, 350 threads per square inch, and/or 400 threads per square inch.

[0064] In another preferred embodiment, the shell of the warmth/insulating layer component **16** of the sleep system **100** or **200** or **300** contains an inner absorptive fill layer. Preferably, the inner absorptive fill layer contains natural, man-made, or synthetic fill material, including one or more of the following: down, cotton, wool, polyester, polyester blends. In one preferred embodiment, the inner absorptive fill layer of the warmth/insulating layer component **16** of the sleep system contains a natural fill material, most preferably down fill. In another preferred embodiment, the inner absorptive fill layer is capable of absorbing significant amounts of water vapor. The loft or density associated with the inner absorptive fill layer preferably is between 60 grams per square meter (GSM) and 800 GSM; the inner absorptive fill layer may have a density of, *inter alia*, 60 GSM, 65 GSM, 70 GSM, 75 GSM, 80 GSM, 85 GSM, 90 GSM, 95 GSM, 100 GSM, 150 GSM, 200 GSM, 250 GSM, 300 GSM, 350 GSM, 400 GSM, 450 GSM, 500 GSM GSM, 550 GSM, 600 GSM, 650 GSM, 700 GSM, 750 GSM, or 800 GSM.

[0065] In one preferred embodiment, the air permeable shell of the warmth/insulating layer component **16** and the inner absorptive fill layer of the warmth/insulating layer component **16** are secured together to create pockets for loft and air flow. Preferably, the shell and inner absorptive fill layer of the warmth/insulating layer component **16** are quilted together, using straight lines or free motion. Quilting stitches that may be used include parallel lines, horizontal lines, diagonal lines, curvilinear lines, crosshatch patterns, chevron design, onion design, geometric shapes, diamonds, triangles, squares, trapezoids, parallelograms, rectangles, hexagons, circles, ovals, spirals, zig-zags, repeating or non-repeating patterns thereof, or combination thereof.

[0066] As an alternative preferred embodiment, the warmth/insulating layer component **16** of the sleep system **100** or **200** or **300** may have a separate top and bottom layer, where such layers are made different fabrics.

[0067] In the inventive sleep system **100** or **200** described above, the sleep chamber exists between the fitted sheet component **12** and flat sheet **14** component. Water vapor and heat move from the sleep chamber through the fitted sheet component **12** and then into the mattress topper

component **10**. The mattress topper component **10** preferably contains a breathable top layer that allows water vapor and heat to be absorbed into the middle layer. The mattress topper component **10** further preferably has a breathable bottom layer that allows water vapor and heat to further dissipate, only if necessary, to the existing mattress. Preferably, the breathability and absorptive abilities of the existing mattress are irrelevant to the conditions in the sleep chamber.

[0068] In the inventive sleep system **100** or **200** described, water vapor and heat also move through the flat sheet component **14**. The flat sheet component **14** is in contact with the warmth/insulating layer component **16** of the sleep system **100** or **200**. The shell of the warmth/insulating layer component **16**, or alternatively, the separate bottom layer of the warmth/insulating layer component **16**, preferably is a breathable fabric that increases air permeability and permits water vapor absorption into the inner absorptive fill layer. The inner absorptive fill layer preferably absorbs moisture vapor; such moisture can also, if necessary, further dissipate through the top portion of the shell.

[0069] In the inventive sleep system **300** described above, the sleep chamber exists between the fitted sheet component **12** and the warmth/insulating layer **16.** Water vapor and heat move from the sleep chamber through the fitted sheet component **12** and then into the mattress topper component **10**. The mattress topper component **10** preferably contains a breathable top layer that allows water vapor and heat to be absorbed into the middle layer. The mattress topper component **10** further preferably has a breathable bottom layer that allows water vapor and heat to further dissipate, only if necessary, to the existing mattress. Preferably, the breathability and absorptive abilities of the existing mattress are irrelevant to the conditions in the sleep chamber.

[0070] In the inventive sleep system **300** described, water vapor and heat come into contact with the warmth/insulating layer component **16**. The shell of the warmth/insulating layer component **16**, or alternatively, the separate bottom layer of the warmth/insulating layer component **16**, preferably is a breathable fabric that increases air permeability and permits water vapor absorption into the inner absorptive fill layer. The inner absorptive fill layer preferably absorbs moisture vapor; such moisture can also, if necessary, further dissipate through the top portion of the shell.

[0071] Although the present disclosure and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from the spirit and scope of the disclosure as defined by the appended claims.

Moreover, the scope of the present application is not intended to be limited to the particular configurations of the process, machine, manufacture, composition of matter, means, methods and steps described in the specification. As one of ordinary skill in the art will readily appreciate from the present disclosure, processes, machines, manufacture, compositions of matter, means, methods, or steps, presently existing or later to be developed that perform substantially the same function or achieve substantially the same result as the corresponding configurations described herein may be utilized according to the present disclosure. Accordingly, the appended claims are intended to include within their scope such processes, machines, manufacture, compositions of matter, means, methods, or steps.

CLAIMS

What is claimed is:

1) A sleep system consisting essentially of a mattress topper component, a fitted sheet component, a flat sheet component, and a warmth/insulating layer component,

wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component,

wherein the sleep chamber is occupied by at least one human, and

wherein the humidity within the sleep chamber is at or below 65% relative humidity.

2) The sleep system of claim 1, wherein the humidity within the sleep chamber is maintained at or below 65% relative humidity for at least four hours.

3) A sleep system consisting essentially of a mattress topper component, a fitted sheet component, a flat sheet component, and a warmth/insulating layer component,

wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component,

wherein the sleep chamber is occupied by at least one human, and

wherein the temperature within the sleep chamber is at or below average human body temperature.

4) The sleep system of claim 3, wherein the temperature within the sleep chamber is maintained at or below average human body temperature for at least four hours.

5) The sleep system of claim 1, wherein the temperature of the sleep chamber is at or below average human body temperature.

6) A sleep system comprising a mattress topper component, a fitted sheet component, a flat sheet component, and a warmth/insulating layer component,

wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component;

wherein the sleep chamber is occupied by at least one human;

wherein the humidity within the sleep chamber is at or below 65% relative humidity; and

wherein the temperature within the sleep chamber is at or below average human body temperature.

7) A sleep system consisting essentially of a mattress topper component, a fitted sheet component, a flat sheet component, a warmth/insulating layer component, and one or more pillowcase components,

wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component;

wherein the sleep chamber is occupied by at least one human; and

wherein the humidity within the sleep chamber is at or below 65% relative humidity.

8) The sleep system of claim 7, wherein the humidity within the sleep chamber is maintained at or below 65% relative humidity for at least four hours.

9) A sleep system consisting essentially of a mattress topper component, a fitted sheet component, a flat sheet component, a warmth/insulating layer component, and one or more pillowcase components,

wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component;

wherein the sleep chamber is occupied by at least one human; and

wherein the temperature within the sleep chamber is at or below average human body temperature.

10) The sleep system of claim 9, wherein the temperature within the sleep chamber is maintained at or below average human body temperature for at least four hours.

11) The sleep system of claim 7, wherein the temperature of the sleep chamber is at or below average human body temperature.

12) A sleep system comprising a mattress topper component, a fitted sheet component, a flat sheet component, a warmth/insulating layer component, and one or more pillowcase components,

wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component;

wherein the sleep chamber is occupied by at least one human;

wherein the humidity within the sleep chamber is at or below 65% relative humidity; and

wherein the temperature within the sleep chamber is at or below average human body temperature.

13) A sleep system consisting essentially of a mattress topper component, a fitted sheet component, a warmth/insulating layer component, and, optionally, one or more pillowcase components,

wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component;

wherein the sleep chamber is occupied by at least one human; and

wherein the humidity within the sleep chamber is at or below 65% relative humidity.

14) The sleep system of claim 13, wherein the humidity within the sleep chamber is maintained at or below 65% relative humidity for at least four hours.

15) A sleep system consisting essentially of a mattress topper component, a fitted sheet component, a warmth/insulating layer component, and, optionally, one or more pillowcase components,

wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component;

wherein the sleep chamber is occupied by at least one human; and

wherein the temperature within the sleep chamber is at or below average human body temperature.

16) The sleep system of claim 15, wherein the temperature within the sleep chamber is maintained at or below average human body temperature for at least four hours.

17) The sleep system of claim 13, wherein the temperature of the sleep chamber is at or below average human body temperature.

18) A sleep system comprising a mattress topper component, a fitted sheet component, a warmth/insulating layer component, and, optionally, one or more pillowcase components,

wherein a sleep chamber is formed between the fitted sheet component and the flat sheet component;

wherein the sleep chamber is occupied by at least one human;

wherein the humidity within the sleep chamber is at or below 65% relative humidity; and

wherein the temperature within the sleep chamber is at or below average human body temperature.

19) A sleep system of claim 9 wherein the fitted sheet component, the flat sheet component, and/or optionally the one or more pillowcase component of the sleep system comprise a blend of cotton fibers, fibers of regenerated cellulosic origin, or fibers of synthetics that perform similar to cellulosic fibers.

20) A sleep system of claim 19 wherein the fibers of regenerated cellulosic origin are selected from the group consisting of rayon, rayon made from the fibers of the beech tree, Modal®, Viscose®, rayon made from the fibers of eucalyptus trees, Tencel,® Lyocell®, and Cupro,® and bamboo.

21) A sleep system of claim 18 wherein the fitted sheet component and/or the one or more pillowcase component of the sleep system comprise a blend of cotton fibers, fibers of regenerated cellulosic origin, or fibers of synthetics that perform similar to cellulosic fibers.

22) A sleep system of claim 21 wherein the fibers of regenerated cellulosic origin are selected from the group consisting of rayon, rayon made from the fibers of the beech tree, Modal®, Viscose®, rayon made from the fibers of eucalyptus trees, Tencel,® Lyocell®, and Cupro,® and bamboo.

23) A method of improving the sleep environment comprising adding a sleep system consisting of a mattress topper component, a fitted sheet component, a flat sheet component, a warmth/insulating layer component, and, optionally, one or more pillowcase components, to an existing mattress, wherein all components of said sleep system promote water vapor absorption, heat dissipation, and/or air circulation.

24) A method of improving the sleep environment comprising adding a sleep system consisting of a mattress topper component, a fitted sheet component, a warmth/insulating layer component, and, optionally, one or more pillowcase components, to an existing mattress, wherein all components of said sleep system promote water vapor absorption, heat dissipation, and/or air circulation.

25) A method of providing substantially the same the sleep environment to two or more disparate mattresses comprising adding a sleep system to said mattresses, wherein said sleep system comprises a mattress topper component, a fitted sheet component, a flat sheet component, a warmth/insulating layer component, and, optionally, one or more pillowcase components, and wherein all components of said sleep system promote water vapor absorption, heat dissipation, and/or air circulation.

26) A method of providing substantially the same the sleep environment to two or more disparate mattresses comprising adding a sleep system to said mattresses, wherein said sleep system comprises a mattress topper component, a fitted sheet component, a warmth/insulating layer component, and, optionally, one or more pillowcase components, and wherein all components of said sleep system promote water vapor absorption, heat dissipation, and/or air circulation.

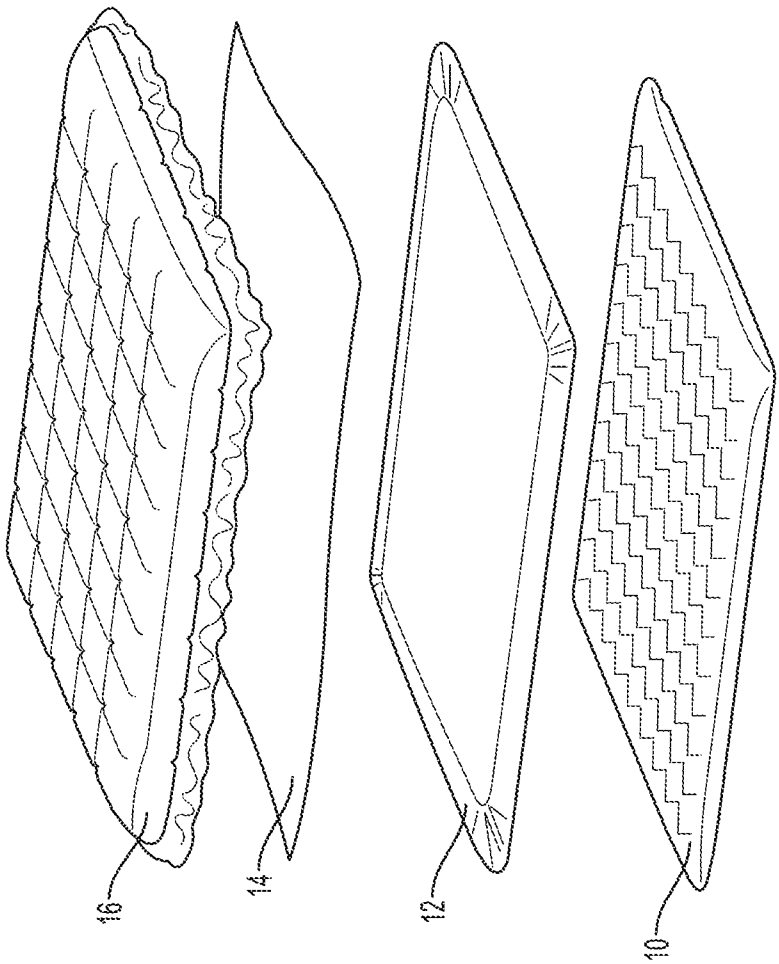


FIG. 1

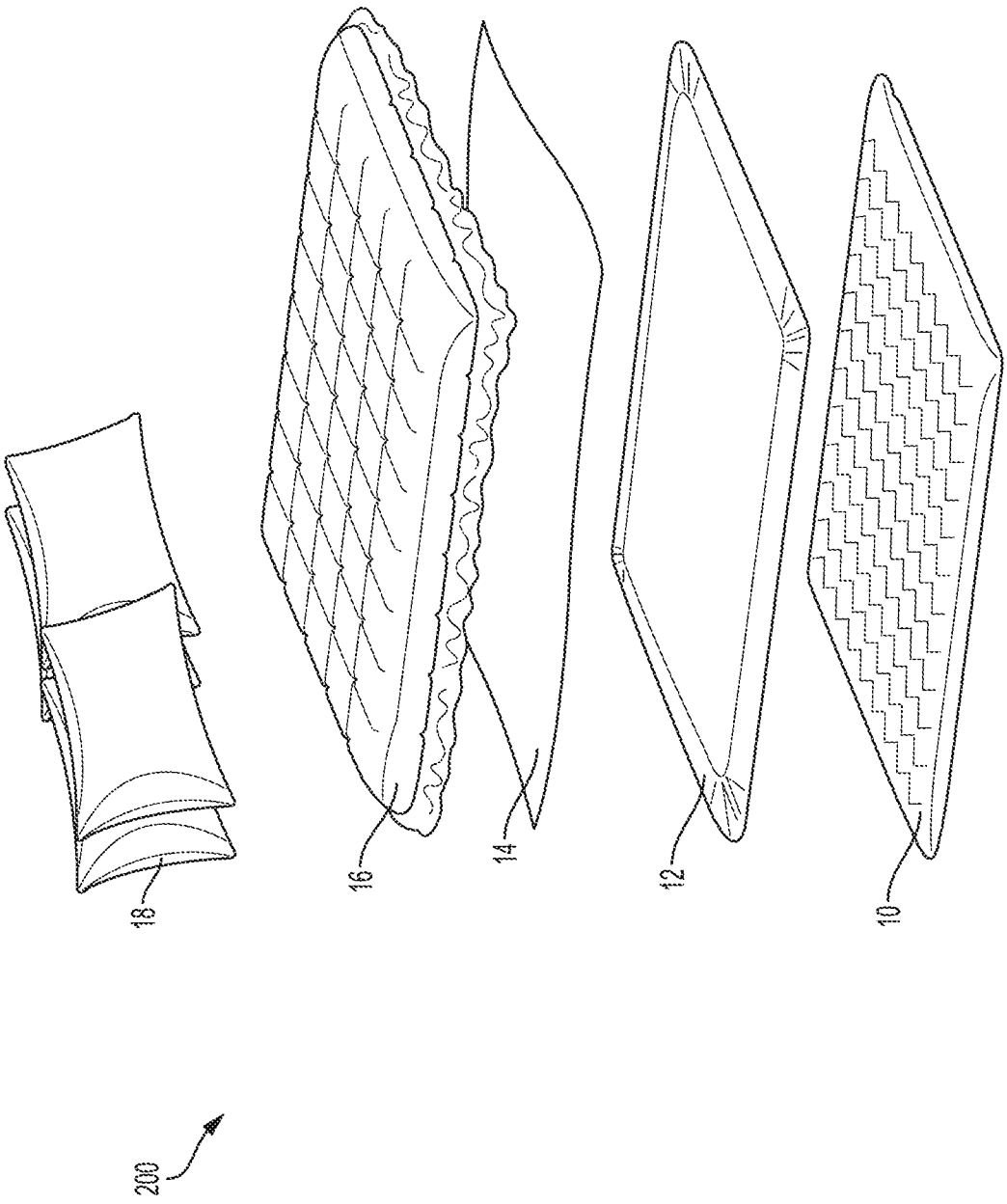


FIG. 2

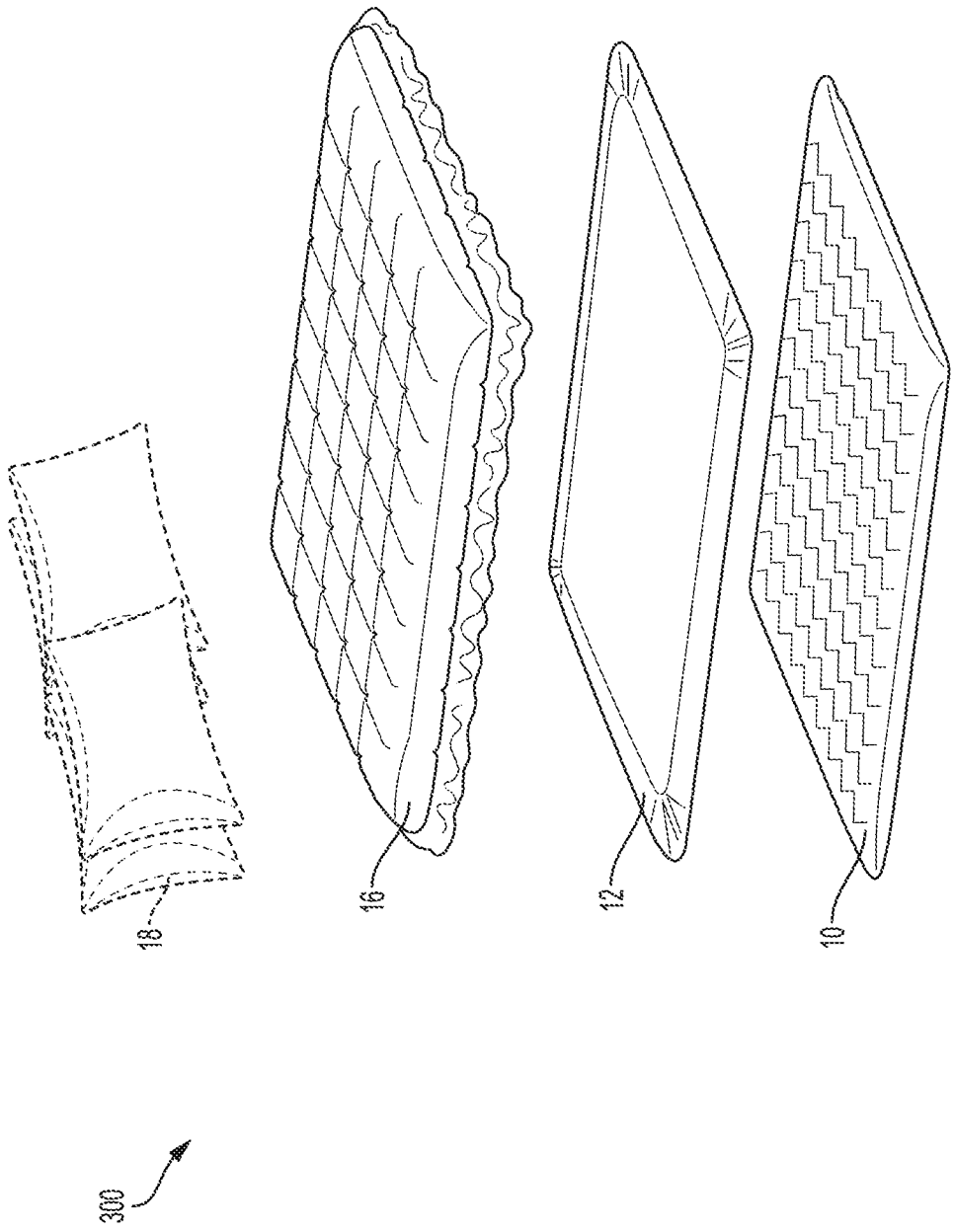


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 19/23686

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A47C 21/04, A47G 9/02, A61G 7/05, A47C 27/00 (2019.01)
CPC - A47C 21/04, A47C 21/044, A47C 21/048, A47G 9/0215, A61G 7/05, A47C 27/007, Y10S 5/941

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)
See Search History Document

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History Document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2012/0233773 A1 (Suzuki) 20 September 2012 (20.09.2012) entire document, especially title, abstract.	1-18 ----- 19-22
Y	US 2017/0231410 A1 (Picasso Style, LLC) 17 August 2017 (17.08.2017) entire document, especially title, abstract.	19-22
A	US 2010/0146709 A1 (Lafleche et al.) 17 June 2010 (17.06.2010) entire document, especially title, abstract.	1-22
A	US 2011/0107514 A1 (Brykalski et al.) 12 May 2011 (2.05.2011) entire document, especially title, abstract.	1-22
A	US 2007/0251016 A1 (Feher) 01 November 2007 (01.11.2007) entire document, especially title, abstract.	1-22

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"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	Date of mailing of the international search report
08 July 2019	25 JUL 2019
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 19/23686

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Group I: Claims 1-22 directed to a sleep system having a mattress topper, a fitted sheet component, a warmth/insulating layer, and a sleep chamber.

Group II: Claims 23-26 directed to method of creating a sleep environment comprising adding a sleep system to a mattress.

--- Continued in supplemental box ---

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-22

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 19/23686

--- Continuation of Box No. III Observations where unity of invention is lacking ---

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

SPECIAL TECHNICAL FEATURES

The invention of Group I includes the special technical features of a sleep chamber formed between the fitted sheet component and the flat sheet component, wherein the sleep chamber is occupied by at least one human, not required by the claims of Group II.

The invention of Group II includes the special technical features of a mattress, and wherein all components of the sleep system promote water vapor absorption, heat dissipation, and/or air circulation, not required by the claims of Group I.

COMMON TECHNICAL FEATURES

Groups I-II share the common technical features of a sleep system consisting of a mattress topper component, a fitted sheet component, a flat sheet component, a warmth/insulating layer component.

However, these shared technical features do not represent a contribution over prior art as being anticipated by US 3,965,504 A to Ainsworth, which discloses a sleep system (bedding assembly 10, Fig. 1) consisting of a mattress topper component (pad 20, Fig. 1), a fitted sheet component (sheeting 36, Fig. 1), a flat sheet component (blanket 38, Fig. 1), a warmth/insulating layer component (bedspread 48, Fig. 1).

As the common technical features were known in the art at the time of the invention, they cannot be considered special technical features that would otherwise unify the groups.

Therefore, Groups I-II lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature.