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(54) **MATTRESS WITH BREATHABLE AND VENTILATION FUNCTION**

(57) A mattress includes a plurality of layers vertically stacked to one another, the plurality of layers comprising a first layer; a second layer; and a third layer. The first layer comprises a plurality of openings defined therein being operably in fluidic communication with a plurality

of fans for providing air circulation to a user through the mattress. The second layer is disposed between the first layer and the third layer and comprises an array of springs.

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Description

CROSS-REFERENCE TO RELATED PATENT APPLICATION

[0001] This application claims priority to and the benefit of U.S. Provisional Patent Application Serial No. 62/889,112, filed August 20, 2019, which is incorporated herein in its entirety by reference.

FIELD OF THE INVENTION

[0002] The invention generally relates to bedding, and more particular to a mattress with breathable and ventilation functions.

BACKGROUND OF THE INVENTION

[0003] Sleep is critical for people in every aspect of their lives. A bed mattress is an instrument for sleeping which provides a cushion or a buffering force using cushion members, such as memory foams.

[0004] Memory foam mattresses are widely considered to be a superior product for users, because of the ability of a foam mattress not only to conform to user's body shapes, but also to be readily compressed and packaged in a size that is manageable for transportation. However, a memory foam mattress may retain a user's heat, thereby causing the user to get hot during sleep. Heat retention in a mattress is generally undesirable to a majority of users.

[0005] Thus, it is beneficial and desirable for people to have a bedding system that is capable of adjusting body positions and bed temperature based on user's sleep preference, so that the user achieves maximum comfort during sleep.

SUMMARY OF THE INVENTION

[0006] In one aspect, the invention relates to a mattress, comprising a plurality of layers vertically stacked to one another, the plurality of layers comprising a first layer; a second layer; and a third layer, where the first layer comprises a plurality of openings defined therein being operably in fluidic communication with a plurality of fans for providing air circulation to a user through the mattress, and the second layer is disposed between the first layer and the third layer and comprises an array of springs.

[0007] In one embodiment, the first layer is formed of a flex support foam for providing corner to corner support.

[0008] In one embodiment, the first layer has a thickness in a range of about 2-3 cm.

[0009] In one embodiment, the array of springs comprises hybrid support-springs for providing ventilation and thorough foundation.

[0010] In one embodiment, the array of springs comprises a plurality of pocket springs.

[0011] In one embodiment, the array of springs comprises about 1500-2500 pocket springs.

[0012] In one embodiment, the second layer further comprises four side walls defining a housing therewith for accommodating the array of springs.

[0013] In one embodiment, the second layer has a thickness in a range of about 12-20 cm.

[0014] In one embodiment, the third layer is formed of a flex comfort foam.

[0015] In one embodiment, the third layer has a thickness in a range of about 2-3 cm.

[0016] In one embodiment, the plurality of layers further comprises a fourth layer disposed on the third layer; and a fifth layer disposed on the fourth layer.

[0017] In one embodiment, the fourth layer is formed of a ventilated bamboo charcoal memory foam, wherein the ventilated bamboo charcoal memory foam comprises a memory foam infused with bamboo charcoal, for regulating moisture, odor and/or temperature.

[0018] In one embodiment, the fifth layer is formed of a smart foam that is breathable, flexible and operably adapts to user body's natural contours.

[0019] In one embodiment, each of the fourth layer and the fifth layer has a thickness in a range of about 2-5 cm.

[0020] In one embodiment, the mattress further comprises a fabric cover for covering the plurality of layers.

[0021] These and other aspects of the invention will become apparent from the following description of the preferred embodiment taken in conjunction with the following drawings, although variations and modifications therein may be affected without departing from the spirit and scope of the novel concepts of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The accompanying drawings illustrate one or more embodiments of the invention and, together with the written description, serve to explain the principles of the invention. Wherever possible, the same reference numbers are used throughout the drawings to refer to the same or like elements of an embodiment.

FIG. 1 shows schematically an exploded view of a mattress according to one embodiment of the invention.

FIG. 2 shows schematically another exploded view of the mattress shown in FIG. 1.

FIG. 3 shows schematically a partial cross-sectional and perspective view of the mattress shown in FIG. 1. FIG. 4 shows schematically a bottom view of the mattress shown in FIG. 1.

FIG. 5 shows schematically a cross-sectional view of the mattress along A-A' shown in FIG. 4.

FIG. 6 shows schematically a bottom view of a mattress according to another embodiment of the invention.

FIG. 7 shows schematically a cross-sectional view of the mattress along B-B' shown in FIG. 6.

FIG. 8 shows schematically a cross-sectional view of an adjustable bed system with a mattress according to one embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0023] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the present invention are shown. The present invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like reference numerals refer to like elements throughout.

[0024] The terms used in this specification generally have their ordinary meanings in the art, within the context of the invention, and in the specific context where each term is used. Certain terms that are used to describe the invention are discussed below, or elsewhere in the specification, to provide additional guidance to the practitioner regarding the description of the invention. For convenience, certain terms may be highlighted, for example using italics and/or quotation marks. The use of highlighting and/or capital letters has no influence on the scope and meaning of a term; the scope and meaning of a term are the same, in the same context, whether or not it is highlighted and/or in capital letters. It will be appreciated that the same thing can be said in more than one way. Consequently, alternative language and synonyms may be used for any one or more of the terms discussed herein, nor is any special significance to be placed upon whether or not a term is elaborated or discussed herein. Synonyms for certain terms are provided. A recital of one or more synonyms does not exclude the use of other synonyms. The use of examples anywhere in this specification, including examples of any terms discussed herein, is illustrative only and in no way limits the scope and meaning of the invention or of any exemplified term. Likewise, the invention is not limited to various embodiments given in this specification.

[0025] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an", and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[0026] It will be understood that when an element is referred to as being "on", "attached" to, "connected" to, "coupled" with, "contacting", etc., another element, it can be directly on, attached to, connected to, coupled with or contacting the other element or intervening elements may also be present. In contrast, when an element is referred to as being, for example, "directly on", "directly attached" to, "directly connected" to, "directly coupled" with or "directly contacting" another element, there are

no intervening elements present. It will also be appreciated by those of skill in the art that references to a structure or feature that is disposed "adjacent" to another feature may have portions that overlap or underlie the adjacent feature.

[0027] It will be understood that, although the terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another element, component, region, layer or section. Thus, a first element, component, region, layer or section discussed below can be termed a second element, component, region, layer or section without departing from the teachings of the present invention.

[0028] Furthermore, relative terms, such as "lower" or "bottom" and "upper" or "top", may be used herein to describe one element's relationship to another element as illustrated in the figures. It will be understood that relative terms are intended to encompass different orientations of the device in addition to the orientation shown in the figures. For example, if the device in one of the figures is turned over, elements described as being on the "lower" side of other elements would then be oriented on the "upper" sides of the other elements. The exemplary term "lower" can, therefore, encompass both an orientation of lower and upper, depending on the particular orientation of the figure. Similarly, if the device in one of the figures is turned over, elements described as "below" or "beneath" other elements would then be oriented "above" the other elements. The exemplary terms "below" or "beneath" can, therefore, encompass both an orientation of above and below.

[0029] It will be further understood that the terms "comprise(s)" and/or "comprising", or "include(s)" and/or "including" or "has (have)" and/or "having" or "contain(s)" and/or "containing" when used in this specification specify the presence of stated features, regions, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, regions, integers, steps, operations, elements, components, and/or groups thereof.

[0030] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the present invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and the present disclosure, and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0031] As used herein, "around", "about", "substantially" or "approximately" shall generally mean within 20 percent, preferably within 10 percent, and more preferably within 5 percent of a given value or range. Numerical

quantities given herein are approximate, meaning that the terms "around", "about", "substantially" or "approximately" can be inferred if not expressly stated.

[0032] As used in this specification, the phrase "at least one of A, B, and C" should be construed to mean a logical (A or B or C), using a non-exclusive logical OR. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0033] The description below is merely illustrative in nature and is in no way intended to limit the invention, its application, or uses. The broad teachings of the invention can be implemented in a variety of forms. Therefore, while this invention includes particular examples, the true scope of the invention should not be so limited since other modifications will become apparent upon a study of the drawings, the specification, and the following claims. For purposes of clarity, the same reference numbers will be used in the drawings to identify similar elements. It should be understood that one or more steps within a method may be executed in different order (or concurrently) without altering the principles of the invention.

[0034] The description will be made as to the embodiments of the invention in conjunction with the accompanying drawings in FIGS. 1-8. In accordance with the purposes of this invention, as embodied and broadly described herein, this invention, in one aspect, relates to a mattress with breathable and ventilation functions.

[0035] Referring FIGS. 1-5, a mattress 100 is schematically shown according to one embodiment of the invention. The mattress includes a plurality of layers 110-150 vertically stacked to one another.

[0036] The plurality of layers includes a first layer 110, a second layer 120 disposed on the first layer 110, a third layer 130 disposed on the second layer 120, a fourth layer 140 disposed on the third layer 130; and a fifth layer 150 disposed on the fourth layer 140. It should be noted that other number of layers can also be utilized to practice the invention.

[0037] As shown in FIG. 2-4, the first layer 110 comprises four openings 111-117 defined in the first layer 110. The openings 111-117 are operably in fluidic communication with a plurality of fans for providing air circulation to a user through the mattress (FIG. 8). It should be noted that other number of openings can also be utilized to practice the invention. In some embodiments, the first layer 110 is formed of a flex support foam for providing corner to corner support, and ensuring a deeper, more regenerative night's sleep. In some embodiments, the first layer 110 has a thickness in a range of about 2-3 cm.

[0038] As shown in FIGS. 1-3 and 5, the second layer 120 is arranged between the first layer 110 and the third layer 130 and comprises an array of springs 125. The array of springs comprises a specially fitted hybrid support-springs to provide breathable, ventilation and thorough foundation. In some embodiments, the array of springs comprises a plurality of pocket springs 125, or coil springs. In some embodiments, the array of springs comprises about 1500-2500 pocket springs, preferably

2000 pocket springs.

[0039] As shown in FIGS. 1-3, the second layer 120 also has four side walls 121-124 defining a housing there-with for accommodating the array of springs 125. Each of the four side walls 121-124 can be formed of a flex support foam.

[0040] In some embodiments, the second layer 120 has a thickness in a range of about 12-20 cm.

[0041] The third layer 130 is formed of a flex comfort foam, which adds an additional layer of comfort to create a more breathable and supple feel.

[0042] In some embodiments, the third layer 130 has a thickness in a range of about 2-3 cm.

[0043] The fourth layer 140 is formed of a ventilated bamboo charcoal memory foam. The ventilated bamboo charcoal memory foam comprises a memory foam infused with bamboo charcoal, for regulating moisture, odor and/or temperature, and adapting to user body's individual points.

[0044] The fifth layer 150 is formed of a smart foam that is breathable, flexible and operably adapts to user body's natural contours. It also provides all of the benefits of the latex whilst being allergy free.

[0045] In some embodiments, each of the fourth layer 140 and the fifth layer 150 has a thickness in a range of about 2-5 cm.

[0046] In addition, the mattress 100 may also have a cool knit fabric cover for covering the plurality of layers 110-150, so as to enhance air-flow and breathability, creating a cooler, more deep sleep.

[0047] In addition, the mattress can be of any sizes, for example, a king size, a queen size, a full size, a twin size, or a customized size, by changing its width, W, and its length, L, as shown in FIGS. 4 and 6.

[0048] FIGS. 6-7 shows schematically a mattress 100' according to another embodiment of the invention. The mattress 100' is similar to the mattress 100 shown in FIGS. 1-5, except that the size of the mattress 100' is different from that of mattress 100 and the first layer 110' has two openings 111' and 113' defined in the mattress 100'. It should be appreciated that other number of openings, e.g., three openings, five openings, etc., can also be utilized to practice this invention.

[0049] Unlike traditional memory foam, the mattress according to the invention provides ventilation for superior airflow and temperature regulation. This added breathability means a user can rest more comfortably.

[0050] FIG. 8 shows schematically a cross-sectional view of an adjustable bed system with the mattress 100' according to one embodiment of the invention. The adjustable bed system includes a frame structure 180, one or more platforms (or bed boards) 170 moveably connected to the frame structure 180, a first lifting assembly 191 and a second lifting assembly 192 moveably connected to the frame structure 180.

[0051] One of the first lifting assembly 191 and the second lifting assembly 192 is a back lifting assembly, and the other of the first lifting assembly 191 and the second

lifting assembly 192 is the leg lifting assembly. For the purpose of illustration, the first lifting assembly 191 is the back lifting assembly, while the second lifting assembly 192 is the second lifting assembly 192. When the mattress 100' is disposed on the platforms 170, the upper (back) portion and the lower (leg) portion of the mattress 100' are in relation to the back lifting assembly 191 and the leg lifting assembly 192, respectively, and positions of the upper portion and the lower portion of the mattress 100' are individually and/or coordinately adjustable in accordance with operations of the back lifting assembly 191 and the leg lifting assembly 192.

[0052] The back lifting assembly 191 comprises a back lifting bracket 191a pivotally connected to the frame structure 180, and a back lifting actuator 191b pivotally connected between the back lifting bracket 191a and the frame structure 180 for operably driving the back lifting bracket 191a to pivotally move in an upward rotating direction or a downward rotating direction relative to the frame structure 180. Such pivotally moving of the back lifting bracket 191a causes the back portion of the platforms 170 and therefore the back portion of the mattress 110' to be lifted up (e.g., in a lift portion, not shown) or lifted down (e.g., in a flat position shown in FIG. 8).

[0053] The leg lifting assembly 192 comprises a leg lifting bracket 192a pivotally coupled to the frame structure 180, and a leg lifting actuator 192b pivotally connected between the leg lifting bracket 192a and the frame structure 180 for operably driving the leg lifting bracket 192a to pivotally move in an upward rotating direction or a downward rotating direction relative to the one of the frame structure. Such pivotally moving of the leg lifting bracket 192a causes the leg portion of the platforms 170 and therefore the leg portion of the mattress 110' to be lifted up (e.g., in a lift portion, not shown) or lifted down (e.g., in a flat position shown in FIG. 8).

[0054] The adjustable bed system also has two fans 161 and 163 that are mounted onto corresponding openings in the platforms 170, such that when the mattress 100' is placed on the platforms 170, the openings 111' and 113' in the first layer 110' of the mattress 100' are aligned with and are in fluidic communication with the two fans 161 and 163, respectively. In operation, the two fan 161 and 163 can individually or cooperatively move air (i.e., air flow or air circulation as indicated by arrows in FIG. 8) via the openings 111' and 113' into the mattress body and outputting the air from the top surface of the mattress 110'.

[0055] Specifically, each fan 161/163 is configured such that in operation, air is flown from the rear side of said fan 161/163 to the 111'/113' of the mattress 110', then spread through the mattress body and output from the sleeping surface (i.e., the top surface) of the mattress 110', as illustrated by arrows shown in FIG. 8. The air can be room temperature air, cooling air or heating air.

[0056] In addition, the strength of the air flow or air circulation is adjustable by individually or cooperatively operating the fans 161 and 163, based on the user's pref-

erence. The operation of the fans 161 and 163 can be automatically controlled, or manually controlled via a remote control. The operation can also be controlled via an AAP.

[0057] The foregoing description of the exemplary embodiments of the invention has been presented only for the purposes of illustration and description and is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Many modifications and variations are possible in light of the above teaching.

[0058] The embodiments were chosen and described in order to explain the principles of the invention and their practical application so as to enable others skilled in the art to utilize the invention and various embodiments and with various modifications as are suited to the particular use contemplated. Alternative embodiments will become apparent to those skilled in the art to which the invention pertains without departing from its spirit and scope. Accordingly, the scope of the invention is defined by the appended claims rather than the foregoing description and the exemplary embodiments described therein.

Claims

1. A mattress (100/100'), comprising:

a plurality of layers (110)-(150) vertically stacked to one another, the plurality of layers comprising a first layer (110); a second layer (120); and a third layer (130), wherein the first layer (110) comprises a plurality of openings (111-117 / 111'-113') defined therein being operably in fluidic communication with a plurality of fans (161)-(162) for providing air circulation to a user through the mattress (100/100'); and wherein the second layer (120) is disposed between the first layer (110) and the third layer (130) and comprises an array of springs (125).

2. The mattress of claim 1, wherein the first layer (110) is formed of a flex support foam for providing corner to corner support.

3. The mattress of claim 1, wherein the first layer (110) has a thickness in a range of about 2-3 cm.

4. The mattress of claim 1, wherein the array of springs (125) comprises hybrid support-springs for providing ventilation and thorough foundation.

5. The mattress of claim 3, wherein the array of springs (125) comprises a plurality of pocket springs.

6. The mattress of claim 4, wherein the array of springs (125) comprises about 1500-2500 pocket springs.

7. The mattress of claim 1, wherein the second layer (120) further comprises four side walls (121-124) defining a housing therewith for accommodating the array of springs 125. 5
8. The mattress of claim 1, wherein the second layer (120) has a thickness in a range of about 12-20 cm.
9. The mattress of claim 1, wherein the third layer (130) is formed of a flex comfort foam. 10
10. The mattress of claim 9, wherein the third layer (130) has a thickness in a range of about 2-3 cm.
11. The mattress of claim 1, wherein the plurality of layers further comprises a fourth layer (140) disposed on the third layer (150) ; and a fifth layer disposed on the fourth layer. 15
12. The mattress of claim 11, wherein the fourth layer (140) is formed of a ventilated bamboo charcoal memory foam, wherein the ventilated bamboo charcoal memory foam comprises a memory foam infused with bamboo charcoal, for regulating moisture, odor and/or temperature. 20 25
13. The mattress of claim 11, wherein the fifth layer (150) is formed of a smart foam that is breathable, flexible and operably adapts to user body's natural contours. 30
14. The mattress of claim 11, wherein each of the fourth layer (140) and the fifth layer (150) has a thickness in a range of about 2-5 cm.
15. The mattress of claim 1, further comprising a fabric cover for covering the plurality of layers (110)-(150). 35

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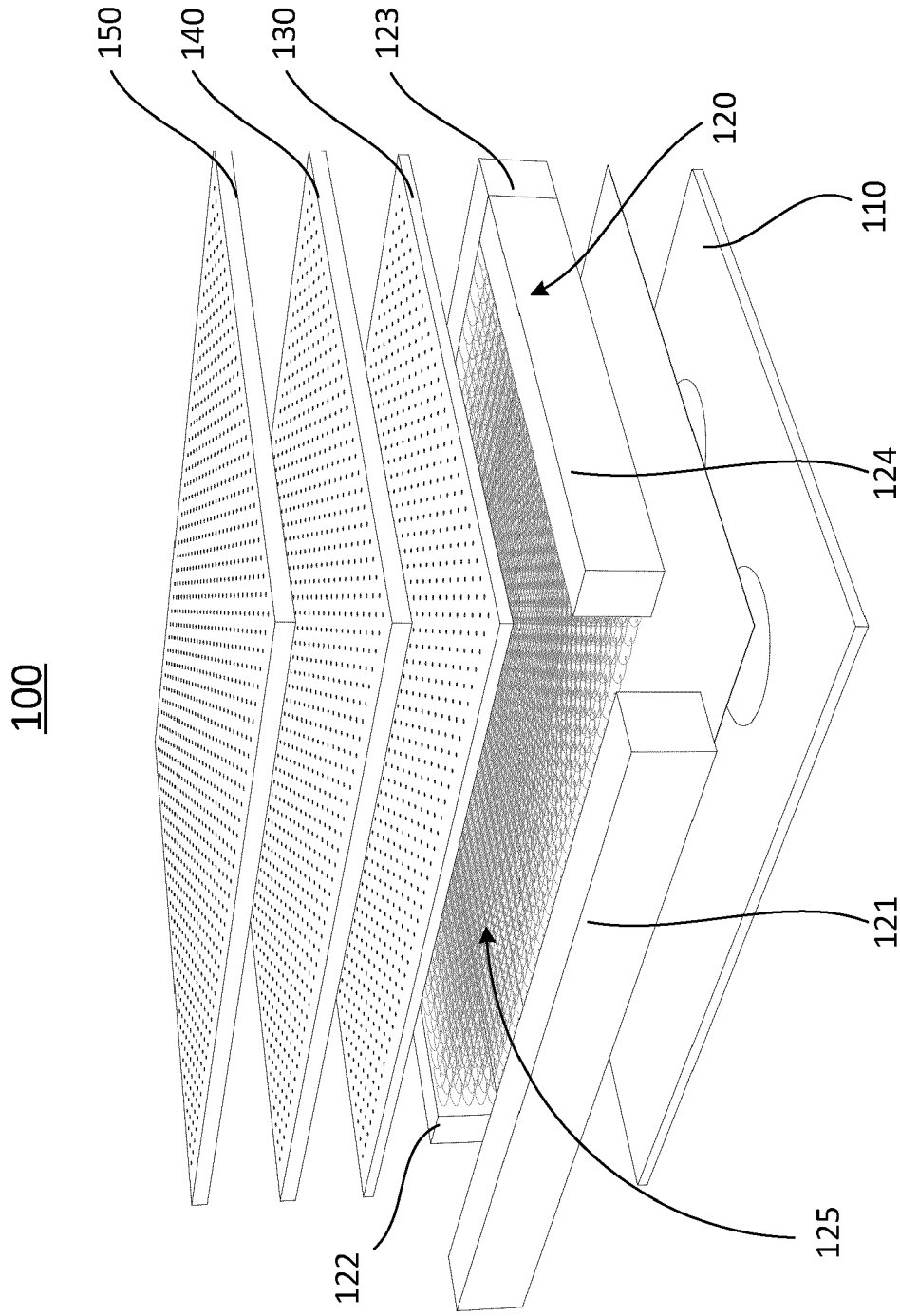


FIG. 1

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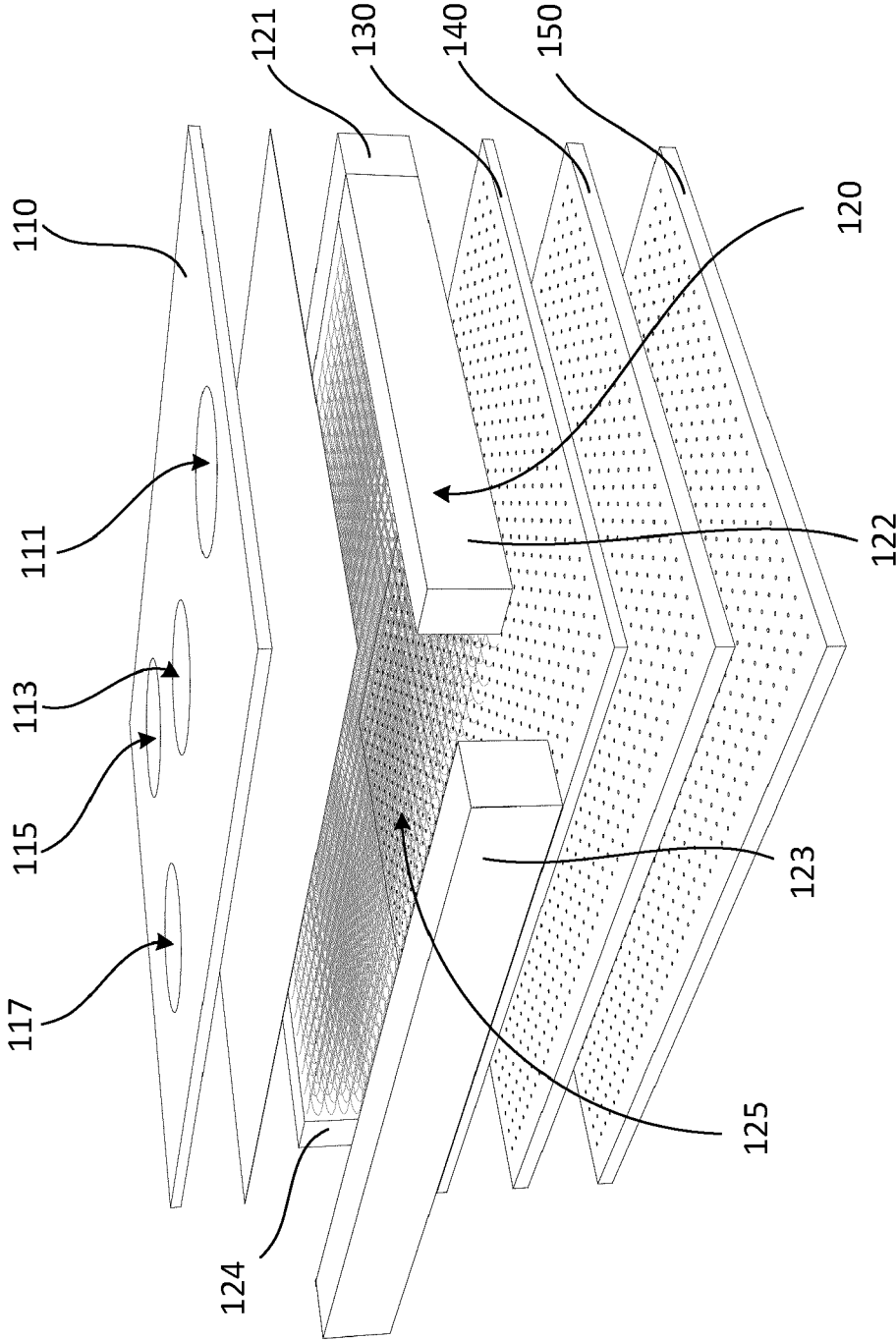


FIG. 2

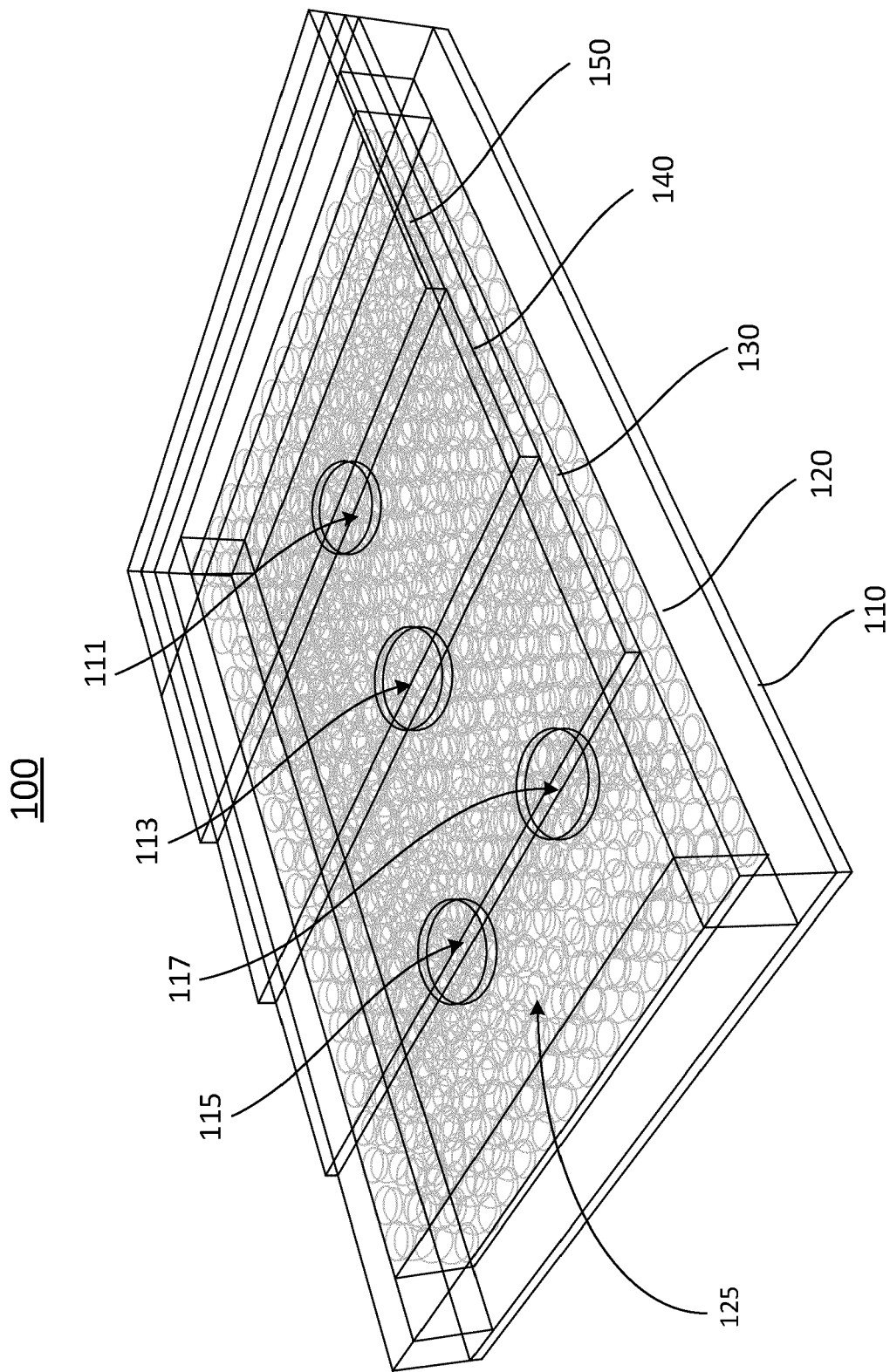


FIG. 3

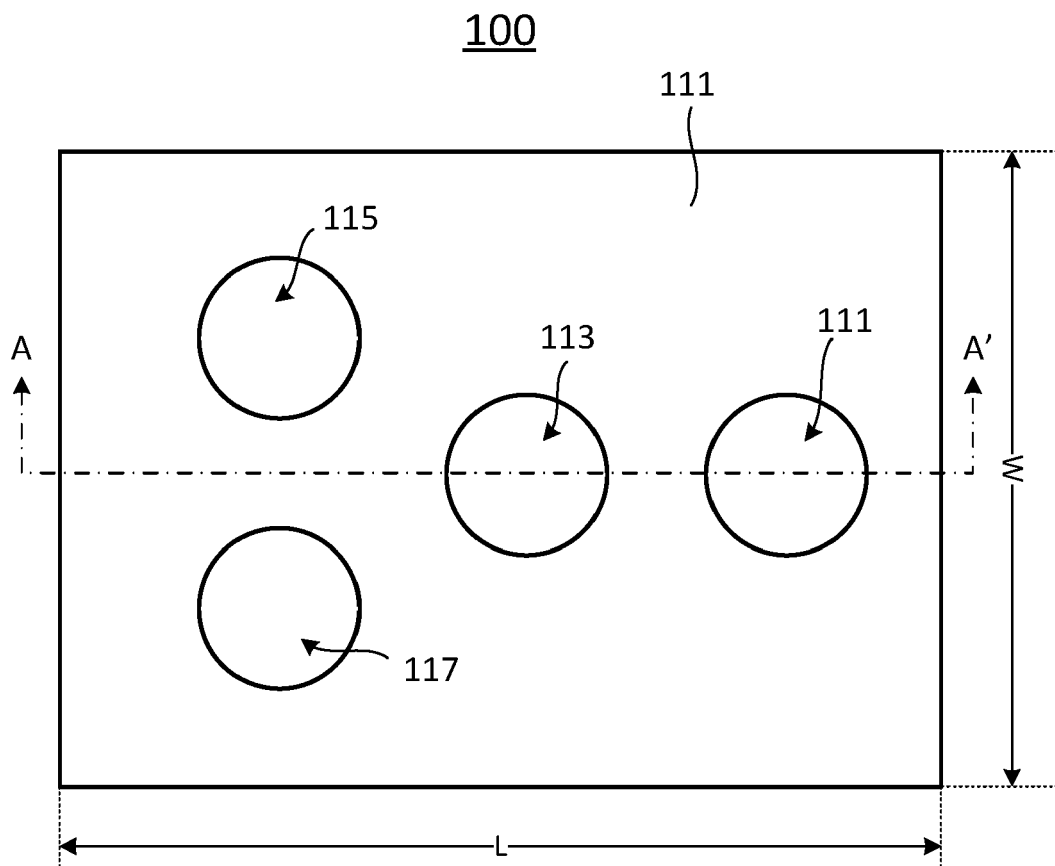


FIG. 4

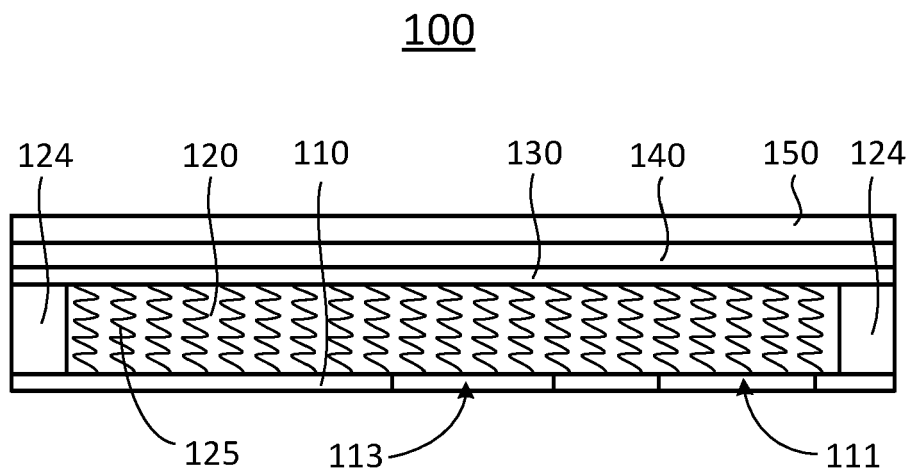


FIG. 5

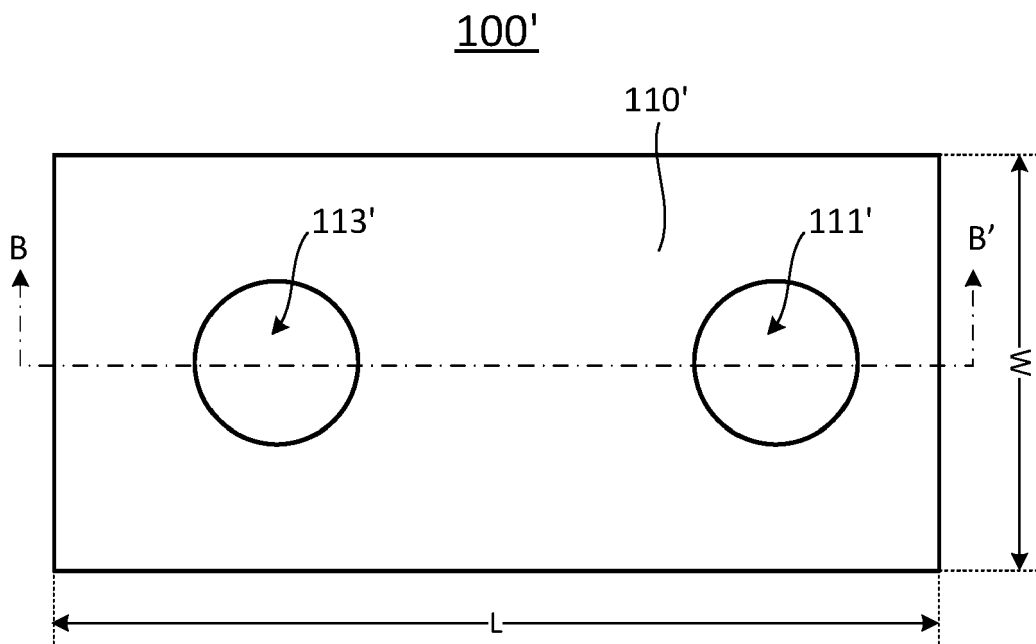


FIG. 6

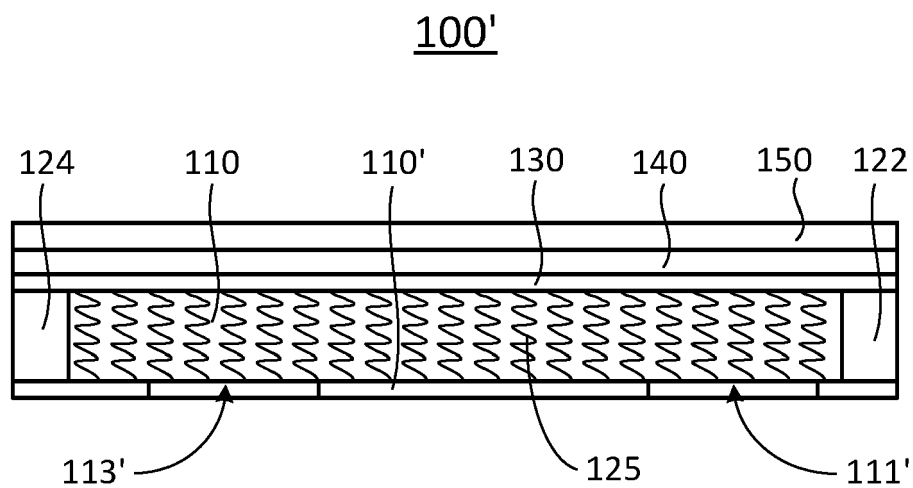


FIG. 7

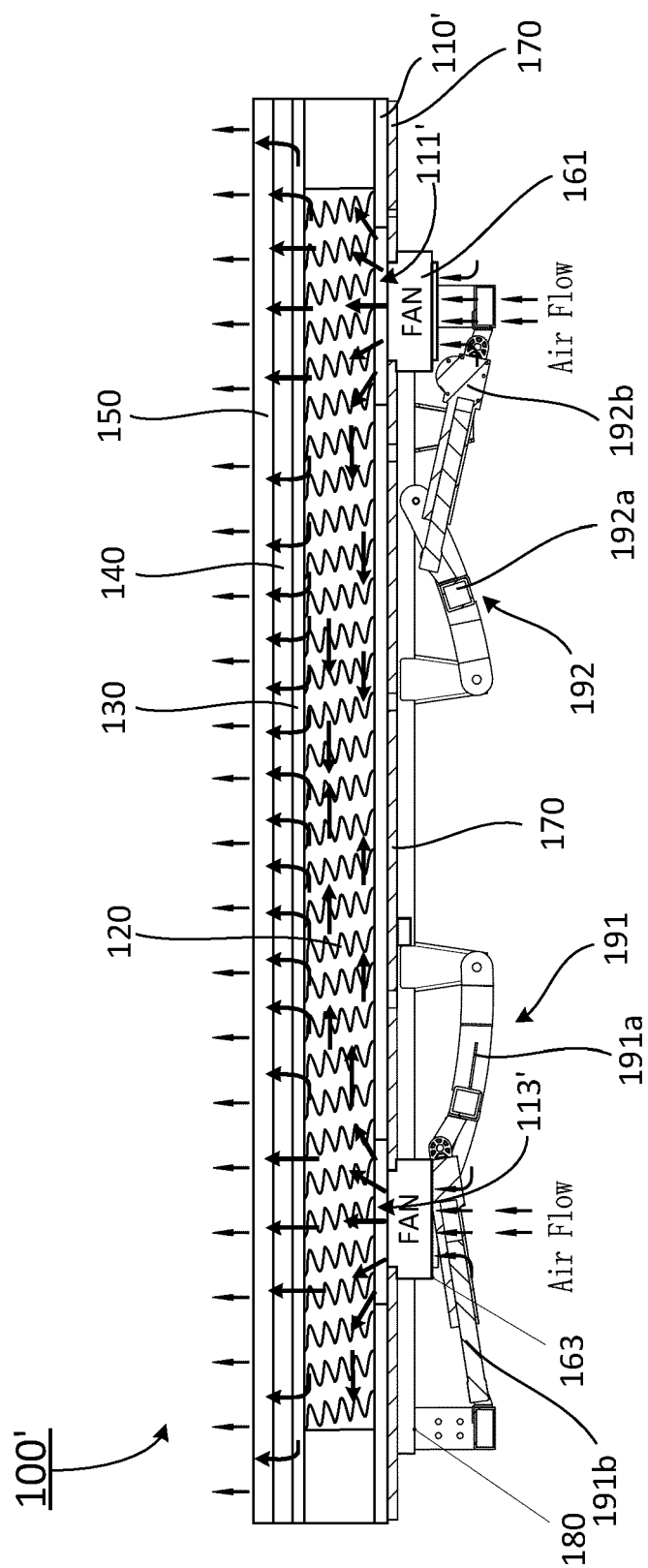


FIG. 8



EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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A	CN 203 302 716 U (SHANGHAI LIWEI TRADE CO LTD) 27 November 2013 (2013-11-27) * claim 1; figure 1 *	12	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 October 2020	Examiner Pössinger, Tobias
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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