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(54) **SUPPORT CUSHIONS INCLUDING THERMOELECTRIC ELEMENTS AND AIR CONDUITS, AND METHODS FOR CONTROLLING SURFACE TEMPERATURE OF SAME**

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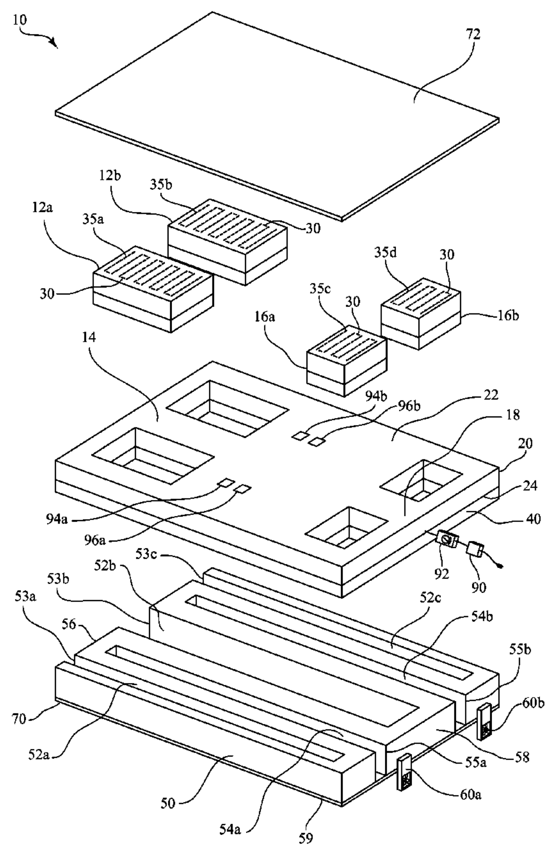
(57) **ABSTRACT**

A support cushion for providing individualized heating and cooling to a user resting on the support cushion is provided. The support cushion includes a body supporting layer, a plurality of thermoelectric elements positioned and configured to selectively provide heating or cooling of the body supporting layer, a heat transfer layer positioned adjacent to the body supporting portion and operably connected to the thermoelectric elements, a base layer positioned adjacent to the heat transfer layer opposite the body supporting layer and defining one or more inlet and outlet conduits, and one or more fans operably connected to each of the outlet conduits. Methods of controlling the surface temperature of a support cushion are also provided.



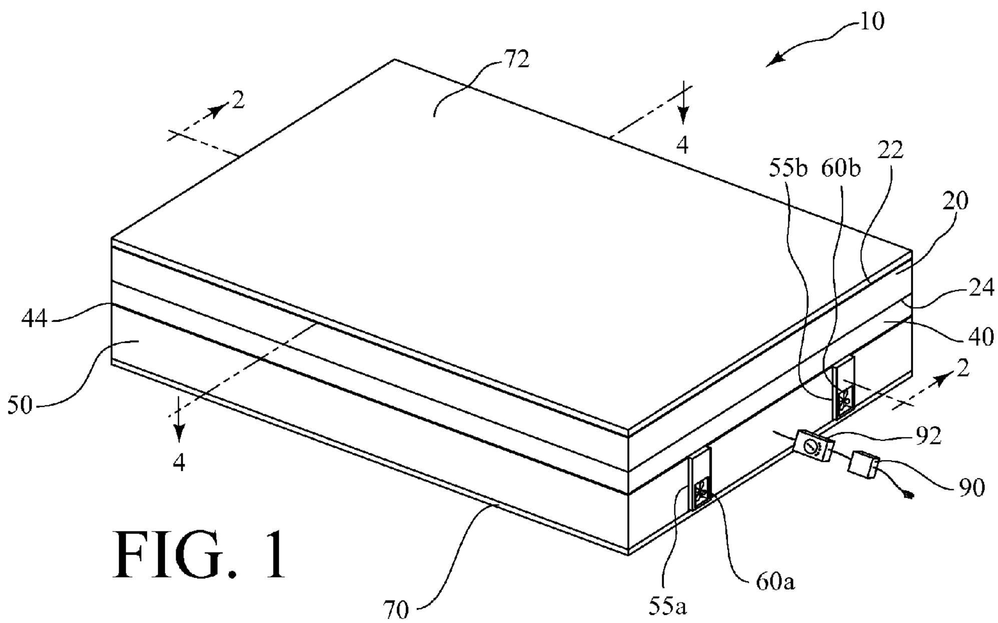


FIG. 1

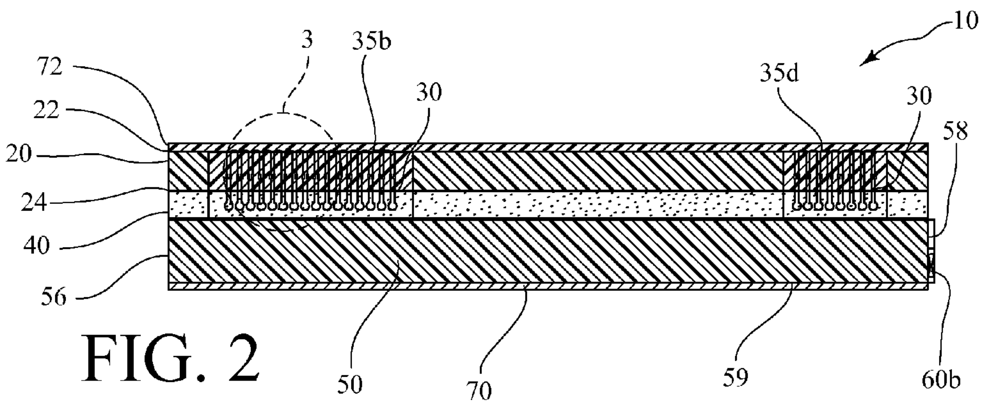


FIG. 2

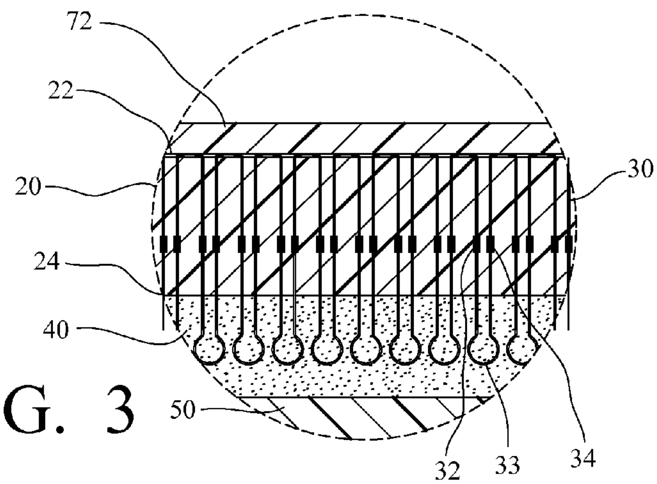
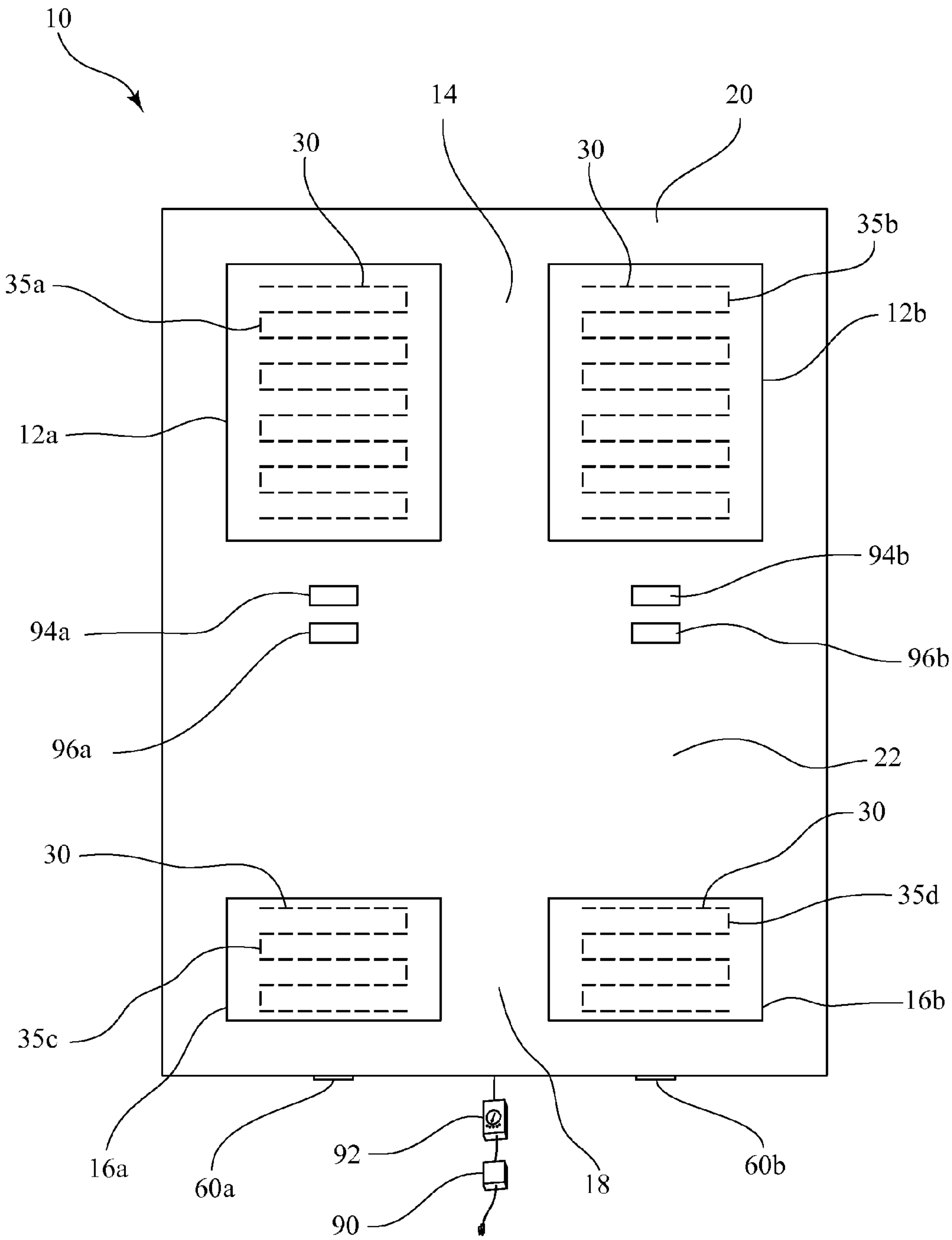


FIG. 3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35b
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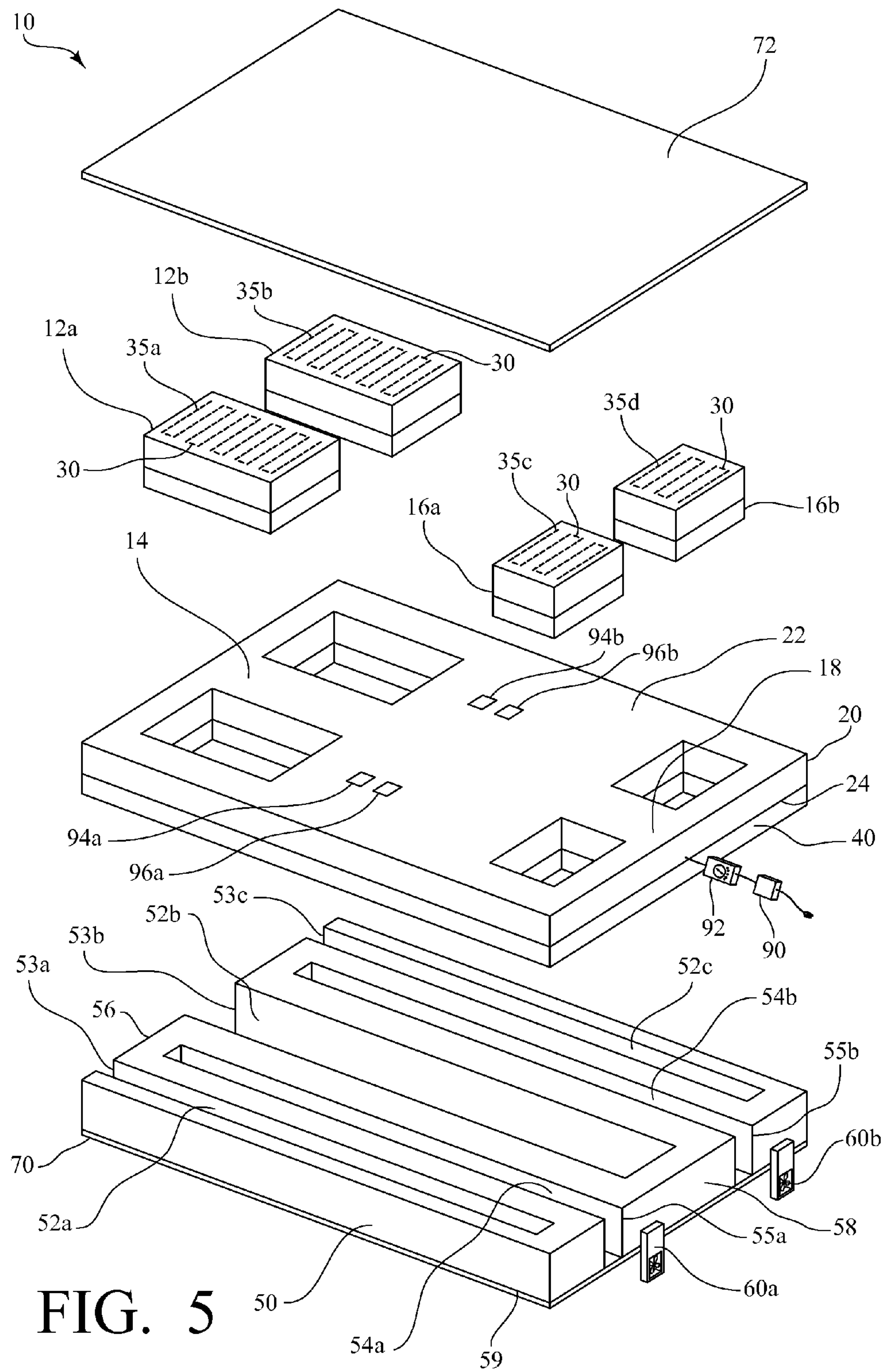
60a
92
90
18
60b

FIG. 4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20
24
40
94a
96a
92
90
53c
52b
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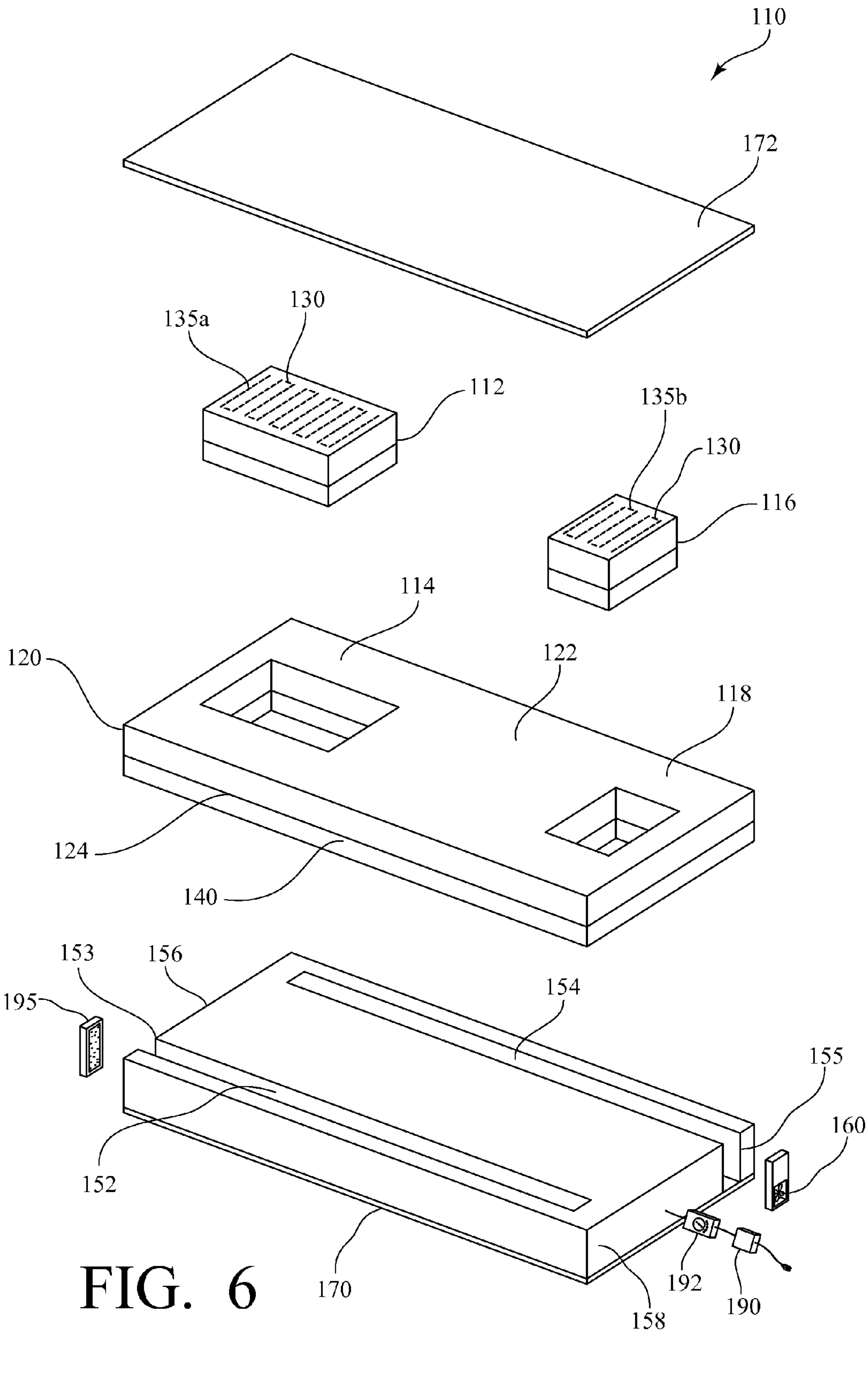
55a
60a
50
54a
59

FIG. 5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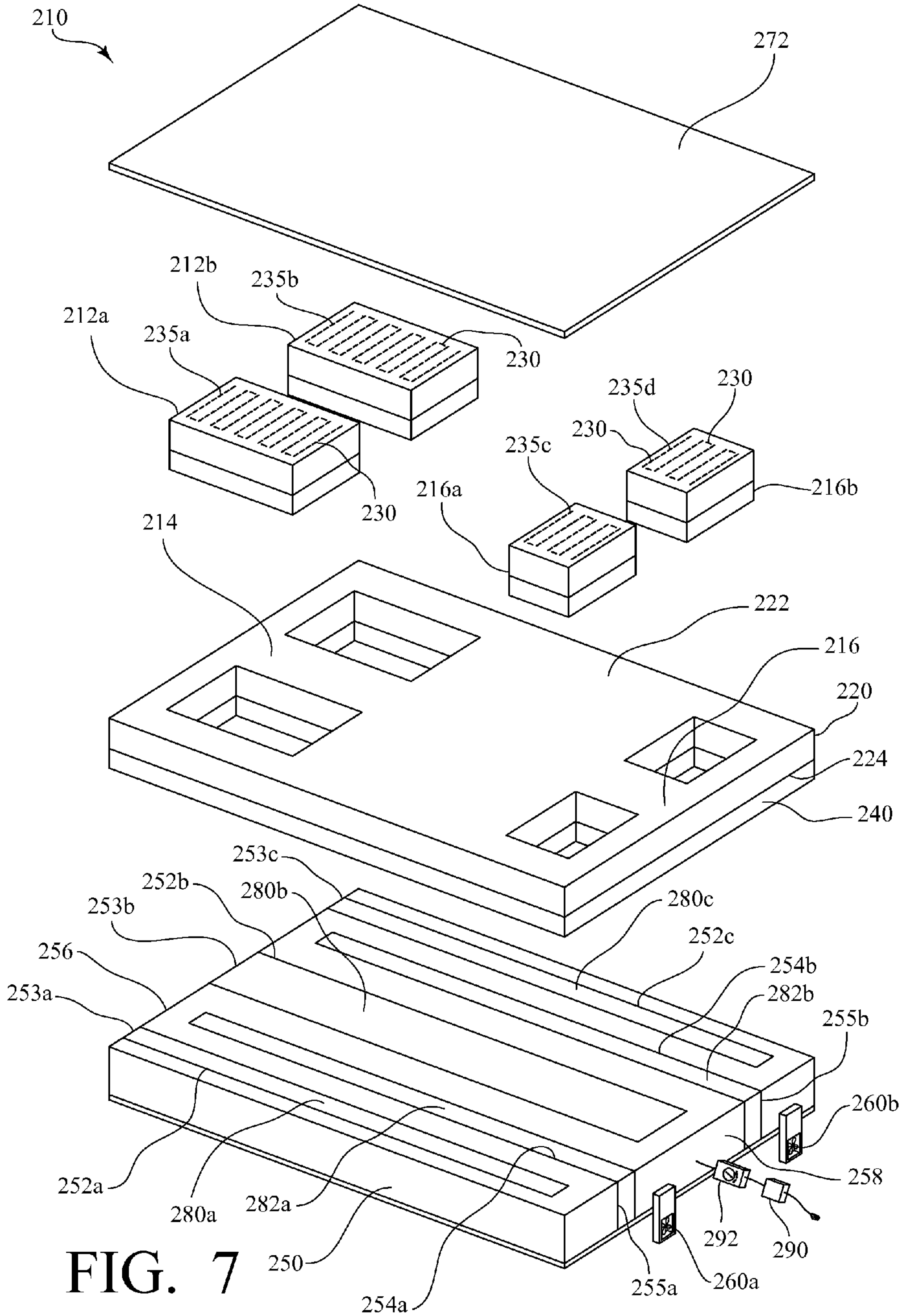
158

FIG. 6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253c
252b
280b
280c
253b
252c
256
254b
282b
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282a
292
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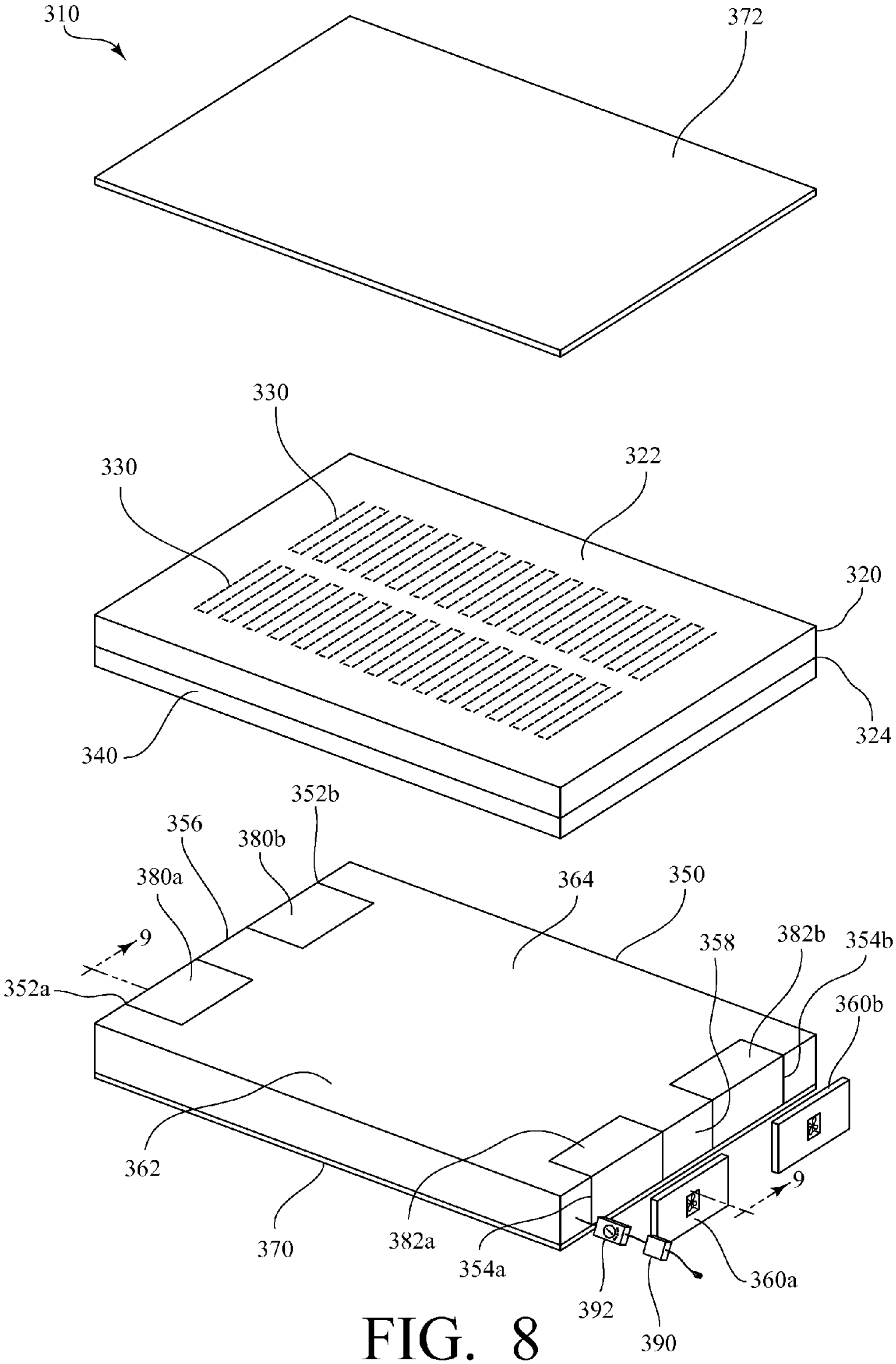
260a
254a

FIG. 7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382a
354a
392
390
360a

FIG. 8

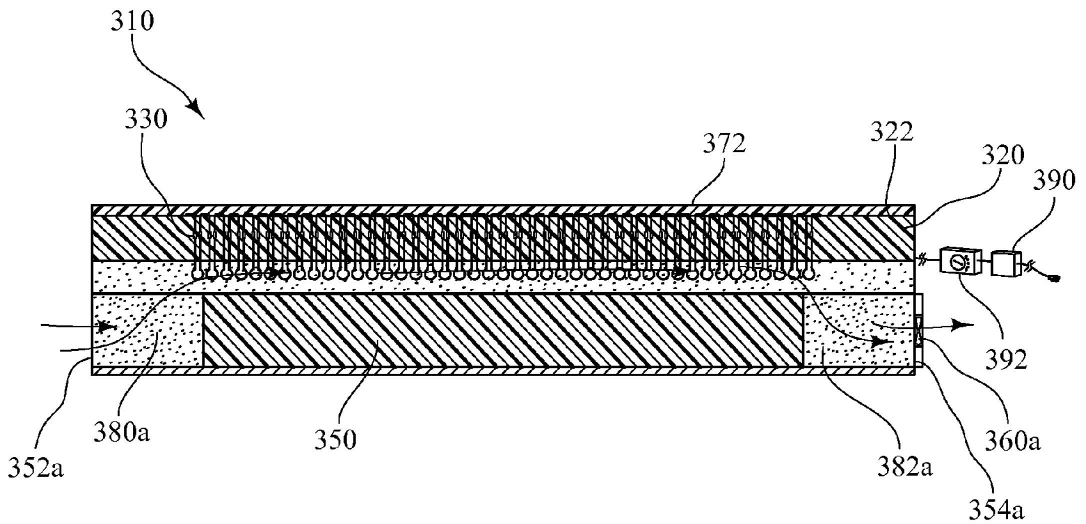
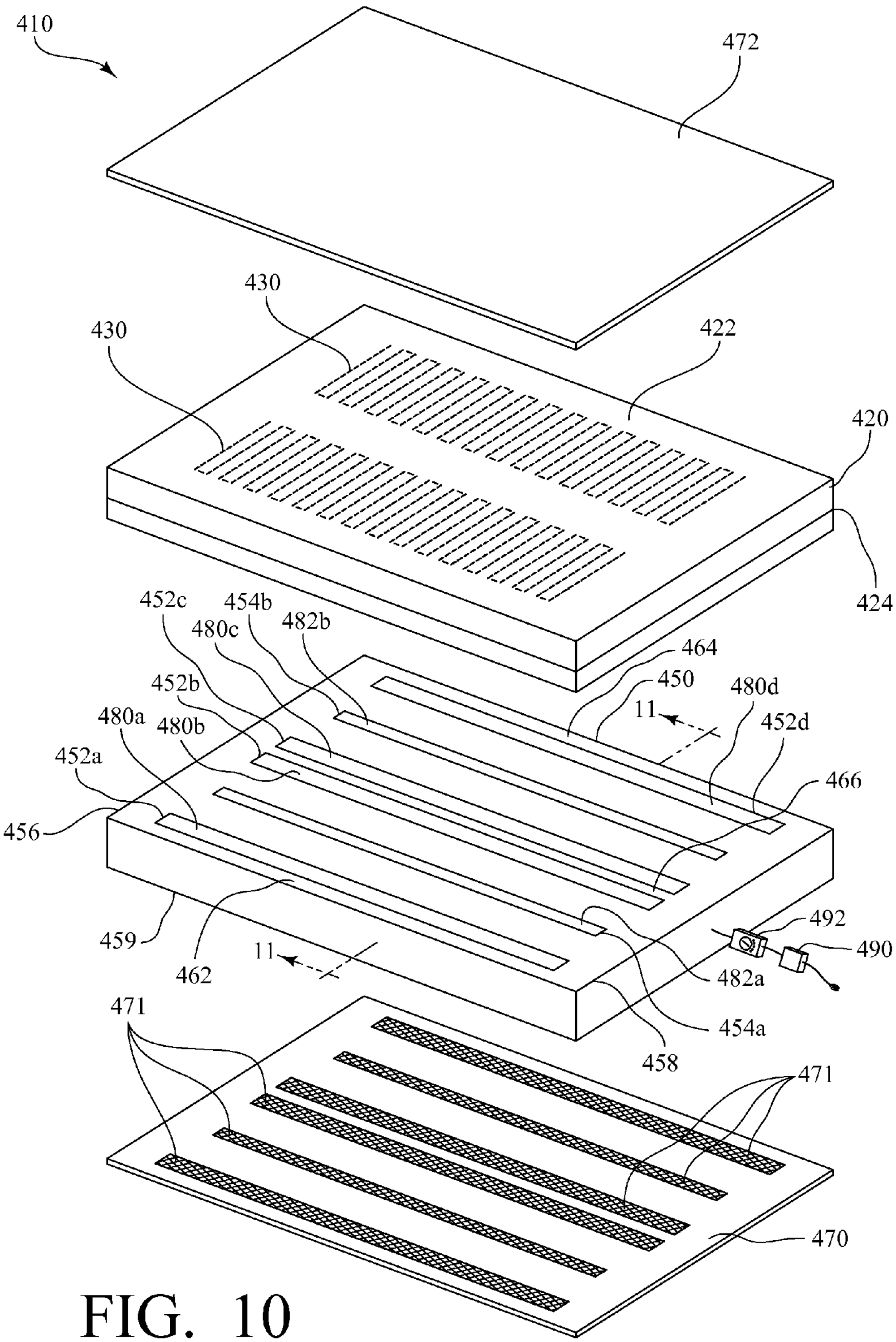


FIG. 9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452b
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482a
454a
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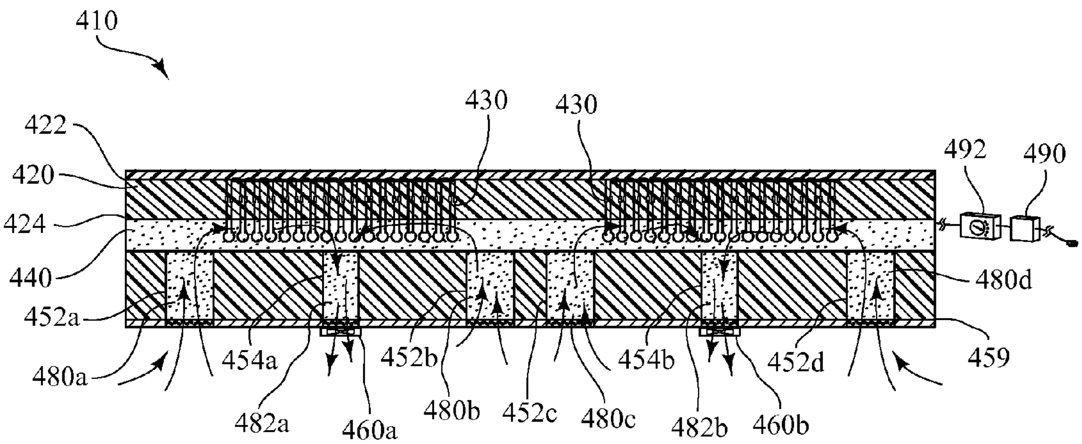
471
471
470

FIG. 10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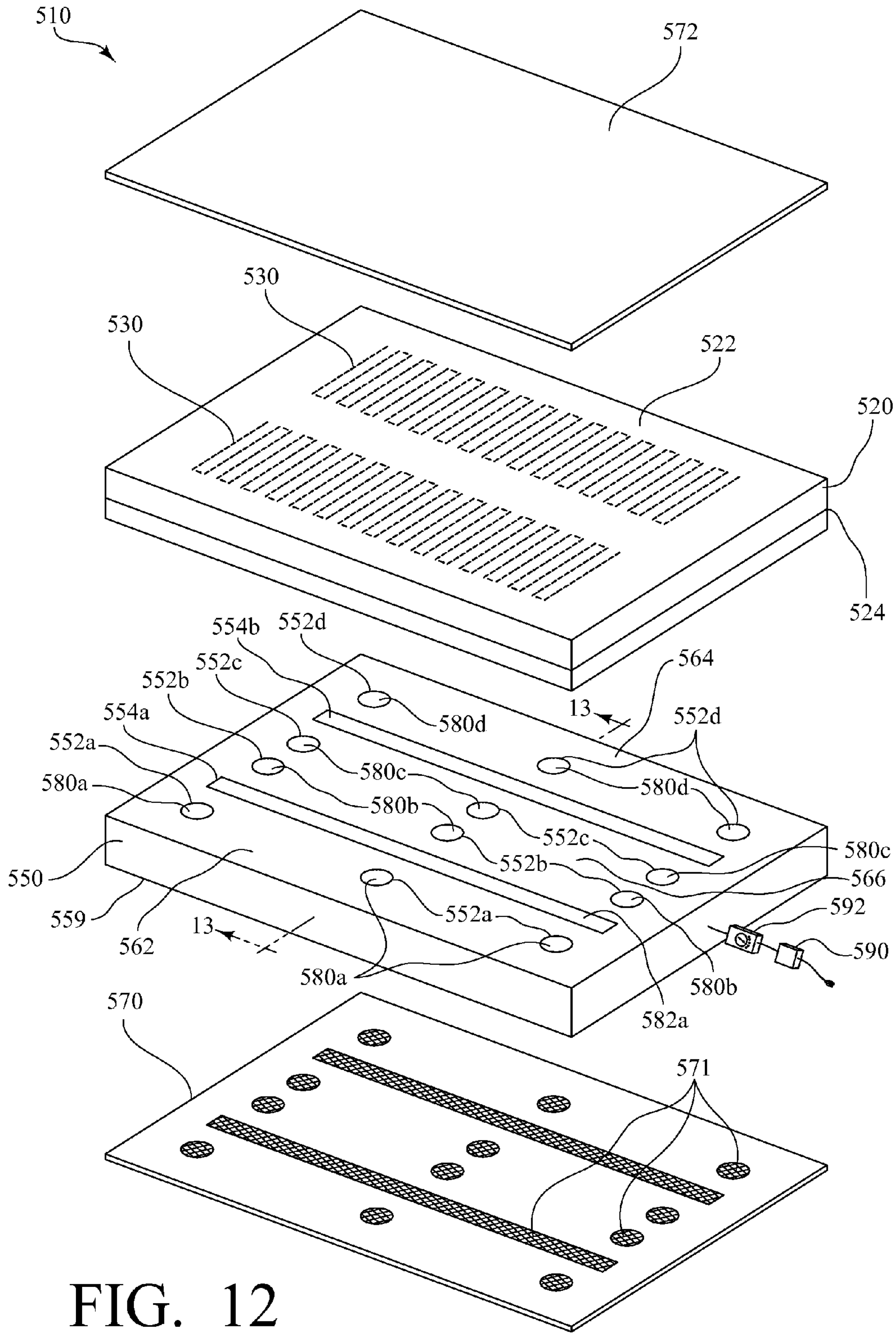
460b
452d

FIG. 11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580c
580d
580b
552c
580c
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552a
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13
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580a
580b
582a
570
571

FIG. 12

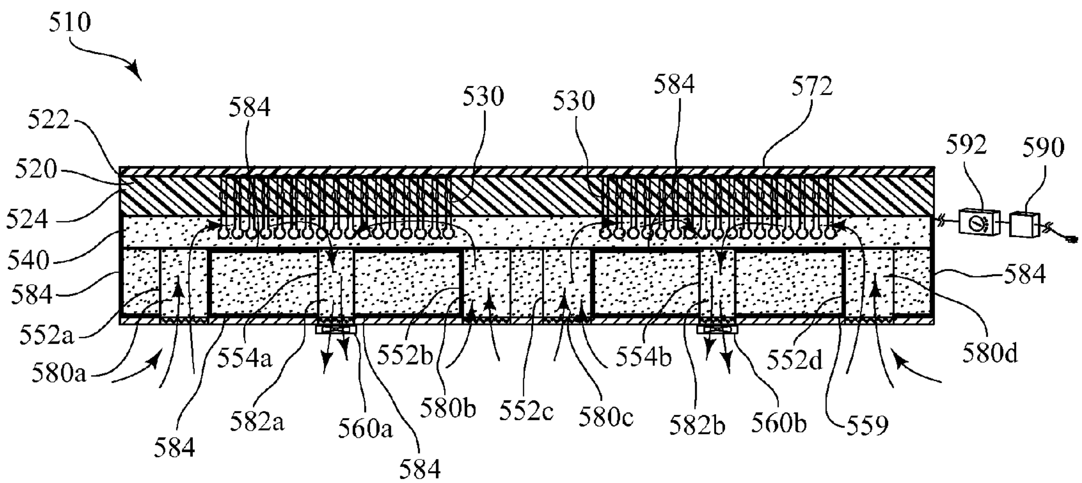
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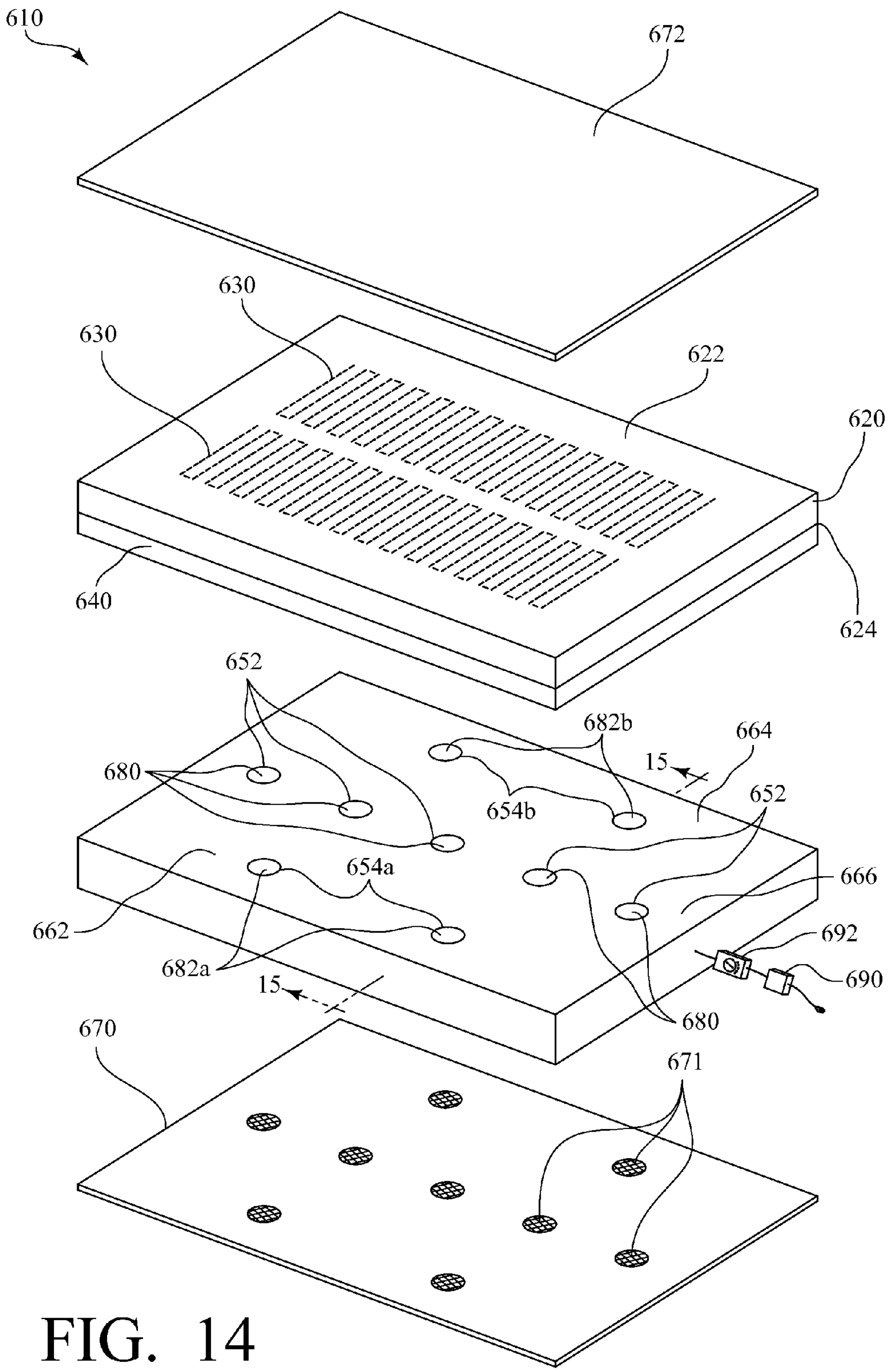
FIG. 13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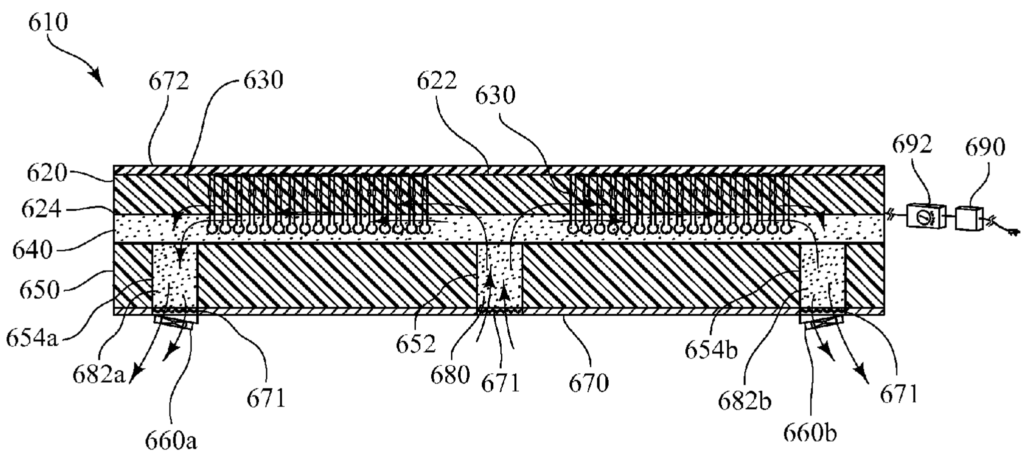
15
680
670
671

FIG. 14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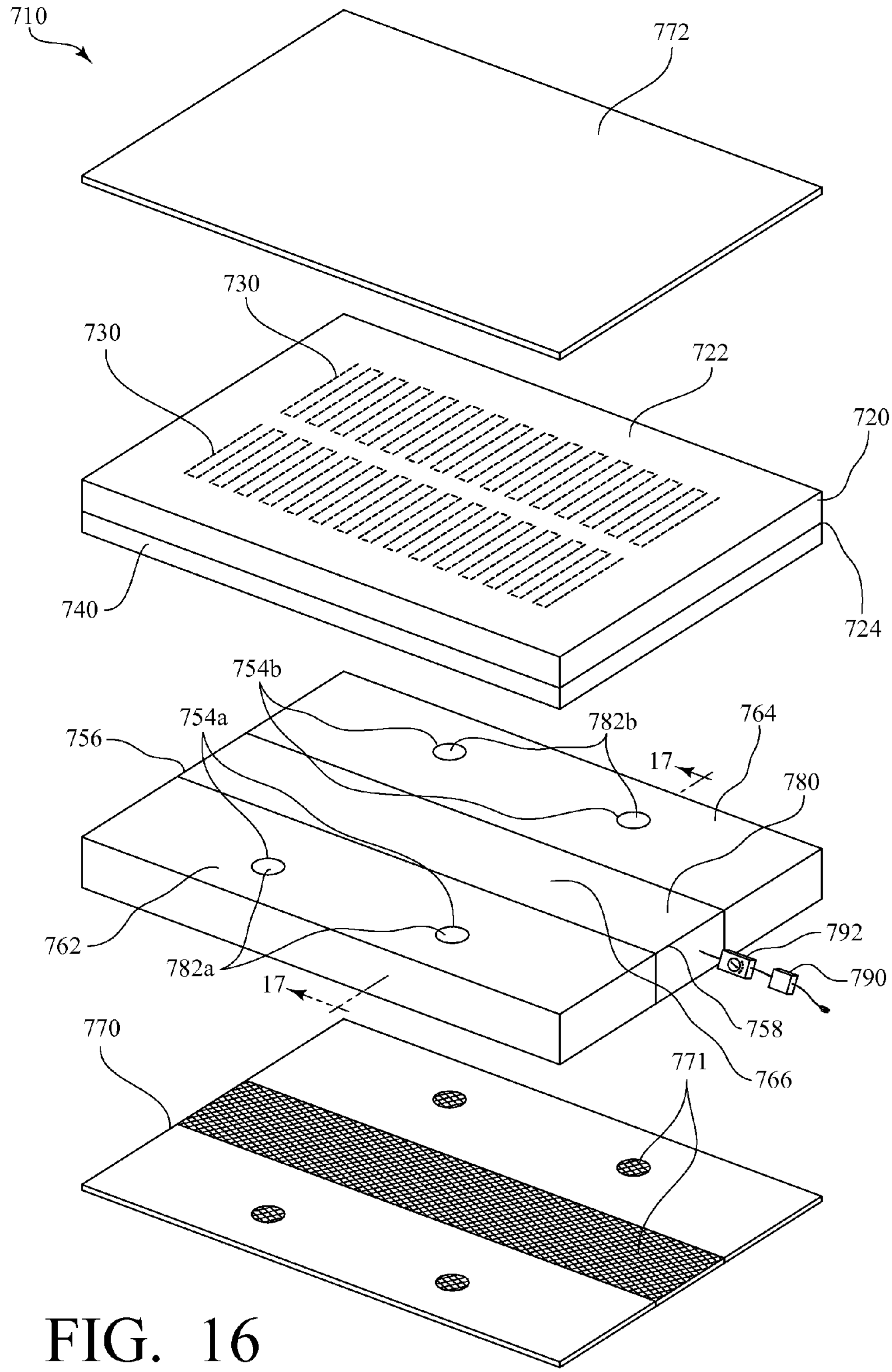
654b
682b
660b
671

FIG. 15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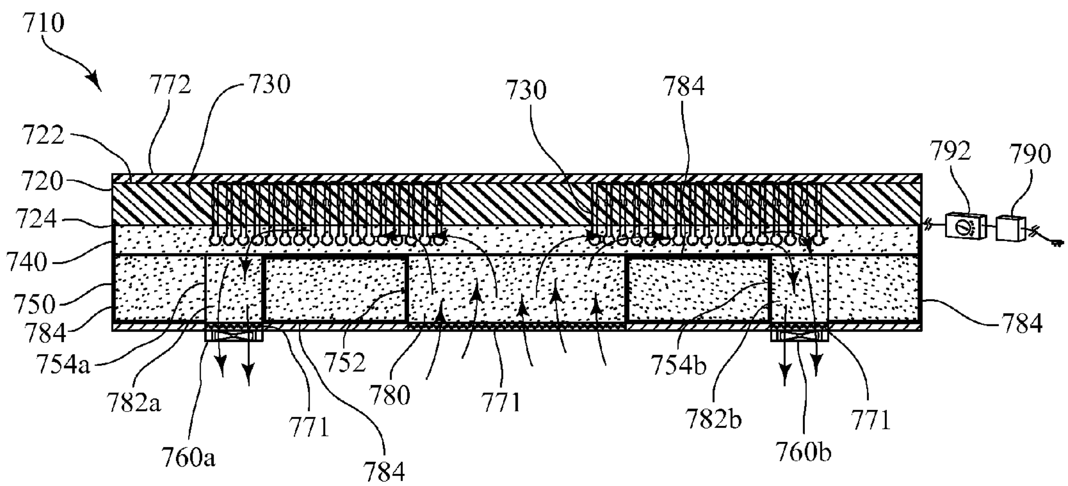
17
758
770
766
771

FIG. 16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760b
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792
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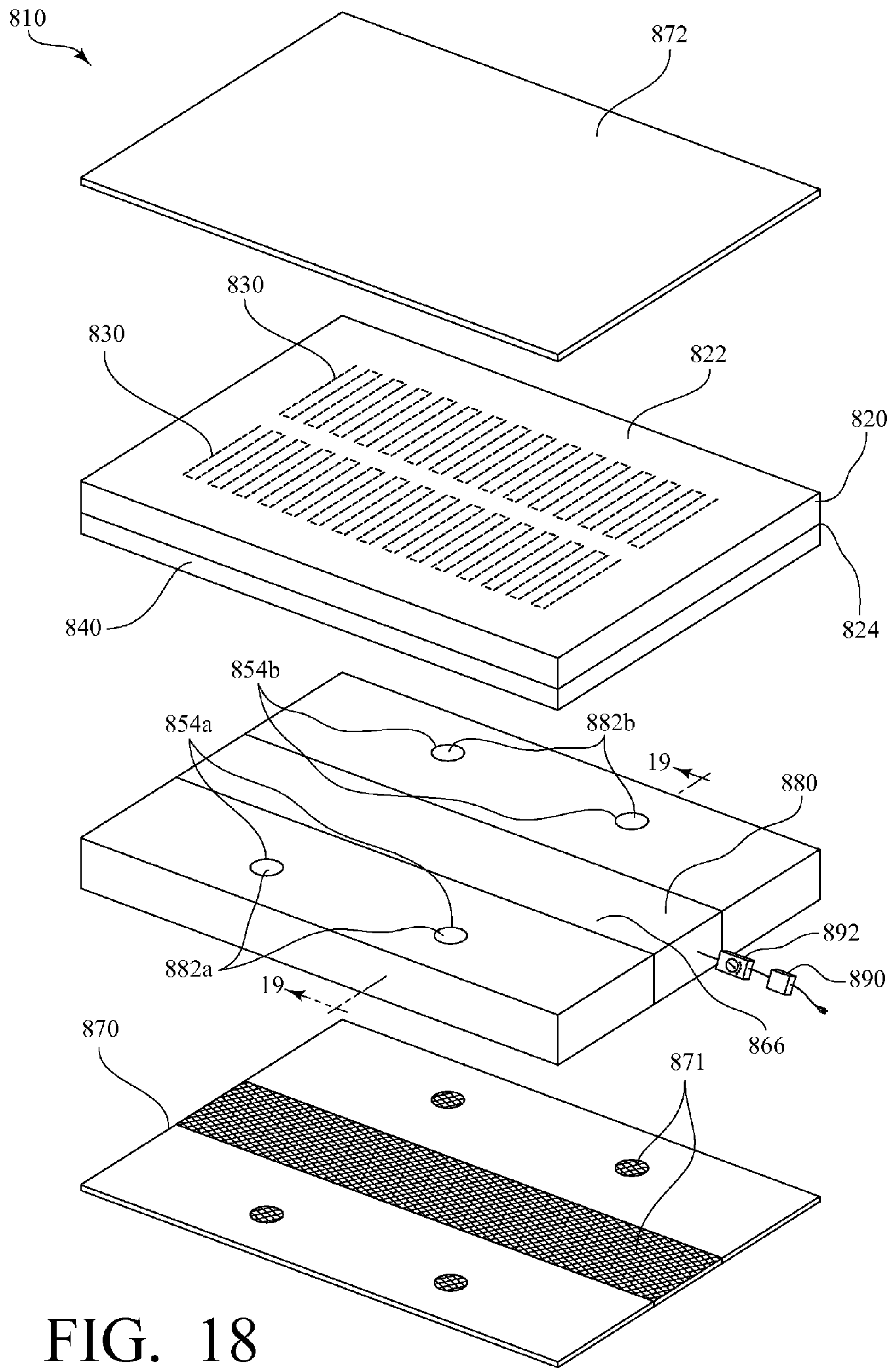
FIG. 17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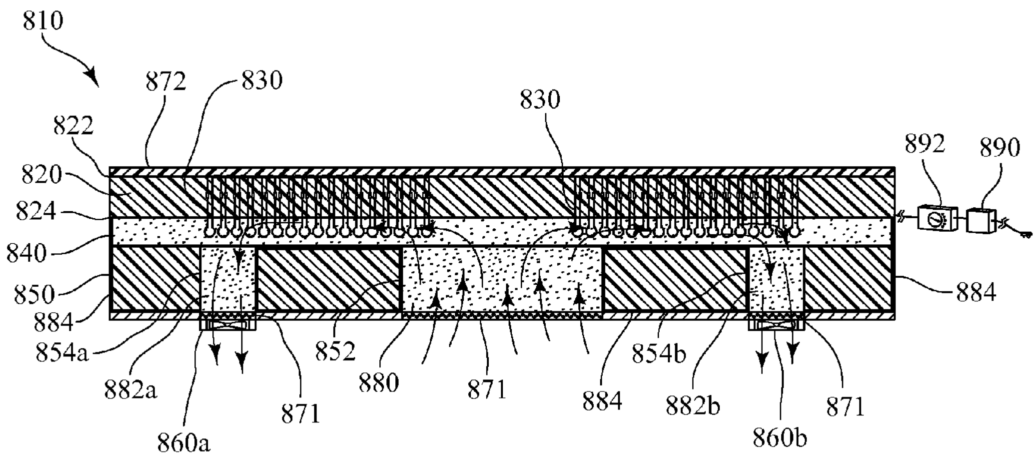
854a
882b
19
880
882a
892
890
19
866
870
871

FIG. 18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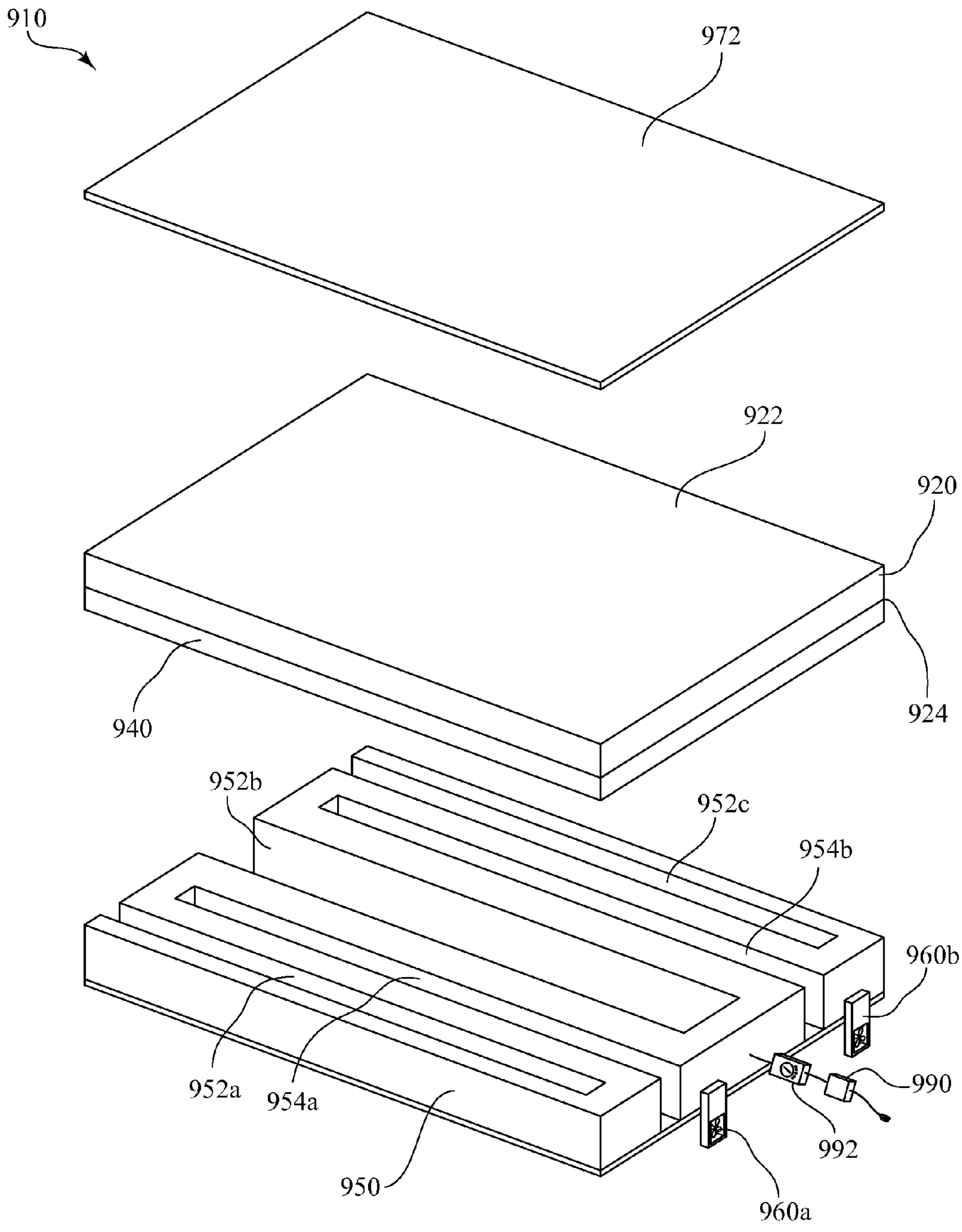
890

FIG. 19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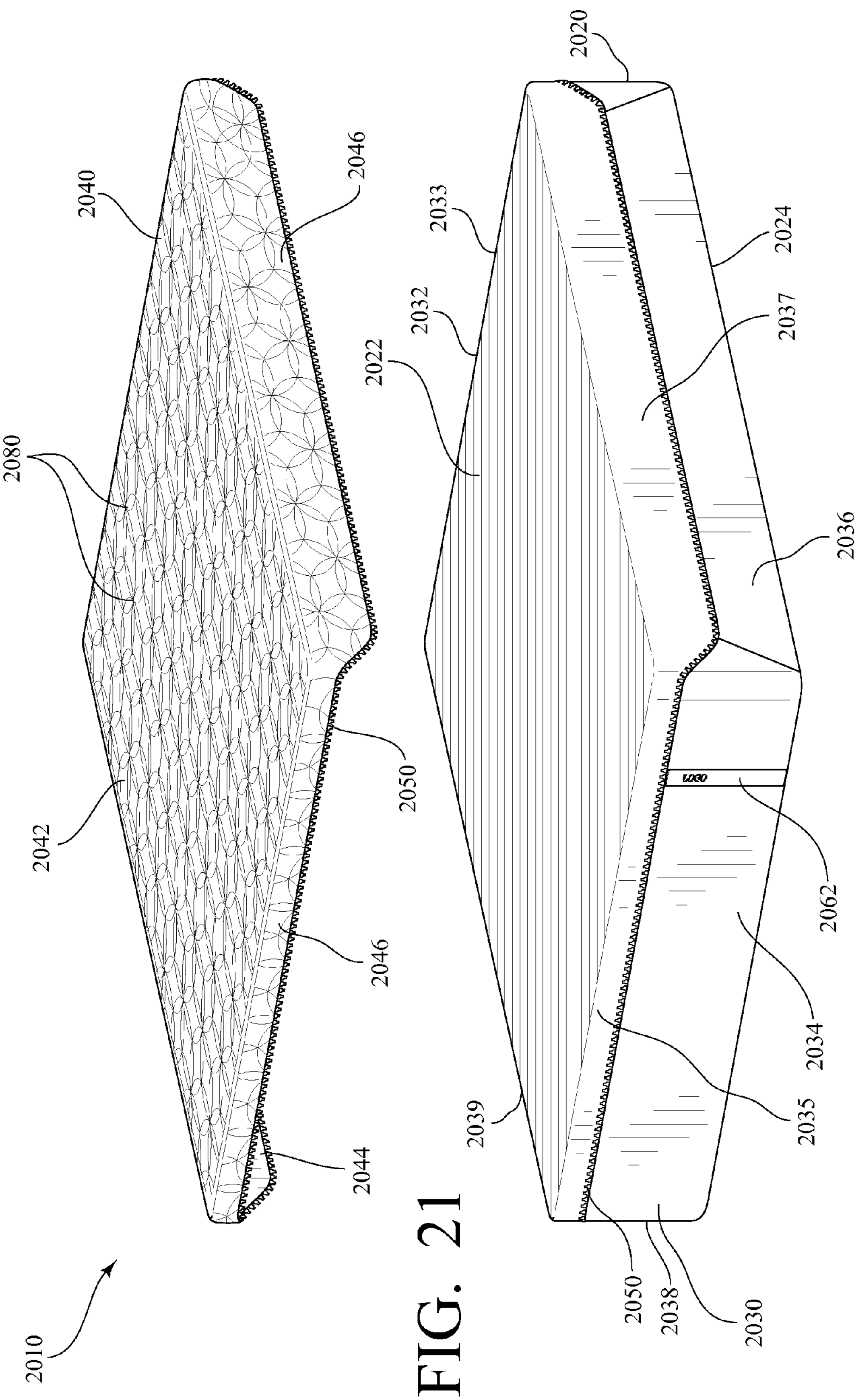
960a

FIG. 20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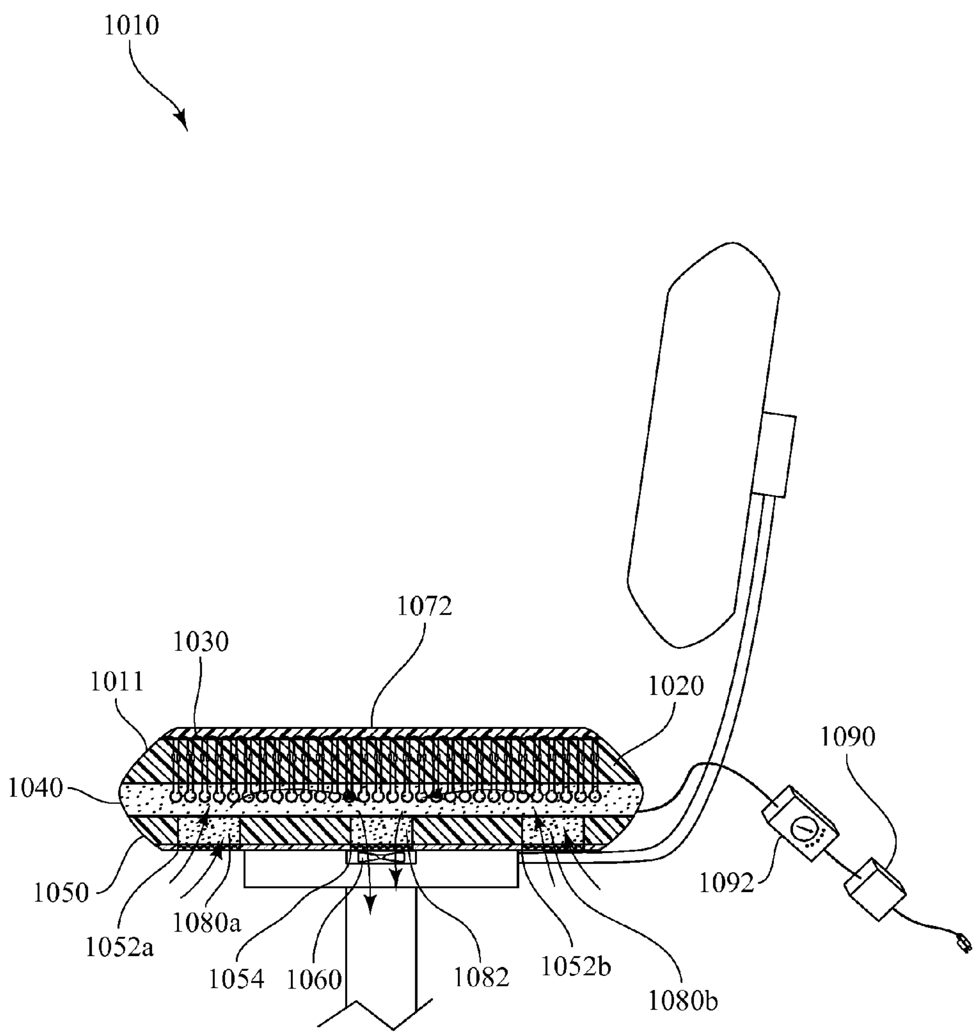
2030
LOGO

FIG. 21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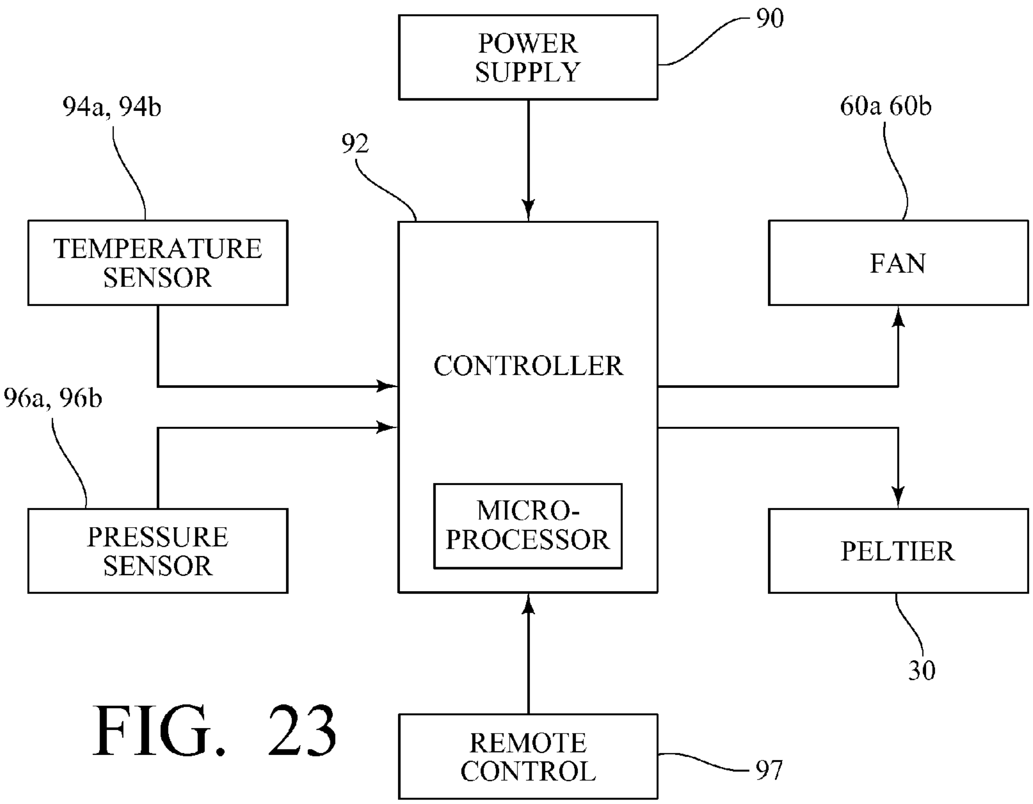
1052b
1080b

FIG. 22


POWER SUPPLY
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94a, 94b
92
60a 60b
TEMPERATURE SENSOR
CONTROLLER
FAN
96a, 96b
MICRO-PROCESSOR
PRESSURE SENSOR
PELTIER
30
REMOTE CONTROL
97

FIG. 23

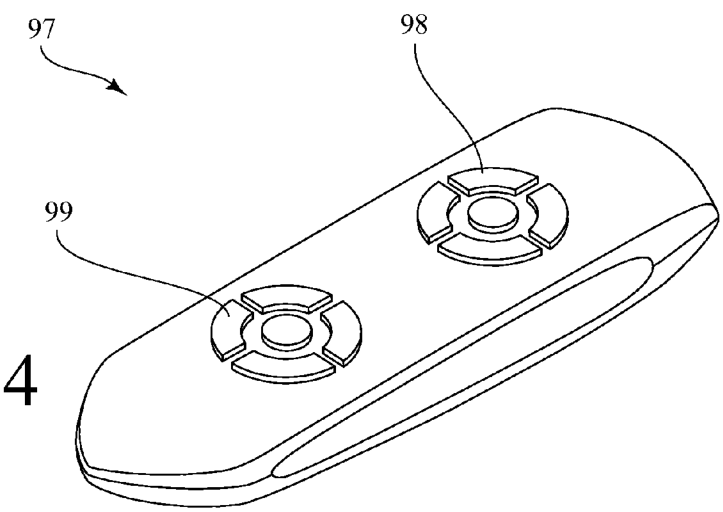
97
98
99

FIG. 24

SUPPORT CUSHIONS INCLUDING THERMOELECTRIC ELEMENTS AND AIR CONDUITS, AND METHODS FOR CONTROLLING SURFACE TEMPERATURE OF SAME

RELATED APPLICATIONS

[0001] This application claims priority from U.S. Provisional Application Ser. No. 61/836,268, filed Jun. 18, 2013, and U.S. Provisional Application Ser. No. 61/836,245, filed Jun. 18, 2014, the entire disclosures of which are incorporated herein by this reference.

TECHNICAL FIELD

[0002] The present invention relates to support cushions and methods for controlling the surface temperature of support cushions. In particular, the present invention relates to support cushions, such as mattress assemblies, that make use of thermoelectric elements and internal air conduits to selectively heat or cool the surfaces of the support cushions.

BACKGROUND

[0003] An aspect of successful and restful sleep is individual sleep comfort. Medical research suggests that sleep deprivation ("sleep debt") can have significant negative impacts on longevity, productivity, and overall mental, emotional, and physical health. Chronic sleep debt has been linked to weight gain and, more specifically, has been observed to not only affect the way the body processes and stores carbohydrates, but has also been observed to alter hormone levels that affect appetite. Moreover, sleep debt may result in irritability, impatience, inability to concentrate, and moodiness, which has led some researchers to suggest a link between sleep debt and worksite accidents, traffic incidents, and general afternoon inattentiveness. Furthermore, sleep disorders have been linked to hypertension, increased stress hormone levels, and irregular heartbeat, and additional research has recently suggested that a lack of sleep can affect immune function, resulting in increased susceptibility to illness and disease, e.g., cancer. In all, researchers have now suggested that sleep debt costs the United States $63 billion annually in lost productivity due to these various effects. Accordingly, a support cushion that improves sleep comfort and lowers individual sleep debt would be both highly desirable and beneficial.

SUMMARY

[0004] The present invention includes support cushions and methods for controlling the surface temperature of support cushions. In particular, the present invention includes support cushions, such as mattress assemblies, that make use of thermoelectric elements and internal air conduits to selectively heat or cool the surfaces of the support cushions. Thus, the support cushions of the present invention allow a user to individualize their level of comfort, including sleep comfort, by controlling the temperature of the surface of the support cushions.

[0005] In one exemplary embodiment of the present invention, a support cushion is provided in the form of a mattress assembly that includes a body supporting layer having a first surface and a second surface that is opposite the first surface. The mattress assembly further includes a plurality of thermoelectric elements that are positioned and configured to selectively provide heating or cooling at the first surface of the body supporting layer. The mattress assembly also includes a heat transfer layer and a base layer. The heat transfer layer is positioned adjacent to the second surface of the body supporting layer and is operably connected to the thermoelectric elements, while the base layer is positioned adjacent to the heat transfer layer opposite the body supporting layer.

[0006] In addition to being positioned adjacent to the heat transfer layer, the base layer defines an inlet conduit that is in fluid communication with the heat transfer layer, and an outlet conduit that is also in fluid communication with the heat transfer layer, but is spaced at a predetermined distance from the inlet conduit. Further included in the mattress assembly is a fan that is operatively connected to the outlet conduit and, as described in further detail below, acts to draw an amount of air from the inlet conduit, through the heat transfer layer, and into the outlet conduit before dissipating the air away from the mattress assembly.

[0007] With respect to the body supporting layer of the mattress assembly, the body supporting layer is generally comprised of a flexible foam capable of suitably distributing pressure from a user's body, or portion thereof, across the body supporting layer. In some embodiments, the flexible foam is a visco-elastic foam that has a desired density and hardness, and allows pressure to be absorbed uniformly and distributed evenly across the body supporting layer of the mattress assembly. In this regard, in certain embodiments, the body supporting layer can be further covered by a comfort layer that is positioned atop the first surface of the body supporting layer to provide an additional level of comfort to the body of a user, or a portion thereof, resting on the mattress assembly. Such a comfort layer, in certain embodiments, is also comprised of a visco-elastic foam or other foam, but typically has a density less than that of the body supporting layer of the mattress assembly so as to provide a softer surface on which to rest and to also provide a sufficiently soft barrier between the body of a user and the thermoelectric elements of a mattress assembly, the position of which are described in further detail below.

[0008] With respect to the thermoelectric elements of the mattress assembly, the thermoelectric elements are positioned in the mattress assembly and are configured to allow a user to control the temperature of the first (or upper) surface of the body supporting layer of the mattress assembly. For example, in certain embodiments, the thermoelectric elements are comprised of a plurality of Peltier elements that, upon flowing an amount of electrical current in a first direction through the Peltier elements, cool the first surface of the body supporting layer by drawing heat away from the first surface and toward the second surface of the body supporting layer. Similarly, in certain embodiments, upon flowing an amount of electrical current in a second (e.g., opposite) direction through the Peltier elements, the Peltier elements heat the first surface of the body supporting layer by drawing heat away from the second surface of the body supporting layer and toward the first surface of the body supporting portion.

[0009] To further take advantage of the heating and cooling capabilities of the Peltier elements, in certain embodiments, the Peltier elements are arranged in a series, such that the Peltier elements are arranged one after another and are capable of providing heating or cooling across the entire surface of the body supporting layer or a desired portion thereof. In other embodiments, the Peltier elements are arranged in an array, such that a group of Peltier elements can be positioned on a desired area of the body supporting portion and used to selectively heat or cool an area of the body supporting portion that would be in contact with a particular portion of the body of a user that is prone to excessive heating or cooling (e.g., the torso or feet of a user, respectively). In some embodiments, to provide a mattress assembly wherein the Peltier elements can be easily removed from the mattress assembly, the mattress assembly can include one or more removable portions that are comprised of an area of the body supporting layer and a corresponding area of the heat transfer layer, and that each house an array of Peltier elements. In some embodiments, to provide a greater amount of control over the selective heating and cooling of the first surface of the body supporting layer, the Peltier elements are comprised of discrete Peltier elements, are individually addressable, or both.

[0010] To facilitate the heating and cooling of the first surface of body supporting layer, each Peltier element typically spans the width of the body supporting layer of the mattress assembly, such that a first side of each Peltier element is positioned above or adjacent to the first surface of the body supporting portion and the opposite side of each Peltier element is positioned below or adjacent to the second surface of the body supporting portion. In these embodiments, the body supporting layer typically defines a plurality of slots that each include a portion of the Peltier elements that are transmitting heat from one surface of the body supporting surface to the other. In other words, in certain embodiments, the Peltier elements are positioned adjacent to the body supporting layer and are directly transferring heat from one surface of the body supporting layer, through the interior of the body supporting layer, and to the other surface of the body supporting layer.

[0011] In addition to being configured to selectively heat or cool the first surface of the body supporting portion, the thermoelectric elements are also operably connected to a heat transfer layer that is typically comprised of a porous flexible foam. In some embodiments, the heat transfer layer of the mattress assembly is comprised of a porous visco-elastic foam that encases at least a portion of the Peltier elements adjacent to or near the second surface of the body supporting layer. By operably connecting the Peltier elements to the heat transfer layer, the heat transfer layer, in addition to providing structural support for the Peltier elements and overlying body supporting layer, provides an open environment into which the heat generated by the Peltier elements can be transferred, such as by diffusion of heat from the Peltier elements into the porous flexible foam of the heat transfer layer. Upon transferring the heat from the Peltier elements into the porous flexible foam of the heat transfer layer, the heat can then by transferred out of the heat transfer layer by conveying an amount of air through the porous flexible foam of the heat transfer layer.

[0012] Turning now to the base layer of the mattress assembly, as noted, the base layer defines an inlet conduit in fluid communication with the heat transfer layer and an outlet conduit that is also in fluid communication with the heat transfer layer and is operably connected to a fan. The base layer is generally also comprised of a flexible foam. In some embodiments, however, the base layer is comprised of a flexible foam having a porosity that is less than that of the flexible foam comprising the heat transfer layer positioned above the base layer. In this regard, when the fan operably connected to the outlet conduit is activated, the fan does not directly draw air into the inlet conduit, through the base layer, and then into the outlet conduit and away from the mattress assembly. Instead, by including a base layer in the mattress assembly that is comprised of a flexible foam having has a porosity less than that of the flexible foam comprising the heat transfer layer, the fan acts to create an air flow route whereby air enters the inlet conduit through an inlet, meets the less porous base layer, travels into the more porous heat transfer layer, picks up any heat generated by the Peltier elements, and then travels from the heat transfer layer into the outlet conduit before being dissipated away from the mattress assembly.

[0013] With further respect to the mattress assemblies of the present invention that make use of a base layer having a porosity less than that of an adjacent heat transfer layer, in some embodiments, a mattress assembly is provided that includes: a base layer having a head portion and a foot portion; one or more inlet conduits that extend longitudinally through the base layer from the head portion; and one or more outlet conduits that extend longitudinally through the base layer from the foot portion and that are each operably connected to a fan. For instance, in some embodiments of the mattress assemblies of the present invention, a mattress assembly is provided that includes a base layer having three inlet conduits extending longitudinally through the base layer from inlets positioned on the head end of the base layer, and two outlet conduits extending longitudinally through the base layer from outlets positioned on a foot end of the base layer. More specifically, in those embodiments, a first inlet conduit is positioned on a first side of the base layer, a second inlet conduit is positioned in a central portion of the base layer, and a third inlet conduit positioned in a second side of the base layer opposite the first inlet conduit. A first outlet conduit is then positioned between the first inlet conduit and the second inlet conduit, and a second outlet conduit is positioned between the second inlet conduit and the third inlet conduit. In this regard, when the fan attached to each outlet conduit is activated, air is drawn into each of the inlet conduits, into a portion of the heat transfer layer positioned between a particular inlet conduit and the outlet conduit that is in closest proximity to that particular inlet conduit, and then into the outlet conduit before it is dissipated away from the mattress assembly.

[0014] In some embodiments of the mattress assemblies of the present invention, the inlet conduits and the outlet conduits included in an exemplary base layer are in the form of evacuated or hollow channels that extend longitudinally through the base layer and allow a maximum amount of air to flow through the channels and the heat transfer layer of each mattress assembly. In other embodiments of the mattress assemblies of the present invention, a flexible foam insert having a porosity greater than that of the base layer can be included each inlet conduit and each outlet conduit of a base layer. By including the flexible foam inserts in each inlet and outlet conduit, a base layer is provided where the inlet and outlet conduits are essentially filled with a flexible foam that provides an increased amount of support to the heat transfer layer, but yet still also allows for a sufficient amount of air to flow into the inlet conduits, into the heat transfer layer, and then into the outlet conduits to dissipate heat away from the thermoelectric elements and away from the mattress assembly.

[0015] For example, in some embodiments of the mattress assemblies of the present invention that make use of flexible foam inserts positioned in each of the inlet and outlet conduits of a base layer, a mattress assembly is provided having: a first inlet conduit extending longitudinally through a first side of the base layer and including a flexible foam insert; a second inlet conduit extending longitudinally through a second side of the base layer opposite the first side and including a flexible foam insert; and an outlet conduit extending longitudinally through the base layer between the first inlet conduit and the second inlet conduit and including a flexible foam insert. In such an embodiment, upon activation of a fan operably connected to the outlet conduit, air is thus first drawn into the flexible foam inserts in each of the inlet conduits. The air then travels from the inlet conduits in the first side and second side of the mattress assembly, through the heat transfer layer, and then into the flexible foam insert in the outlet conduit positioned in the central portion of the mattress assembly, where it is then dissipated away from the mattress assembly.

[0016] As another example of a mattress assembly that makes use of flexible foam inserts in the inlet conduits and outlet conduits of a base layer, in some embodiments, each of the one or more inlet conduits and outlet conduits are substantially rectangular areas that are positioned at the head end and the foot end of an exemplary mattress assembly, respectively, and that each include a flexible foam insert having a porosity greater than that of the base layer. In this regard, in these embodiments and upon activation of a fan operatively connected to the outlet conduit, air enters the flexible foam insert positioned in the inlet conduit, and then enters and travels along the length of the heat transfer layer before it enters and subsequently exits through the flexible foam insert positioned in the outlet conduit at the foot end of the mattress assembly.

[0017] In yet further embodiments of the present invention, the base layers of the mattress assemblies include inlet and outlet conduits that do not extend from a first end or second end of the base layer (e.g., from the head end or foot end of the mattress assembly). Instead, in such embodiments, the base layer defines one or more inlet conduits that extend from the bottom surface of the base layer to the heat transfer layer, and one or more outlet conduits that extend from the bottom surface of the base layer to the heat transfer layer and that are spaced at a predetermined distance from each of the one or more inlet conduits. For example, in one such embodiment, a mattress assembly is provided that comprises a first inlet conduit extending longitudinally through a first side of the base layer, a second inlet conduit extending longitudinally through a second side of the base layer opposite the first side, and an outlet conduit positioned between the first inlet conduit and the second inlet conduit. In that embodiment, neither the first inlet conduit, the second inlet conduit, nor the outlet conduit extend from or contact the head end or the foot end of the base layer. Instead, because the first inlet conduit, the second inlet conduit, and the outlet conduit each extend from the bottom surface of the base layer to the heat transfer layer, air flows from below the base layer, into the inlet conduits, and upwardly into and through the heat transfer layer before being drawn back down into the outlet conduit and away from the mattress assembly by virtue of a fan operatively connected to the outlet conduit.

[0018] In other embodiments of the mattress assemblies of the present invention that include inlet and outlet conduits extending from the bottom surface of the base layer to the heat transfer layer, the inlet conduits, the outlet conduits, or both the inlet and inlet conduits do not extend longitudinally through the base layer, but are instead in the form of columnar voids. In some embodiments, a mattress assembly is provided that includes at least two columnar voids as inlet conduits on a first side of the base layer, at least two columnar voids as inlet conduits on a second side of the base layer opposite the first side, and an elongated channel as an outlet conduit that extends longitudinally through the base layer between the inlet conduits on the first side and the inlet conduits on the second side of the base layer. In another embodiment, a mattress assembly is provided that includes at least two columnar voids as outlet conduits positioned on a first side of the base layer, a second side of the base layer, or both, and an elongated channel as an inlet conduit that extends longitudinally through the base layer (e.g., through a central portion of the base layer). In yet further embodiments, a mattress assembly is provided that includes at least two columnar voids as outlet conduits positioned on a first side of the base layer, at least two columnar voids as outlet conduits positioned on a second side of the base layer opposite the first side, and at least two columnar voids as inlet conduits positioned in a central portion of the base layer.

[0019] With further respect to the mattress assemblies of the present invention that make use of a base layer having inlet conduits and outlet conduits that extend from the bottom surface of the base layer to the heat transfer layer, in some of those embodiments, a flexible foam insert is positioned in each of the inlet and outlet conduits and has a porosity greater than that of the base layer. In such embodiments, and similar to the embodiments described above, air is drawn into the flexible foam insert positioned in each of the inlet conduits, into and through the heat transfer layer, and into the flexible foam insert positioned in each of the outlet conduits upon activation of a fan operatively connected to each of the outlet conduits. In other embodiments of the mattress assemblies, however, the porosity of the flexible foam inserts positioned in the inlet or outlet conduits is the same as or is at least comparable to the base layer. In those embodiments, to draw air into each inlet conduit, into the heat transfer layer, and then into each outlet conduit, a barrier layer is used to cover one or more portions of the base layer including, in some embodiments, a continuous side panel of the base layer, as well as top and/or bottom surface of the base layer.

[0020] Regardless of the particular arrangement and configuration of the base layer of the mattress assembly, each mattress assembly of the present invention further includes a power supply for supplying electrical current to the plurality of thermoelectric elements and the fan attached to each outlet conduit, and a controller for controlling the electrical current that is supplied to the plurality of thermoelectric elements and each fan. By including a controller in the mattress assemblies, the amount of electrical current supplied to each fan can not only be controlled to control the amount of air being drawn through the mattress assembly, but the amount of electrical current being supplied to the thermoelectric elements can also be controlled to provide a desired amount of heating or cooling at the first surface of the body supporting layer. For example, in certain embodiments, the controller is configured to automatically control the electrical current supplied to Peltier elements, such that the electrical current can be supplied to the Peltier elements in a particular direction to heat or cool the first surface of the body supporting portion when the first surface of the body supporting portion reaches a particular temperature. As another example, the controller, in some embodiments, is configured to allow the electrical current to be supplied to the Peltier elements for a predetermined time period, such as for an 8-hour sleeping period or for a length of time that corresponds to the time a user usually spends in a specific stage of the sleep cycle (e.g., REM sleep).

[0021] To provide an additional level of control over the thermoelectric elements included in the mattress assemblies of the present invention, in certain embodiments, the mattress assemblies further include one or more features that are operably connected to the body supporting layer, the heat dissipating layer, or both of the mattress assembly and provide input to the controller. Such features include, in some embodiments, pressure sensors that provide pressure feedback to the controller and allow the controller to automatically begin heating or cooling the mattress assembly when a user lies on the mattress or otherwise places an amount of pressure on the mattress assembly. In other embodiments, temperature sensors are included in an exemplary mattress assembly and provide temperature feedback to the controller to allow the controller to selectively heat or cool the first surface of the body supporting portion in response to received temperature feedback and to maintain a desired temperature. Such desired temperature or pressure feedback settings are, in certain embodiments, directly inputted or adjusted at the controller itself or, in other embodiments, can be transmitted to the controller from a remote control that is also operably connected to the controller and allows a user to remotely adjust the first surface of the body supporting layer to a desired temperature.

[0022] As an additional refinement to the mattress assemblies of the present invention, in some embodiments, mattress assemblies are provided that include additional features to further increase the comfort and convenience of the user of the mattress assembly. For example, as described above, each of the mattress assemblies of the present invention generally includes at least three layers, namely a body supporting layer, a heat transfer layer, and a base layer. In some embodiments, however, additional layers are incorporated into the mattress assemblies to provide an increased level of comfort, to provide additional support for the mattress assemblies, or both. For instance, in certain embodiments, a foundation is included in the mattress assembly to provide support to the body supporting layer, the heat transfer layer, and/or the base layer. In some embodiments, the foundation can be used as a housing for the fans that are operatively connected to the outlet conduits of the mattress assemblies.

[0023] With further regard to the support cushions of the present invention, an exemplary support cushion can also be used as part of a method of controlling a surface temperature of a support cushion. In some implementations, a method of controlling the surface temperature of a support cushion includes first providing a support cushion having a body supporting layer, a heat transfer layer, and a base layer positioned adjacent to the heat transfer layer opposite the body supporting layer and having a porosity less than that of the heat transfer layer. The base layer further defines one or more inlet conduits in fluid communication with the heat transfer layer, and one or more outlet conduits in fluid communication with the heat transfer layer and spaced at a predetermined distance from each of the one or more inlet conduits. A fan is also included in the mattress assembly utilized as part of the method and is operably connected to each of the one or more outlet conduits. In this regard, in some implementations of the method of controlling the surface temperature of the support cushion, an electrical current is then supplied to each fan, such that each fan draws an amount of air into each of the inlet conduits, from the inlet conduits and through the heat transfer layer, and then into the outlet conduits to thereby control the surface temperature of the support cushion. In some implementations of the method, the support cushion further comprises a plurality of Peltier elements that are positioned and configured to selectively provide heating or cooling at the first surface of the body supporting layer. In such implementations, an electrical current can also be supplied to the plurality of Peltier elements, such that when electrical current is supplied in a first direction, the surface temperature of the body supporting portion decreases, and such that when electrical current is supplied in a second direction, the surface temperature of the body supporting portion increases.

[0024] Further features and advantages of the present invention will become evident to those of ordinary skill in the art after a study of the description, figures, and non-limiting examples in this document.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] FIG. **1** is a perspective view of an exemplary support cushion, in the form of a mattress assembly, made in accordance with the present invention;

[0026] FIG. **2** is a cross-sectional view of the exemplary mattress assembly of FIG. **1** taken along line **2-2** of FIG. **1**;

[0027] FIG. **3** is a partial cross-sectional view of the exemplary mattress assembly of FIG. **1** also taken along line **2-2** of FIG. **1**;

[0028] FIG. **4** is another cross-sectional view of the exemplary mattress assembly of FIG. **1**, but taken along line **4-4** of FIG. **1**;

[0029] FIG. **5** is an exploded, perspective view of the exemplary mattress assembly of FIG. **1**;

[0030] FIG. **6** is an exploded, perspective view of another exemplary mattress assembly made in accordance with the present invention;

[0031] FIG. **7** is an exploded, perspective view of another exemplary mattress assembly made in accordance with the present invention;

[0032] FIG. **8** is an exploded, perspective view of another exemplary mattress assembly made in accordance with the present invention;

[0033] FIG. **9** is a cross-sectional view of the exemplary mattress assembly of FIG. **8** taken along line **9-9** of FIG. **8**;

[0034] FIG. **10** is an exploded, perspective view of another exemplary mattress assembly made in accordance with the present invention;

[0035] FIG. **11** is a cross-sectional view of the exemplary mattress assembly of FIG. **10** taken along line **11-11** of FIG. **10**;

[0036] FIG. **12** is an exploded, perspective view of another exemplary mattress assembly made in accordance with the present invention;

[0037] FIG. **13** is a cross-sectional view of the exemplary mattress assembly of FIG. **12** taken along line **13-13** of FIG. **12**;

[0038] FIG. **14** is an exploded, perspective view of another exemplary mattress assembly made in accordance with the present invention;

[0039] FIG. **15** is a cross-sectional view of the exemplary mattress assembly of FIG. **14** taken along line **15-15** of FIG. **14**;

[0040] FIG. **16** is an exploded, perspective view of another exemplary mattress assembly made in accordance with the present invention;

[0041] FIG. **17** is a cross-sectional view of the exemplary mattress assembly of FIG. **16** taken along line **17-17** of FIG. **16**;

[0042] FIG. **18** is an exploded, perspective view of another exemplary mattress assembly made in accordance with the present invention;

[0043] FIG. **19** is a cross-sectional view of the exemplary mattress assembly of FIG. **18** taken along line **19-19** of FIG. **18**;

[0044] FIG. **20** is an exploded, perspective view of another exemplary mattress assembly made in accordance with the present invention;

[0045] FIG. **21** is a perspective view of a cover assembly for covering an exemplary mattress assembly of the present invention;

[0046] FIG. **22** is a cross-sectional view of an exemplary support cushion for use in a chair and made in accordance with the present invention;

[0047] FIG. **23** is a schematic diagram showing input into and output from an exemplary controller used in accordance with the present invention; and

[0048] FIG. **24** is a perspective view of an exemplary remote control for controlling the surface temperature of a support cushion made in accordance with the present invention.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0049] The present invention includes support cushions and methods for controlling the surface temperature of support cushions. In particular, the present invention includes support cushions, such as mattress assemblies, that make use of thermoelectric elements and internal air conduits to selectively heat or cool the surfaces of the support cushions. Thus, the support cushions of the present invention allow a user to individualize their level of comfort, including sleep comfort, by controlling the temperature of the surface of the support cushions.

[0050] Referring first to FIGS. **1-5**, in one exemplary embodiment of the present invention, a support cushion in the form of a mattress assembly **10** is provided that includes a body supporting layer **20** having a first surface **22** and a second surface **24** that is opposite the first surface **22**. The mattress assembly **10** further includes a plurality of thermoelectric elements in the form of Peltier elements **30** that are positioned and configured to selectively provide heating or cooling at the first surface **22** of the body supporting layer **20**. The mattress assembly also includes a heat transfer layer **40** and a base layer **50**. The heat transfer layer **40** is positioned adjacent to the second surface **24** of the body supporting layer **20** and is operably connected to the thermoelectric elements **30**, while the base layer **50** is positioned adjacent to the heat transfer layer **40** opposite the body supporting layer **20** and is supported by a foundation **70**.

[0051] In addition to being positioned adjacent to the heat transfer layer **40**, the base layer **50** defines three inlet conduits **52***a*, **52***b*, **52***c*, each of which extend longitudinally from respective inlets **53***a*, **53***b*, **53***c* positioned on the head end **56** of the base layer **50**. Each of the inlet conduits **52***a*, **52***b*, **52***c* are in fluid communication with the heat transfer layer **40**. The base layer **50** further defines a first outlet conduit **54***a* and a second outlet conduit **54***b*, each of which extend longitudinally from respective outlets **55***a*, **55***b* positioned on the foot end **58** of the base layer **50**. Each of the outlet conduits **54***a*, **54***b* are also in fluid communication with the heat transfer layer **40**, but are spaced at a predetermined distance from each of the inlet conduits **52***a*, **52***b*, **52***c*. Further included in the mattress assembly **10** is a first fan **60***a* that is operatively connected to the first outlet conduit **54***a*, and a second fan **60***b* that is operatively connected to the second outlet conduit **54***b*. As described in further detail below, each of the fans **60***a*, **60***b* act to draw an amount of air from the inlet conduits **52***a*, **52***b*, **52***c*, through the heat transfer layer **40**, and into the respective outlet conduits **54***a*, **54***b* before dissipating the air away from the mattress assembly **10**.

[0052] The body supporting layer **20** of the mattress assembly **10** is generally comprised of a continuous layer of flexible foam for suitably distributing pressure from a user's body or portion thereof across the body supporting layer **20**. Such flexible foams include, but are not limited to, latex foam, reticulated or non-reticulated visco-elastic foam (sometimes referred to as memory foam or low-resilience foam), reticulated or non-reticulated non-visco-elastic foam, polyurethane high-resilience foam, expanded polymer foams (e.g., expanded ethylene vinyl acetate, polypropylene, polystyrene, or polyethylene), and the like. In the embodiment shown in FIGS. **1-5**, the body supporting layer **20** is comprised of a visco-elastic foam that has a low resilience as well as a sufficient density and hardness, which allows pressure to be absorbed uniformly and distributed evenly across the body supporting layer **20** of the mattress assembly **10**. Generally, such visco-elastic foams have a hardness of at least about 10 N to no greater than about 80 N, as measured by exerting pressure from a plate against a sample of the material to a compression of at least 40% of an original thickness of the material at approximately room temperature (i.e., 21° C. to 23° C.), where the 40% compression is held for a set period of time as established by the International Organization of Standardization (ISO) 2439 hardness measuring standard. In some embodiments, the visco-elastic foam has a hardness of about 10 N, about 20 N, about 30 N, about 40 N, about 50 N, about 60 N, about 70 N, or about 80 N to provide a desired degree of comfort and body-conforming qualities.

[0053] The visco-elastic foam described herein for use in the mattress assembly **10** can also have a density that assists in providing a desired degree of comfort and body-conforming qualities, as well as an increased degree of material durability. In some embodiments, the density of the visco-elastic foam used in the body supporting layer **20** has a density of no less than about 30 kg/m^3 to no greater than about 150 kg/m^3. In some embodiments, the density of the visco-elastic foam used in the body supporting layer **20** of the mattress assembly **10** is about 30 kg/m^3, about 40 kg/m^3, about 50 kg/m^3, about 60 kg/m^3, about 70 kg/m^3, about 80 kg/m^3, about 90 kg/m^3, about 100 kg/m^3, about 110 kg/m^3, about 120 kg/m^3, about 130 kg/m^3, about 140 kg/m^3, or about 150 kg/m^3. Of course, the selection of a visco-elastic foam having a particular density will affect other characteristics of the foam, including its hardness, the manner in which the foam responds to pressure, and the overall feel of the foam, but it is appreciated that a visco-elastic foam having a desired density and hardness can readily be selected for a particular application or mattress assembly as desired. Additionally, it is appreciated that the body supporting layers of the mattress assemblies need not be comprised of a continuous layer of flexible foam at all, but can also take the form of more traditional mattresses, including spring-based mattresses, without departing from the spirit and scope of the subject matter described herein.

[0054] Referring still to FIGS. **1-5**, the body supporting layer **20** of the mattress assembly **10** is further covered by a comfort portion or layer **72** that is positioned atop the body supporting layer **20** and provides a level of comfort to a body of a user or a portion of thereof that is resting on the mattress assembly **10**. The comfort layer **72** can also be comprised of a visco-elastic foam. However, the comfort layer **72** typically has a density, hardness, or both that is less than that of the body supporting layer **20** of the mattress assembly **10**, such that the comfort layer **72** provides a softer surface on which to rest the body of a user or a portion thereof, while also providing a sufficiently soft barrier between the body of a user and the Peltier elements **30** of the mattress assembly **10**, as described in further detail below. For example, in certain embodiments, the mattress assembly **10** includes a body supporting layer **20** that is comprised of visco-elastic foam with a density of about 80 kg/m^3 and a hardness of about 13 N, while the comfort layer **72** is comprised of a visco-elastic foam with a density of about 35 kg/m^3 and a hardness of about 10 N.

[0055] With further regard to the body supporting layer **20** shown in FIGS. **1-5**, the flexible foam material utilized for the body supporting layer **20** generally has a composition different than that of the heat transfer layer **40** of the mattress assembly **10**, as is described in further detail below, but it is additionally contemplated that an exemplary body supporting layer can be further comprised of one or more different or additional layers having various densities and hardnesses. For instance, it is contemplated that a layer of high-resilience polyurethane foam can be secured to the second surface of a layer of low-resilience visco-elastic foam used in a body supporting portion. Such multi-layered body supporting portions are described, for example, in U.S. Pat. Nos. 7,469,437; 7,507,468; 8,025,964; and 8,034,445, as well as in U.S. Patent Application Publication No. 2011/0252562, each of which is incorporated herein by this reference.

[0056] Turning now to the thermoelectric elements included in the support cushions of the present invention, various thermoelectric elements can be incorporated into a support cushion and used to heat or cool a surface of an exemplary support cushion, including resistive heaters that convert electrical energy to heat, as well as other thermoelectric elements. In the exemplary mattress assembly **10** shown in FIGS. **1-5**, and as indicated above, the thermoelectric elements are Peltier elements **30** that are positioned in the mattress assembly **10** and are configured to allow a user to control the temperature of the first surface **22** of the body supporting layer **20** of the mattress assembly **10**, which can then change the temperature of the comfort layer **72** of the mattress assembly **10** by virtue of the proximity of the first surface **22** of the body supporting layer **20** to the comfort layer **72**. The Peltier elements **30**, which may also be referred to as Peltier devices, Peltier heaters or heat pumps, solid-state refrigerators or thermoelectric heat pumps, are solid-state active heat pumps which transfer heat from one side of body supporting layer **20** of the mattress assembly **10** to the other side of the body supporting layer **20** by flowing an amount of electrical current through the Peltier elements **30** to produce a Peltier effect or, in other words, the presence of heat at an electrified junction of two different metals.

[0057] In the Peltier elements **30** shown in FIGS. **1-5**, the junctions of two different metals are in the form of a n-type semiconductor or element **32** and a p-type semiconductor or element **34**. In these Peltier elements **30**, when an amount of electrical current flows in a first direction through the n-type element **32**, crosses a metallic interconnect **33**, and passes into the p-type element **34**, a Peltier effect is created whereby electrons in the n-type elements **32** move in the opposite direction of the current and holes in the p-type element **34** move in the direction of current, such that both remove heat from the first surface **22** of the body supporting layer **20** of the mattress assembly **10** toward the second surface **24** of the body supporting layer **20**. Similarly, with the Peltier elements **30**, upon flowing an amount of electrical current in a second (e.g., opposite) direction through the Peltier elements **30** and the n-type elements **32** and p-type elements **34**, the Peltier effect can be reversed, and the Peltier elements **30** can be used to heat the first surface **22** of the body supporting layer **20** by drawing heat away from the second surface **24** of the body supporting layer **20** and toward the first surface **22** of the body supporting layer **20**. For additional information and guidance regarding the Peltier effect, including the types of Peltier elements that may be included in support cushion to create such an effect, see, e.g., U.S. Patent Application Publication Nos. 2012/0198616 and 2012/0060885, each of which is incorporated herein by this reference in their entirety.

[0058] As shown in FIG. **3**, to facilitate the heating and cooling of the first surface **22** of body supporting layer **20**, the Peltier elements **30** substantially span the width of the body supporting layer **20** of the mattress assembly **10** such that an upper portion **31** of each of the Peltier elements **30** is positioned above and adjacent to the first surface **22** of the body supporting layer **20**, and the metallic interconnects **33** of the Peltier elements **30** are positioned below and adjacent to the second surface **24** of the body supporting layer **20**. Although not shown in FIG. **3**, to allow the Peltier elements **30** to pass through the body supporting layer **20**, the body supporting layer **20** typically includes slots to allow a portion of the Peltier elements **30**, including the n-type elements **32** and the p-type elements **34** to be positioned in and pass through the body supporting layer **20** and allow heat to be transferred from one surface of the body supporting layer **20** to the other. In other words, and as best shown in FIG. **2**, the Peltier elements **30** are positioned adjacent to the body supporting layer **20** and direct transfer heat from one surface of the body supporting layer **20** and through the body supporting layer **20** to the other surface of the body supporting layer **20** and into the heat transfer layer **40**.

[0059] Referring now to FIGS. **2-5**, to further take advantage of the heating and cooling capabilities of the Peltier elements **30**, the Peltier elements **30** are arranged in a series, where the Peltier elements **30** are arranged one after another to provide substantially uniform and continuous heating or cooling across the entire first surface **22** of the body supporting layer **20** or a portion thereof. In this regard, and as best shown in FIGS. **4-5**, the Peltier elements **30** are further arranged in arrays **35*a***, **35*b***, **35*c***, **35*d***, such that groupings of Peltier elements **30** are positioned on certain areas of the body supporting layer **20** and used to selectively heat or cool an area of the body supporting layer **20**. In the mattress assembly **10**, each of the arrays **35*a***, **35*b***, **35*c***, **35*d*** are included in removable portions **12*a***, **12*b***, **16*a***, **16*b*** of the mattress assembly **10** that are each comprised of a portion of the body supporting layer **20** and a corresponding portion of the heat transfer layer **40**, and that allow a user to easily remove the Peltier elements **30** from the mattress assembly **10** as desired (e.g., to service or replace the Peltier elements **30**). Further, each of the removable portions **12*a***, **12*b***, **16*a***, **16*b*** are positioned in the mattress assembly **10**, such that the arrays **35***a*, **35***b*, **35***c*, **35***d* of the Peltier elements **30** would be in contact with a particular portion of the body of a user that is prone to excessive heating or cooling (e.g., the torso a user vs. the feet of a user). For example, and as described in further detail below, in some embodiments, the arrays **35***a*, **35***b*, **35***c*, **35***d* of Peltier elements **30** are individually addressable such that it is possible to cool the arrays **35***a*, **35***b* that would be in contact with the torso or head of a user lying in a supine or prone position, while heating the arrays **35***c*, **35***d* that would be in proximity to the feet of a user lying in a supine or prone position. Of course, to provide a greater amount of control over the selective heating and cooling of the first surface **22**, individual rows or columns of the Peltier elements **30** in the arrays **35***a*, **35***b*, **35***c*, **35***d* can also be individually addressable such that more specific portions of the first surface **22** of the body supporting layer **20** can be selectively heated and cooled to allow a particular portion of a user's body to be heated or cooled, or to allow only the Peltier elements **30** that are in closest contact with the body of a user to be selectively heated or cooled (e.g., when a user is lying on their side). Likewise, although not shown in FIGS. **2-5**, it is also appreciated that the Peltier elements used in the mattress assemblies of the present invention can be provided in the form of discrete Peltier elements that are not connected to one another in a series, so as to provide an even greater amount of control over the heating and cooling of the first surface of a body supporting layer.

[0060] Referring now to FIGS. **2-3**, in addition to being configured to selectively heat or cool the first surface **22** of the body supporting layer **20**, the Peltier elements **30** are also operably connected to the heat transfer layer **40** of the mattress assembly **10**. More particularly, in the embodiment shown in FIGS. **2-3**, the heat transfer layer **40** of the mattress assembly **10** is comprised of a substantially uniform layer of a porous visco-elastic foam that is secured to and covers the entirety of the second surface **24** of the body supporting layer **20**. The porous visco-elastic foam of the heat transfer layer **40** also encases the metallic interconnects **33** of the Peltier elements **30** near the second surface **24** of the body supporting layer **20**. In this regard, by operably connecting the Peltier elements **30** to the heat transfer layer **40**, the porous visco-elastic foam of the heat transfer layer **40**, in addition to providing structural support for the Peltier elements **30** and the overlying body supporting layer **20**, provides an open environment into which the heat generated by the Peltier elements **30** can be transferred, such as by the flow of air across the Peltier elements **30** and through the open environment provided by the porous visco-elastic foam of the heat transfer layer **40**, as described in further detail below.

[0061] With further respect to the porous visco-elastic foam included in the heat transfer layer **40** of the mattress assembly, it of course contemplated that the heat transfer layer need not be comprised of a visco-elastic foam, but that any number of porous flexible foams can be used to produce a heat transfer layer having a porosity sufficient to allow for the heat generated by the Peltier elements to dissipate within. In this regard, the term "porous flexible foam" (visco-elastic or otherwise) is used herein to generally refer to flexible foam having a cellular foam structure in which at least a portion of the cells of the foam are essentially skeletal. In other words, at least a portion of the cells of the foam are each defined by a plurality of apertured windows surrounded by cell struts, where the cell windows of the porous foam can be entirely absent (leaving only the cell struts) or substantially missing. In some embodiments, the foam is considered "porous" if at least 50% of the windows of the cells are missing (i.e., windows having apertures therethrough, or windows that are completely missing and therefore leaving only the cell struts). Such structures can be created by destruction or other removal of cell window material, by chemical or mechanical means, or by preventing the complete formation of cell windows during the manufacturing process of the foam. In some embodiments of the present invention, the term "porous" can thus be used interchangeably with the term "reticulated" when referring to flexible foam.

[0062] Regardless of the manufacturing process used to produce the porous foam, porous foam, by virtue of its open cellular structure, has characteristics that are well suited for use in the heat transfer layer **40** of the mattress assembly **10**, including the enhanced ability to permit fluid movement through the porous foam and, consequently, the ability to provide enhanced air movement into, through, and away from the heat transfer layer **40** of the mattress assembly **10**. In this regard, by encasing the metallic interconnects **33** of the Peltier elements **30** in the porous visco-elastic foam of the heat transfer layer **40**, the heat that is transferred to the heat transfer layer **40** by the Peltier elements **30** as part of the cooling of the first surface **22** of the body supporting layer **20** is allowed to easily disperse throughout the porous visco-elastic foam of the heat transfer layer **40**. Upon transferring heat into the open environment of the heat transfer layer **40**, the heat can then easily be transferred out of the heat transfer layer **40** by conveying an amount of air through the porous visco-elastic foam of the heat transfer layer **40**. In the mattress assembly **10**, the heat transfer layer **40** and, in particular, the porous visco-elastic foam of the heat transfer layer **40**, has a pore size of about 10 pores per inch (ppi) to allow a sufficient amount of air to move into, through, and away from the heat transfer layer **40**. It is of course contemplated, however, that the size of the pores present in the foam of an exemplary heat transfer layer can readily be adjusted as needed to convey a particular amount of air through an exemplary heat transfer layer and/or through a particular mattress assembly without departing from the spirit and scope of the subject matter described herein.

[0063] Turning now to the base layer **50** of the mattress assembly **10**, and referring again to FIGS. **1-5**, as noted above, the base layer **50** defines three separate, hollow inlet conduits **52***a*, **52***b*, **52***c* that are spaced apart from one another and extend longitudinally from the head end **56** of the base layer **50**. The base layer **50** further defines two separate, hollow outlet conduits **54***a*, **54***b* that extend longitudinally from the foot end **58** of the base layer **50**, with the first outlet conduit **54***a* being positioned between the first inlet conduit **52***a* and the second inlet conduit **52***b*, and the second outlet conduit **54***b* being positioned between the second inlet conduit **52***b* and the third inlet conduit **52***c*. Each of the inlet conduits **52***a*, **52***b*, **52***c* and each of the outlet conduits **54***a*, **54***h* span the width of the base layer **50** and extend from the bottom surface **59** of the base layer **50** to the bottom surface **44** of the heat transfer layer **40**. As such, and by virtue of the hollow nature of the inlet conduits **52***a*, **52***b*, **52***c* and the outlets conduits **54***a*, **54***h*, each the inlet conduits **52***a*, **52***b*, **52***c* and the outlet conduits **54***a*, **54***b* of the base layer **50** are in fluid communication with the heat transfer layer **40**.

[0064] The base layer **50** is also generally comprised of a flexible foam. In the embodiments shown in FIGS. **1-5**, the base layer **50** is comprised of a standard polyurethane foam. However, the polyurethane foam used in the base layer **50** has a porosity that is less than that found in the porous visco-elastic foam of the heat transfer layer **40** positioned immediately above the base layer **50**. In this regard, when the first fan **60***a* operably connected to the first outlet conduit **54***a* is activated and the second fan **60***b* operably connected to the second outlet conduit **54***b* is activated, the first fan **60***a* and the second fan **60***b* do not directly draw air into the inlet conduits **52***a*, **52***b*, **52***c*, through the base layer **50**, and then into the outlet conduits **54***a*, **54***b* and away from the mattress assembly **10**. Instead, by including a base layer **50** in the mattress assembly **10** that has a porosity less than that of the heat transfer layer **40**, the fans **60***a*, **60***b* act to create an air flow route whereby air is drawn into the inlet conduits **52***a*, **52***b*, **52***c* through the respective inlets **53***a*, **53***b*, **53***c*, meets the less porous base layer **50**, is drawn into the more porous heat transfer layer **40** and picks up any heat generated by the Peltier elements **30** and dissipated into the heat transfer layer **40**, and then travels from the heat transfer layer **40** into the outlet conduits **54***a*, **54***b* before being dissipated away from the mattress assembly **10** by the first fan **60***a* and the second fan **60***b*.

[0065] To further facilitate the flow of air through the inlet conduits **52***a*, **52***b*, **52***c*, into the heat transfer layer **40**, and then into the outlet conduits **54***a*, **54***b*, and to also prevent the various layers of the mattress assembly **10** from moving relative to one another during use, the base layer **50** and the heat transfer layer **40**, as well as the body supporting layer **20** and the comfort layer **72**, are generally secured to one another. Various means of securing one layer of material to another can be used in this regard, including tape, hook and loop fasteners, conventional fasteners, stitches, and the like. In one particular embodiment, the base layer **50**, the heat transfer layer **40**, the body supporting layer **20**, and the comfort layer **72** are bonded together by an adhesive or cohesive bonding material to create a substantially continuous assembly where the comfort layer **72** and the body supporting layer **20** and are fully adhered to one another, the body supporting layer **20** and the heat transfer layer **40** are fully adhered to one another, and the heat transfer layer **40** and the base layer **50** are fully adhered to one another. Such adhesive bonding materials include, for example, environmentally-friendly, water based adhesives, like SABA AQUABOND RSD, a two-component water-based adhesive product produced by SABA DINXPERLO BV, B-7090 AA, Dinxperlo, Belgium.

[0066] Regardless of the particular means for adhering the various layers to one another, and referring now to FIGS. **1-5** and to the schematic diagram of a circuit of the mattress assembly **10** shown in FIG. **23**, the mattress assembly **10** further includes a power supply **90** for supplying electrical current to the Peltier elements **30** and the fans **60***a*, **60***b*, as well as a controller **92** for controlling the electrical current that is supplied to the plurality of Peltier elements **30** and the fans **60***a*, **60***b*. By including a controller **92** in the mattress assembly **10**, not only can the amount of electrical current being supplied to each of the fans **60***a*, **60***b* be controlled in order to control the amount of air being drawn into the mattress assembly **10**, but the amount of electrical current supplied to the Peltier elements **30** can also be controlled to provide a desired amount of heating or cooling at the first surface **22** of the body supporting layer **20** of the mattress assembly **10**. For example, the controller **92** can be configured to automatically control the electrical current supplied to Peltier elements **30**, such that electrical current can be supplied to the Peltier elements **30** to heat or cool the first surface **22** of the body supporting layer **20** when the first surface **22** of the body supporting layer **20** reaches a particular temperature, such as after a user has been lying on the body supporting layer **20** for an extended period of time. As another example, the controller **92** can also be configured to allow the electrical current to be supplied to the Peltier elements **30** for a predetermined time period, such as for an 8-hour sleeping period.

[0067] As yet another example, the controller **92** can further be configured to supply electrical current to the Peltier elements **30** in a manner that corresponds to a user's sleep rhythms. For instance, it is appreciated that during REM (rapid eye movement) sleep, a user generally loses at least some of their ability to control the temperature of his or her body. As such, in certain embodiments, the controller **92** can be configured to begin cooling the first surface **22** of the body supporting layer **20** at a time during the course of a night's sleep when a user would generally be in REM sleep. Alternatively, the controller **92** can further be operably connected to a device that monitors sleep rhythms, such as, for example, the ZEO SLEEP MANAGER™ manufactured by ZEO, Newton, Mass., such that the controller **92** can be configured to provide electrical current to the Peltier elements **30** upon receiving input that the user lying on the mattress assembly **10** has entered a particular stage of the sleep cycle (e.g., REM sleep).

[0068] In addition to providing control over the amount of current that is being supplied to the Peltier elements **30**, the controller **92** of the mattress assembly **10** further allows the direction of the electrical current being supplied to the Peltier elements **30** to be controlled. In this regard, the controller **92** can be used to not only alter the direction of the electrical current being supplied to the Peltier elements **30** in order to either selectively heat or cool the first surface **22** of the body supporting layer **20** of the mattress assembly **10**, but can further be configured to dissipate heat away from the heat transfer layer **40** of the mattress assembly **10** after an extended period of cooling the first surface **22** of the body supporting layer **20**. For instance, after an overnight period of cooling the first surface **22** of the body supporting layer **20**, a significant amount of heat will have been transferred to the heat transfer layer **40** of the mattress assembly **10**. As such, and in addition to or as an alternative to activating the fans **60***a*, **60***b* to dissipate such heat and move it away from the heat transfer layer **40**, the direction of the electrical current being supplied to the Peltier elements **30** can be reversed, and the heat in the heat transfer layer **40** can be transferred from the heat transfer layer **40** to the first surface **22** of the body supporting layer **20** and released into the surrounding atmosphere.

[0069] To provide an additional level of control over the Peltier elements included in the mattress assemblies of the present invention, exemplary mattress assemblies can further include one or more features that are operably connected to the body supporting layers, the heat transfer layers, or both and provide input to the controllers. For example, and referring now to FIGS. **4** and **23**, the mattress assembly **10** includes pressure sensors **94***a*, **94***b* that provide pressure feedback to the controller **92** in response to a user resting upon the first surface **22** of the body supporting layer **20** to thereby allow the controller **92** to automatically begin providing electrical current and heating or cooling the mattress assembly **10** as soon as the user lies on the mattress assembly **10** or otherwise places an amount of pressure on the mattress assembly **10**. As also shown in FIGS. **4** and **23**, temperature sensors **96***a*, **96***b* are further included in the mattress assembly **10** and provide temperature feedback to the controller **92** to thereby allow the controller **92** to selectively heat or cool the first surface of the mattress assembly **10** in response to the received temperature feedback and to thereby maintain a desired temperature at the first surface **22** of the body supporting layer **20**. Such desired temperature or pressure feedback settings are, in certain embodiments, directly inputted or adjusted at the controller **92** itself or, in other embodiments, are transmitted to the controller **92** from a remote control **97** that includes temperature control buttons **98** and fan control buttons **99**, as shown in FIG. **24**, and that is also operably connected to the controller **92** such that the Peltier elements **30** and fans **60***a*, **60***b* of the mattress assembly **10** can be operated remotely.

[0070] With further regard to the fans **60***a*, **60***b* of the mattress assembly **10**, and referring again to FIGS. **1-5**, the first fan **60***a* is generally secured to the first outlet **55***a* and the second fan **60***b* is generally secured to the second outlet **55***b* at the foot end **58** of the base layer. However, it is contemplated that each of the fans **60***a*, **60***b* can also be housed within the outlet conduits **54***a*, **54***b* themselves or within specialized assemblies to conceal the fans **60***a*, **60***b* within the mattress assembly **10** itself and/or to reduce the amount of noise generated by the fans. Furthermore, in the mattress assembly **10**, it is also contemplated that any number of types of fans, as well as any number of other means for drawing an amount of air through an exemplary mattress assembly of the present invention, including air pumps and the like, can be used in accordance with the present invention. Such fans include, for example, a Delta Electronics Fan Model No. P/N VFB070B3A1-DC54 manufactured and distributed by Delta Electronics, Inc. (Taipei City, Taiwan).

[0071] Upon activation of the first fan **60***a* and the second fan **60***b* in the mattress assembly **10** shown in FIGS. **1-5**, the arrangement of the three inlet conduits **52***a*, **52***b*, **52***c* and the two outlet conduits **54***a*, **54***b* in the mattress assembly **10** has been found to allow for a sufficient amount of air to be moved through the heat transfer layer **40** to thereby dissipate heat away from the Peltier elements **30** included in an exemplary "king" size mattress assembly. It is contemplated, however, that a number of different arrangements of inlet and outlet conduits can be used in an exemplary mattress assembly of the present invention and can be selected based, at least in part, on the size of the mattress assembly. For example, and referring now to FIG. **6**, in another embodiment of the present invention that makes use of separate, hollow inlet and outlet conduits, a "twin" size mattress assembly **110** is provided that includes a comfort layer **172**, a body supporting layer **120** having a first surface **122** and a second surface **124** that is opposite the first surface **122**, a heat transfer layer **140**, a base layer **150** comprised of a material having porosity greater than that of the heat transfer layer **140**, and a foundation **170**. The mattress assembly **110** further includes a plurality of Peltier elements **130** that are arranged in a first array **135***a* in a first removable insert **112** positioned in a central region **114** of the mattress assembly **110** and in a second array **135***b* in a second removable insert **116** positioned in a lower region **118** of the mattress assembly **110**. Unlike the "king" size mattress assembly **10** shown in FIGS. **1-5**, however, the base layer **150** of the "twin" size mattress assembly **110** does not include a series of three inlet conduits and two outlet conduits. Rather, in the "twin" size mattress assembly **110**, the base layer **150** only includes a single inlet conduit **152** extending longitudinally through the base layer **150** from an inlet **153** positioned on a head end **156** of the base layer **150**, and a single outlet conduit **154** extending longitudinally through the base layer **150** from an outlet **155** positioned on a foot end **158** of the base layer **150**. Additionally, by virtue of only including the single outlet conduit **154** in the base layer **150**, the mattress assembly **110** only includes a single fan **160** operably connected to the outlet conduit **154**. In this regard, when the fan **160** is activated, via a power supply **190** and controller **192** connected to the fan **160** and Peltier elements **130**, the fan **160** draws air into the single inlet conduit **152**, up through the heat transfer layer **140**, and then into the single outlet conduit **154** before exiting through the outlet **155**.

[0072] As an additional refinement, in the mattress assembly **110**, to ensure that fresh air is entering the base layer **150** and, more specifically, the inlet conduit **153**, the base layer **150** also includes a filter **195** that covers the inlet **153**, such that only filtered air is allowed to pass into the inlet conduit **152** through the inlet **153** and the inlet conduit **152** is kept free of particulates such as smoke, dust, dirt, pollen, mold, bacteria, hair, or insects that may otherwise collect in the interior of the mattress **10** and limit air flow. Of course, it is contemplated that various types of filters including, but not limited to, charcoal filters for removing chemicals and/or unpleasant odors can be readily incorporated into an exemplary mattress of the present invention without departing from the spirit and scope of the subject matter described herein.

[0073] As another refinement to the mattress assemblies of the present invention that make use of inlet and outlet conduits in a base layer to provide for a sufficient amount of air flow through an exemplary mattress assembly, and referring now to FIG. **7**, in another embodiment, a mattress assembly **210** is provided that also includes a comfort layer **272**, a body supporting layer **220** having a first surface **222** and a second surface **224** that is opposite the first surface **224**, a heat transfer layer **240**, a base layer **250** comprised of a material having porosity less than that of the heat transfer layer **240**, and a foundation **270**. The mattress assembly **210** further includes a plurality of Peltier elements **230** that are arranged in separate arrays **235***a*, **235***b*, **235***c*, **235***d* included in removable portions **212***a*, **212***b*, **212***c*, **212***d* of the mattress assembly **210**. Additionally, defined by the base layer **250** of the mattress assembly **210**, are three separate inlet conduits **252***a*, **252***b*, **252***c* that are spaced apart from one another and that extend longitudinally from inlets **253**; **253***b*, **253***c* at the head end **256** of the base layer **250**. The base layer **250** further defines two separate outlet conduits **254***a*, **254***b* that extend longitudinally from particular outlets **255***a*, **255***b* at the foot end **258** of the base layer **250**, with the first outlet conduit **254***a* operably connected to a first fan **260***a* and positioned between the first inlet conduit **252***a* and the second inlet conduit **252***b*, and with the second outlet conduit **254***b* operably connected to a second fan **260***b* and positioned between the second inlet conduit **252***b* and the third inlet conduit **252***c*.

[0074] As an alternative to including hollow inlet and outlet conduits in the mattress assembly **210**, however, the mattress assembly **210** includes a porous foam insert **280***a*, **280***b*, **280***c* positioned in each of the inlet conduits **252***a*, **252***b*, **252***c* and a porous foam insert **282***a*, **282***b* positioned in each of the outlet conduits **254**; **254***b*. Each of the porous foam inserts **280**; **280***b*, **280***c* positioned in the inlet conduits **252***a*, **252***b*, **252***c* and each of the porous foam inserts **282***a*, **282***b* positioned in the outlet conduits **254***a*, **254***b* have a porosity greater than that of the flexible foam comprising the base layer **250**. In this regard, by positioning the porous foam inserts **280***a*, **280***b*, **280***c* in the inlet conduits **252***a*, **252***b*, **252***c* and the porous foam inserts **282***a*, **282***b* in the outlet conduits **254***a*, **254***b*, the porous foam inserts **280***a*, **280***b*, **280***c*, **282***a*, **282***b* allow a greater amount of support to be provided to the heat transfer layer **240**, but yet still allow for a sufficient amount of air to be drawn into the inlet conduits **252***a*, **252***b*, **252***c*, into the heat transfer layer **240**, and then into the outlet conduits **254***a*, **254***b* to dissipate heat away from the Peltier elements **230** in the heat transfer layer **240** and away from the mattress assembly **210**. In particular, when the fans **260***a*, **260***b* are activated via a power supply **290** and a controller **292** connected to the fans **260***a*, **260***b* and Peltier elements **230**, the fans **260***a*, **260***b* draw air through the porous foam inserts **280***a*, **280***b*, **280***c* in the inlet conduits **252***a*, **252***b*, **252***c*, through the heat transfer layer **240**, and then into the porous foam inserts **282***a*, **282***b* in the outlet conduits **254***a*, **254***b* before exiting the mattress assembly **210** through the outlets **255***a*, **255***b* at the foot end **258** of the base layer **250**.

[0075] As a further refinement to the use of inlet and outlet conduits in accordance with the present invention and, more particularly, to the use of porous foam inserts in such inlet and outlet conduits, in some embodiments, the inlet and outlet conduits can be positioned in discrete areas of a base layer of an exemplary mattress assembly rather than extending longitudinally through a substantial portion of the base layer. Referring now to FIGS. **8-9**, in another exemplary embodiment, a mattress assembly **310** is provided that includes a comfort layer **372**, a body supporting layer **320** having a first surface **322** and a second surface **324** that is opposite the first surface **324**, a plurality of Peltier elements **30**, a heat transfer layer **340**, a base layer **350** comprised of a material having porosity less than that of the heat transfer layer **140**, and a foundation **370**. The mattress assembly **310** further includes a first inlet conduit **352***a* and a second inlet conduit **352***b*, as well as a first outlet conduit **354***a* operably connected to a first fan **360***a* and a second outlet conduit **354***b* operably connected to a second fan **360***b*. The first inlet conduit **352***a* and the first outlet conduit **354***a* are positioned on a first side **362** of the base layer **350**, and the second inlet conduit **352***b* and second outlet conduit **354***b* are positioned on a second side **364** of the base layer **350** opposite the first side **362**. Notably, however, each of the inlet conduits **352***a*, **352***b* and each of the outlet conduits **354***a*, **354***b* do not extend longitudinally through a substantially portion of the base layer **350**. Rather, each of the inlet conduits **352***a*, **352***b* and each of the outlet conduits **354***a*, **354***b* are substantially rectangular areas that are positioned at the head end **356** and at the foot end **358** of the mattress assembly **310**, respectively, and that each include a porous foam insert **380***a*, **380***b*, **382***a*, **382***b* having a porosity greater than that of the base layer **350**. As such, upon activation of the fans **360***a*, **360***b* operatively connected to the outlet conduits **354***a*, **354***b* via a controller **392** and a power supply **390**, air enters the porous foam inserts **380***a*, **380***b* positioned in the inlet conduits **352***a*, **352***b*, travels upwards into the heat transfer layer **340** across the Peltier elements **330**, and then travels downwardly into the porous foam inserts **382***a*, **382***b* positioned in the outlet conduits **354***a*, **354***b* before exiting the foot end **358** of the base layer **350** and thereby dissipating any heat generated by the Peltier elements **330** away from the mattress assembly **310**, as best shown by the arrows in FIG. **9**.

[0076] As yet another refinement to the use of inlet and outlet conduits in accordance with the present invention, in some embodiments, the base layers of the mattress assemblies can include inlet and outlet conduits that do not extend from a head end or foot end of the base layer, but instead extend only from a bottom surface of the base layer. Referring now to FIGS. **10-11**, in another exemplary embodiment, a mattress assembly **410** is provided that, similar to the other embodiments described herein, includes a comfort layer **472**, a body supporting layer **420** having a first surface **422** and a second surface **424** that is opposite the first surface **422**, a plurality of Peltier elements **430**, a heat transfer layer **440**, and a base layer **450** comprised of a flexible foam having porosity less than that of the heat transfer layer **440**. The mattress assembly **410** further includes a first inlet conduit **452***a* extending longitudinally through a first side **462** of the base layer **450**, a second inlet conduit **452***b* extending longitudinally through a central portion **466** of the base layer **450**, a third inlet conduit **452***c* also extending longitudinally through the central portion **466** of the base layer and spaced apart from the second inlet conduit **452***b*, and a fourth inlet conduit **452***d* extending longitudinally though a second side **464** of the base layer **450** opposite the first side **462**. Also included in the mattress assembly **410** is a first outlet conduit **454***a* extending longitudinally through the base layer **450** and positioned between the first inlet conduit **452***a* and the second inlet conduit **452***b*, and a second outlet conduit **454***b* extending longitudinally through the base layer **450** and positioned between the third inlet conduit **452***c* and fourth inlet conduit **452***d*. Porous foam inserts **480***a*, **480***b*, **480***c*, **480***d* are positioned in each of the inlet conduits **452***a*, **452***b*, **452***c*, **452***d*, and porous foam inserts **482***a*, **482***b* are also positioned in each of the outlet conduits **454***a*, **454***b*. In the mattress assembly **410**, however, neither the inlet conduits **452***a*, **452***b*, **452***c*, **452***d*, nor the outlet conduits **454***a*, **454***b* extend from or contact the head end **456** or the foot end **458** of the base layer **450**. Instead, in the mattress assembly **410**, each of the inlet conduits **452***a*, **452***b*, **452***c*, **452***d* and each of the outlet conduits **454***a*, **454***b*, in addition to extending longitudinally through the base layer, span the thickness of the base layer **450** and extend from the bottom surface **459** of the base layer **450** to the heat transfer layer **440**.

[0077] In the embodiment shown in FIGS. **10 and 11**, to facilitate the movement of air from the bottom surface **459** of the base layer **450** to the heat transfer layer **440**, the mattress assembly **410** further includes a foundation **470** positioned adjacent to the bottom surface **459** of the base layer **450**. The foundation **470** includes a plurality of grates **471** positioned below and having a shape corresponding to the inlet conduits **452***a*, **452***b*, **452***c*, **452***d* and the outlet conduits **454***a*, **454***b* of the base layer **450**. The foundation **470** further houses a first fan **460***a* positioned below and operably connected to the first outlet conduit **454***a* and a second fan **460***b* positioned below and operably connected to the second outlet conduit **454***b*. By positioning the first fan **460***a* and the second fan **460***b* below the first outlet conduit **454***a* and the second outlet conduit **454***b*, upon activation of the fans **460***a*, **460***b*, air is drawn from below the base layer **450**, through the grates **471**, into the inlet conduits **452***a*, **452***b*, **452***c*, **452***d*, and then upwardly into and through the heat transfer layer **440** before being drawn back down into the first outlet conduit **454***a* and the second outlet conduit **454***b* and away from the mattress assembly **410**, as indicated by the arrows in FIG. **11**.

[0078] Referring now to FIGS. **12-13**, in another embodiment of the present invention, a mattress assembly **510** is provided that includes another exemplary arrangement of inlet conduits **552***a*, **552***b*, **552***c*, **552***d* and outlet conduits **554***a*, **554***b*. Similar to the exemplary mattress assembly **410** shown in FIGS. **10-11**, the mattress assembly **510** includes a comfort layer **572**, a body supporting layer **520** having a first surface **522** and a second surface **524** that is opposite the first surface **522**, a plurality of Peltier elements **530**, a heat transfer layer **540**, a base layer **550**, and a foundation **570** housing a first fan **560***a* and a second fan **560***b* that are each positioned below one of the outlet conduits **554***a*, **554***b*. The foundation **570** also similarly includes a number of grates **571** corresponding to the position and shape of the inlet conduits **552***a*, **552***b*, **552***c*, **552***d* and outlet conduits **554***a*, **554***b*. In the mattress assembly **510**, however, the inlet conduits **552***a*, **552***b*, **552***c*, **552***d* do not extend longitudinally through a substantial length of the base layer **550**. Instead, the inlet conduits **552***a*, **552***b*, **552***c*, **552***d* defined by the base layer **550** of the mattress assembly **510** are in the form of columnar voids that extend from the bottom surface **559** of the base layer **550** to the heat transfer layer **540**.

[0079] In particular, the base layer **550** includes a first row of three inlet conduits **552***a* in the form of columnar voids that are spaced apart from one another in a first side **562** of the base layer **550**, a second row of three inlet conduits **552***b* in the form of columnar voids that are spaced apart from one another in a central portion **566** of the base layer **550**, a third row of three inlet conduits **552***c* in the form of columnar voids that are spaced apart from one another and from the second row of inlet conduits **552***b* in the central portion **566** of the base layer **550**, and a fourth row of three inlet conduits **552***d* in the form of columnar voids that are spaced apart from one another in a second side **564** of the base layer **550**. In the mattress assembly **510**, a first outlet conduit **554***a* then extends longitudinally though the base layer **550** between the first row of inlet conduits **552***a* and the second row of inlet conduits **552***b*, and a second outlet conduit **554***b* extends longitudinally though the base layer **550** between the third row of inlet conduits **552***c* and the fourth row of inlet conduits **552***d*. Porous foam inserts **580***a*, **580***b*, **580***c*, **580***d* are further positioned in each of the inlet conduits **552***a*, **552***b*, **552***c*, **552***d*, respectively. Additionally, a porous foam insert **582***a* is positioned in the first outlet conduit **554***a* and a porous foam insert **582***b* is positioned in the second outlet conduit **554***b*. Thus, when the first fan **560***a* and the second fan **560***b* are activated via a controller **592** and power supply **590** connected to the mattress assembly **510**, air is drawn from below the base layer **550**, into porous foam inserts **580***a*, **580***b*, **580***c*, **580***d* positioned in the inlet conduits **552***a*, **552***b*, **552***c*, **552***d*, and then upwardly into and through the heat transfer layer **540** before being drawn back down into the porous foam insert **582***a* positioned in the first outlet conduit **554***a* and the porous foam insert positioned in the second outlet conduit **554***b* and away from the mattress assembly **510**, as indicated by the arrows in FIG. **13**.

[0080] As an additional refinement to the base layer **550** of the mattress assembly **510**, the base layer **550** of the mattress **510** is not comprised of a flexible foam having a porosity greater than that of the heat transfer layer **540**, so as to direct an amount of air through the row of inlet conduits **452***a*, **452***b*, **452***c*, **452***d* and into the heat transfer layer **540**. Rather, in the mattress assembly **510**, the base layer **550** is also comprised of a porous foam. In this regard, the mattress assembly **510** further includes a barrier layer **584** that is positioned over the exposed exterior surfaces of the base layer **550** and the heat transfer layer **540** (i.e., the continuous side walls of the base layer **550** and the heat transfer layer **540**, and the bottom surface **559** of the base layer **550**), as well as between the base layer **550** and the heat transfer layer **540**. The barrier layer **584** can be comprised of a number of different materials, such as plastics, textiles, and the like, but, in all cases, functions as an substantially air tight layer that directs air being drawn through the base layer **550** and the heat transfer layer **540** by the fans **560***a*, **560***b* through the rows of inlet conduits **552***a*, **552***b*, **552***c*, **552***d*, into the heat transfer layer **540**, and then into the first outlet conduit **554***a* and the second outlet conduit **554***b*.

[0081] Referring now to FIGS. **14-15**, in another exemplary embodiment of the present invention, a mattress assembly **610** is provided that includes yet another arrangement of inlet conduits **652** and outlet conduits **654***a*, **654***b*. Again, the mattress assembly **610** includes a comfort layer **672**, a body supporting layer **620** having a first surface **622** and a second surface **624** that is opposite the first surface **622**, a plurality of Peltier elements **630**, a heat transfer layer **640**, a base layer **650** comprised of a flexible foam having a porosity less than that of the heat transfer layer **640**, and a foundation **670** including a number of grates **671** corresponding to the position and shape of the inlet conduits **652** and outlet conduits **654***a*, **654***b*. The foundation **670** further houses four separate fans (of which only a first fan **660***a* and a second fan **660***b* are shown in FIG. **15**) that are angled to direct air away from the mattress assembly **610** and that are connected to a controller **692** and a power supply **690**.

[0082] Porous foam inserts **680** are also included in each of the inlet conduits **652** and porous foam inserts **682***a*, **682***b* are also included in each of the outlet conduits **654***a*, **654***b*, respectively, of the mattress assembly **610**. In the mattress assembly **610**, however, the inlet conduits **652** are included in a central portion **666** of the base layer **650**, and a first row of the outlet conduits **654***a* is included on a first side **662** of the base layer **650** and a second row of outlet conduits **654***b* are included on a second side **664** of the mattress assembly **610**. In this regard, when air is drawn into the mattress assembly **610**, the air first enters the porous foam inserts **680** positioned in the inlet conduits **652** in the central portion **666** of the mattress assembly **610**, then flows through the heat layer transfer layer **640** to both the first side **662** of the base layer **650** and the second side **664** of the base layer **650** before exiting through the porous foam inserts **682***a*, **682***b* in the outlet conduits **682***a*, **682***b*, as shown best in FIG. **15**.

[0083] As yet another example of a mattress assembly made in accordance with the present invention, in another embodiment and referring now to FIGS. **16-17**, a mattress assembly **710** is provided that includes a comfort layer **772**, a body supporting layer **720** having a first surface **722** and a second surface **724** that is opposite the first surface **722**, a plurality of Peltier elements **730**, a heat transfer layer **740**, a base layer **750**, and a foundation **770** including a number of shaped grates **771**. The foundation **770** also houses four separate fans, of which only a first fan **760***a* and a second fan **760***b* are shown in FIG. **17**. The mattress assembly **710** further includes a first row of outlet conduits **754***a* positioned on a first side **762** of the base layer **750** and including porous foam inserts **782***a*, and a second row of outlet conduits **754***b* positioned on a second side **764** of the base layer **750** and including porous foam inserts **782***b*. Unlike the mattress assembly

610 shown in FIGS. **14-15**, however, in the mattress assembly **710**, the inlet conduit **752** is in the form of a porous foam area **780** positioned in a central portion **766** of the base layer **750** and extending longitudinally from the head end **756** of the base layer **750** to the foot end **758** of the base layer **750**. Moreover, in the mattress assembly **710**, the base layer **750** is comprised of a porous foam and a barrier layer **784** is again positioned over the exterior surfaces of the base layer **750** and the heat transfer layer **740**, as well as between the base layer **750** and the heat transfer layer **740**. As such, when air is drawn into the mattress assembly **710**, the air enters the base layer **750** along the length of the porous foam area **780** of the inlet conduit **752**, and flows upwardly from the porous foam area **780** and then throughout the entirety of the heat transfer layer **740** before it is directed downwardly into the porous foam inserts **782***a*, **782***b* in the outlet conduits **754***a*, **754***b*, as best shown in FIG. **17**.

[0084] Referring now to FIGS. **18-19**, as an alternative to the mattress assembly **710** shown in FIGS. **16-17**, another exemplary mattress assembly **810** is provided that similarly includes a comfort layer **872**, a body supporting layer **820**, a plurality of Peltier elements **830**, a heat transfer layer **840**, a base layer **850**, and a foundation **870** including a number of grates **871** and housing four separate fans, of which only a first fan **860***a* and a second fan **860***b* are shown in FIG. **19**. The mattress assembly **810** also includes a first row of outlet conduits **854***a* positioned on a first side **862** of the base layer **850** and including porous foam inserts **882***a*, and a second row of outlet conduits **852***b* positioned on a second side **864** of the base layer **850** and including porous foam inserts **882***b*. Further included in the mattress assembly **810** is an inlet conduit **852** in the form of a porous foam area **880** extending longitudinally in a central portion **866** of the base layer **850**. In the mattress assembly **810**, however, the base layer **850** is not comprised of a porous foam, but is instead comprised a standard flexible foam (e.g., a polyurethane foam) having a porosity less than that of the heat transfer layer **840**. Moreover, in the mattress assembly **810**, a barrier layer **884** is only used to surround the exterior surfaces of the base layer **850** and the heat transfer layer **840**, and is not positioned between the base layer **850** and the heat transfer layer **840**.

[0085] As an additional refinement to the present invention, although each of the mattress assemblies **10**, **110**, **210**, **310**, **410**, **510**, **610**, **710**, **810** shown in FIGS. **1-19** include a plurality of Peltier elements **30**, **130**, **230**, **330**, **430**, **530**, **630**, **730**, **830**, the present invention is further inclusive of mattress assemblies that do not make use of a plurality of Peltier elements to selectively cool the body supporting layer of a mattress assembly. For example, as shown in FIG. **20**, in an additional exemplary embodiment of the present invention, a mattress assembly **910** is provided that includes a body supporting layer **920**, a heat transfer layer **940** comprised of a porous flexible foam, and a base layer **950** comprised of a flexible foam having a porosity less than that of the porous flexible foam of the heat transfer layer **940**. The mattress assembly **910** also includes three inlet conduits **952***a*, **952***b*, **952***c* and two outlet conduits **954***a*, **954***b* defined by the base layer **950**. Further included in the mattress assembly is a pair of fans **960***a*, **960***b* operably connected to a power supply **990** and a controller **992**, with one of the fans **960***a*, **960***b* operatively connected to each of the two outlet conduits **954***a*, **954***b*. To selectively cool the body supporting layer **920** of the mattress assembly, however, no Peltier elements are used. Rather in the mattress assembly **910**, the body supporting layer **920** is cooled by activating each of the fans **960***a*, **960***b* to draw an amount of air into the inlet conduits **952***a*, **952***b*, **952***c*, through the heat transfer layer **940** where the air picks up heat absorbed by the adjacent body supporting layer **920**, and then into the outlet conduits **954***a*, **954***b* before being dissipated away from the mattress assembly **910**.

[0086] As an even further refinement to the mattress assemblies of the present invention, one or more covers can also be included and used to cover the mattress assemblies described herein. For example, in one embodiment, a cover in the form of a fire sock can be first used to initially surround an exemplary mattress assembly. Then, an outer fabric cover, such as a cover comprised of 100% cotton or another soft and breathable textile, can be used to cover the fire sock. As another example, and referring now to FIG. **21**, in one exemplary embodiment of the present invention, a cover assembly **2010** for an exemplary mattress assembly can be utilized that includes a first cover **2020** having a top panel **2022**, a bottom panel **2024**, and a continuous side panel **2030**. The continuous side panel **2030** of the first cover **2020** can be characterized as including a head panel **2032**, a foot panel **2034**, and two opposing side panels **2036**, **2038** that, with the top panel **2022** and bottom panel **2024**, collectively define a cavity for enclosing a mattress assembly of the present invention. The first cover **2020** further includes a brand tag **2062** extending vertically along a portion of the foot panel **2034**.

[0087] The cover assembly **2010** further includes a second cover **2040** having a top surface **2042** and a bottom surface **2044**, with the second cover **2040** also defining a perimeter **2046**. The second cover **2040** of the cover assembly **2010** is generally positioned over the top panel **2022** of the first cover **2020** and is dimensionally-sized to cover at least the top panel **2022** of the first cover **2020**, the area of which is indicated by the hatching that is shown in FIG. **21** and that designates a blue color for the top panel **2022** of the first cover **2020**. In particular, in the cover assembly **2010**, the second cover **2040** is dimensionally-sized to cover the top panel **2022**, the upper halves **2037**, **2039** of each opposing side panel **2036**, **2038**, an upper edge **2035** of the foot panel **2034**, and an upper edge **2033** of the head panel **2032**. By including such a second cover **2040** in the cover assembly **2010**, the second cover **2040** is thus configured to cover and protect the portions of the underlying first cover **2020** and, consequently, the portions of any mattress underlying the first cover **2020**, that would be exposed to excessive wear and would be at an increased risk of becoming stained or damaged, namely the top panel **2022**, the upper halves **2037**, **2039** of each opposing side panel **2036**, **2038**, the upper edge **2035** of the foot panel **2034**, and the upper edge **2033** of the head panel **2032**. Further, by including such a second cover **2040** in the cover assembly **2010**, the second cover **2040** causes the upper halves **2037**, **2039** of each opposing side panel **2036**, **2038** to assume a more rounded configuration upon attachment of the second cover **2040** to the first cover **2020** via a zipper **2050**. Of course, numerous other sizes and configurations for the second cover **2040** can also be readily selected as desired and can be incorporated into a particular cover assembly to prevent damage or staining to a mattress or to alter the appearance of an a mattress without departing from the spirit and scope of the subject matter described herein.

[0088] As an even further refinement to the present invention, although the support cushions shown in FIGS. **1-21** are in the form of mattress assemblies **10**, **110**, **210**, **310**, **410**, **510**, **610**, **710**, **810**, **910**, and are dimensionally sized to support a user lying in a supine or prone position, it is contemplated that the features described herein are equally applicable to head pillows, seat cushions, seat backs, neck pillows, leg spacer pillows, mattress topers, overlays, and the like. As such, the phrase "support cushion" is used herein to refer to any and all such objects having any size or shape, and that are capable of or are generally used to support the body of a user or a portion thereof. For example, as shown in FIG. **22**, in an additional exemplary embodiment of the present invention, a support cushion made in accordance with the present invention is incorporated into the seat **1011** of a desk chair **1010**. Each support cushion of the desk chair **1010** includes: a comfort layer **1072**; a body supporting layer **1020**; a plurality of Peltier elements **1030**; a heat transfer layer **1040** comprised of a porous visco-elastic foam; a base layer **1050** comprised of a flexible foam having a porosity less than that of the visco-elastic foam included in the heat transfer layer **1040**; and a fan **1060** operably connected to a power supply **990** and a controller **992**. The base layer **1050** of the seat **1011** also defines a first inlet conduit **1052***a* and a second inlet conduit **1052***b* that each include a porous foam insert **1080***a*, **1080***b*, as well as an outlet conduit **1054** that includes a porous foam insert **1082** and that is operatively connected to the fan **1060**. The fan **1060** draws an amount of air through the porous foam inserts **1080***a*, **1080***b* in the inlet conduits **1052***a*, **1052***b*, through the heat transfer layer **1040**, and then into the porous foam insert **1082** positioned in the outlet conduit **1054**, to thereby assist in the selective heating and cooling of the seat **1011** of the desk chair **1010**.

[0089] Each of the exemplary support cushions described herein can also be used as part of a method of controlling a surface temperature of a support cushion. In some implementations, a method of controlling the surface temperature of a support cushion includes first providing a support cushion of the present invention. Electrical current is then supplied to each fan such that each fan draws an amount of air into each inlet conduit, through the heat transfer layer, and into each outlet conduit. For implementations where the support the support cushions include a plurality of Peltier elements, electrical current can also be supplied to the plurality of Peltier elements, such that when the electrical current is supplied in a first direction, the surface temperature of the body supporting portion decreases, but when electrical current is supplied in a second direction, the surface temperature of the body supporting portion increases. In some implementations, to control an amount of heating or cooling of the support cushion, the amount of electrical current supplied to the Peltier elements can be controlled. In some implementations, the surface temperature of the support cushion is controlled by first receiving feedback from a temperature sensor or pressure sensor positioned in the body supporting portion of the support cushions, and then supplying electrical current to the fan, the plurality of Peltier elements, or both based on the feedback received from the temperature sensor, the pressure sensor, or both.

[0090] Throughout this document, various references are mentioned. All such references are incorporated herein by reference, including the references set forth in the following list:

REFERENCES

[0091] 1. U.S. Pat. No. 8,034,445 to Landvik, et al., issued Oct. 11, 2011, and entitled "Laminated Visco-Elastic Support."

[0092] 2. U.S. Pat. No. 8,025,964 to Landvik, et al., issued Sep. 27, 2011, and entitled "Laminated Visco-Elastic Support."

[0093] 3. U.S. Pat. No. 7,979,374 to Landvik, issued Jul. 12, 2011, and entitled "Product Demonstration System and Method for Using the Same."

[0094] 4. U.S. Pat. No. 7,735,169 to Wassilefsky, issued Jun. 15, 2010, and entitled "Comfort Pillow."

[0095] 5. U.S. Pat. No. 7,707,670 to Fogg, issued May 4, 2010, and entitled "Pillow top for a Cushion."

[0096] 6. U.S. Pat. No. 7,555,615 to Landvik, issued Jun. 30, 2009, and entitled "Product Demonstration System and Method for Using the Same."

[0097] 7. U.S. Pat. No. 7,507,468 to Landvik, et al., issued Mar. 24, 2009, and entitled "Laminated Visco-Elastic Support."

[0098] 8. U.S. Pat. No. 7,469,437 to Mikkelsen, et al., issued Dec. 30, 2008, and entitled "Reticulated Material Body Support and Method."

[0099] 9. U.S. Pat. No. 7,444,702 to Fogg, issued Nov. 4, 2008, and entitled "Pillow top for a Cushion."

[0100] 10. U.S. Pat. No. 7,415,742 to Wassilefsky, issued Aug. 26, 2008, and entitled "Comfort Pillow."

[0101] 11. U.S. Design Pat. No. D558,499 to Maarbjerg, issued Jan. 1, 2008, and entitled "Pillow."

[0102] 12. U.S. Pat. No. 7,155,765 to Fogg, issued Jan. 2, 2007, and entitled "Pillow top for a Cushion."

[0103] 13. U.S. Design Pat. No. D529,325 to Maarbjerg, issued Oct. 3, 2006, and entitled "Pillow."

[0104] 14. U.S. Pat. No. 7,082,633 to Maarbjerg issued Aug. 1, 2006 and entitled "Pillow."

[0105] 15. U.S. Pat. No. 7,051,389 to Wassilefsky, issued May 30, 2006, and entitled "Comfort Pillow."

[0106] 16. U.S. Pat. No. 6,866,915 to Landvik, issued Mar. 15, 2005, and entitled "Cushion."

[0107] 17. U.S. Pat. No. 6,602,579 to Landvik, issued Aug. 5, 2003, and entitled "Cushion."

[0108] 18. U.S. Pat. No. 6,578,218 to Wassilefsky, issued Jun. 17, 2003, and entitled "Leg Spacer Pillow."

[0109] 19. U.S. Pat. No. 6,541,094 to Landvik, et al., issued Apr. 1, 2003, and entitled "Laminated Visco-Elastic Support."

[0110] 20. U.S. Design Pat. No. D456,660 to Landvik, issued May 7, 2002, and entitled "Contoured Head Pillow."

[0111] 21. U.S. Patent Application Publication No. 2012/0198616 by Makansi, published Aug. 9, 2012, and entitled "Distributed Thermoelectric String and Insulating Panel and Applications for Local Heating, Local Cooling, and Power Generation from Heat."

[0112] 22. U.S. Patent Application Publication No. 2012/0060885 by Makansi, published Mar. 15, 2012, and entitled "Distributed Thermoelectric String and Insulating Panel."

[0113] 23. U.S. Patent Application Publication No. 2011/0252562 by Mikkelsen, et al., published Oct. 20, 2011, and entitled "Adjustable-Firmness Body Support and Method."

[0114] 24. U.S. Patent Application Publication No. 2007/0094803 by Fogg, published May 3, 2007, and entitled "Pillow top for a Cushion."

[0115] 25. U.S. Patent Application Publication No. 2006/0288490 by Mikkelsen, et al., published Dec. 28, 2006, and entitled "Reticulated Material Body Support and Method."

[0116] 26. U.S. Patent Application Publication No. 2006/0277684 by Wassilefsky, published Dec. 14, 2006, and entitled "Comfort Pillow."

[0117] 27. U.S. Patent Application Publication No. 2006/0174414 by Maarbjerg, published Aug. 10, 2006, and entitled "Pillow."

[0118] 28. U.S. Patent Application Publication No. US2005/0202214 by Landvik, published Sep. 15, 2005, and entitled "Cushion."

[0119] 29. U.S. Patent Application Publication No. 2005/0084667 by Landvik, et al., published Apr. 21, 2005, and entitled "Laminated Visco-Elastic Support."

[0120] 30. U.S. Patent Application Publication No. 2005/0076446 by Fogg, published Apr. 14, 2005, and entitled "Pillow top for a Cushion."

[0121] 31. U.S. Patent Application Publication No. 2004/0073931 by Trussel Jr., et al., published Apr. 15, 2004, and entitled "Interactive Bed Display."

[0122] 32. U.S. Patent Application Publication No. 2004/0033351 by Landvik, et al., published Feb. 19, 2004, and entitled "Laminated Visco-Elastic Support."

[0123] 33. U.S. Patent Application Publication No. 2003/0171954 by Guerin, et al., published Sep. 11, 2003, and entitled "Method of Managing the Provision of Healthcare and System for Effecting Same."

[0124] 34. U.S. Patent Application Publication No. 2001/0021438 by Landvik, published Sep. 13, 2001, and entitled "Cushion."

[0125] One of ordinary skill in the art will recognize that additional embodiments are also possible without departing from the teachings of the present invention or the scope of the claims which follow. This detailed description, and particularly the specific details of the exemplary embodiments disclosed herein, is given primarily for clarity of understanding, and no unnecessary limitations are to be understood therefrom, for modifications will become apparent to those skilled in the art upon reading this disclosure and may be made without departing from the spirit or scope of the claimed invention.

What is claimed is:

1. A support cushion, comprising:

a body supporting layer having a first surface and a second surface opposite the first surface;

a plurality of thermoelectric elements positioned and configured to selectively provide heating or cooling at the first surface of the body supporting layer;

a heat transfer layer positioned adjacent to the second surface of the body supporting layer, the heat transfer layer operably connected to the thermoelectric elements;

a base layer positioned adjacent to the heat transfer layer opposite the body supporting layer, the base layer defining an inlet conduit in fluid communication with the heat transfer layer, and the base layer further defining an outlet conduit in fluid communication with the heat transfer layer and spaced at a predetermined distance from the inlet conduit; and

a fan operably connected to the outlet conduit.

2. The support cushion of claim **1**, wherein the base layer further defines an inlet in fluid communication with the inlet conduit and an outlet in fluid communication with the outlet conduit.

3. The support cushion of claim **2**, wherein the fan is connected to the outlet.

4. The support cushion of claim **2**, wherein the inlet is positioned on a first exterior surface of the base layer and the inlet conduit extends longitudinally from the inlet through the base layer, and wherein the outlet is positioned on a second exterior surface of the base layer and the outlet conduit extends longitudinally from the outlet through the base layer.

5. The support cushion of claim **4**, wherein the first exterior surface is a head end of the base layer, and wherein the second exterior surface is a foot end of the base layer.

6. The support cushion of claim **1**, further comprising a foundation positioned below the base layer.

7. The support cushion of claim **6**, wherein the fan is housed in the foundation.

8. The support cushion of claim **1**, wherein the body supporting layer, the heat transfer layer, and the base layer are comprised of a flexible foam.

9. The support cushion of claim **8**, wherein the flexible foam comprising the heat transfer layer has a porosity greater than that of the flexible foam comprising the base layer.

10. The support cushion of claim **8**, wherein the body supporting layer and the heat transfer layer are comprised of a visco-elastic foam.

11. The support cushion of claim **10**, wherein the heat transfer layer is comprised of a porous visco-elastic foam.

12. The support cushion of claim **8**, further comprising a first flexible foam insert positioned in the inlet conduit and a second flexible foam insert positioned in the outlet conduit, both the first flexible foam insert and the second flexible foam insert having a porosity greater than that of the base layer.

13. The support cushion of claim **1**, wherein the thermoelectric elements are discrete Peltier elements.

14. The support cushion of claim **1**, wherein the thermoelectric elements are multiple Peltier elements arranged in a series.

15. The support cushion of **1**, wherein the thermoelectric elements are arranged in an array.

16. The support cushion of claim **15**, wherein at least a portion of the thermoelectric elements of the array are individually addressable.

17. The support cushion of claim **15**, wherein the support cushion includes one or more removable portions, each removable portion comprised of an area of the body supporting layer and a corresponding area of the heat transfer layer, and each removable portion housing an array of thermoelectric elements.

18. The support cushion of claim **17**, wherein the one or more removable portions comprise a first removable portion positioned in a central region of the support cushion and a second removable portion positioned in a lower region of the support cushion.

19. The support cushion of claim **1**, wherein the body supporting layer is dimensionally-sized to support a user lying in a supine or prone position.

20. The support cushion of claim **1**, further comprising a comfort layer positioned atop the body supporting layer, the comfort layer comprised of a visco-elastic foam.

21. The support cushion of claim **20**, wherein the comfort layer has a density less than that of the body supporting layer.

22. The support cushion of claim **1**, further comprising:

a power supply for supplying electrical current to the fan and to the plurality of thermoelectric elements; and

a controller for controlling the electrical current supplied to the fan and to the plurality of thermoelectric elements from the power supply.

23. The support cushion of claim **22**, wherein the controller is configured to allow power to be supplied to the fans, the plurality of thermoelectric elements, or both for a predetermined time period.

24. The support cushion of claim **22**, further comprising one or more temperature sensors for providing thermal feedback to the controller, the one or more temperature sensors operably connected to the body supporting layer.

25. The support cushion of claim **22**, further comprising one or more pressure sensors for providing pressure feedback to the controller, the one or more pressure sensors operably connected to the body supporting layer.

26. The support cushion of claim **1**, further comprising a filter operably connected to the inlet conduit, the outlet conduit, or both the inlet conduit and the outlet conduit.

27. A support cushion, comprising:

a body supporting layer having a first surface and a second surface opposite the first surface;

a heat transfer layer positioned adjacent to the second surface of the body supporting layer;

a base layer positioned adjacent to the heat transfer layer opposite the body supporting layer, the base layer defining one or more inlet conduits in fluid communication with the heat transfer layer, the base layer further defining one or more outlet conduits in fluid communication with the heat transfer layer and spaced at a predetermined distance from each of the one or more inlet conduits, and the base layer having a porosity less than that of the heat transfer layer; and

a fan operably connected to each of the one or more outlet conduits, the fan for drawing an amount of air from the one or more inlet conduits, through the heat transfer layer, and into the one or more outlet conduits.

28. The support cushion of claim **27**, further comprising a flexible foam insert positioned in each of the one or more inlet conduits and a flexible foam insert positioned in each of the one or more outlet conduits, each of the flexible foam inserts having a porosity greater than that of the base layer.

29. A mattress assembly, comprising:

a body supporting layer having a first surface and a second surface opposite the first surface;

a plurality of thermoelectric elements positioned and configured to selectively provide heating or cooling at the first surface of the body supporting layer;

a heat transfer layer positioned adjacent to the second surface of the body supporting layer, the heat transfer layer operably connected to the thermoelectric elements;

a base layer positioned adjacent to the heat transfer layer opposite the body supporting layer, the base layer including a head portion and a foot portion, the base layer defining one or more inlet conduits in fluid communication with the heat transfer layer and extending longitudinally through the base layer from the head portion, and the base layer further defining one or more outlet conduits in fluid communication with the heat transfer layer and extending longitudinally through the base layer from the foot portion; and

a fan operably connected to each of the one or more outlet conduits.

30. The mattress assembly of claim **29**, wherein the one or more inlet conduits comprises a first inlet conduit positioned in a first side of the base layer, a second inlet conduit positioned in a central portion of the base layer, and a third inlet conduit positioned in a second side of the base layer opposite the first side; and

wherein the one or more outlet conduits comprises a first outlet conduit positioned between the first inlet conduit and the second inlet conduit, and a second outlet conduit positioned between the second inlet conduit and the third inlet conduit.

31. The mattress assembly of claim **29**, wherein the mattress assembly includes one or more removable portions, each removable portion comprised of an area of the body supporting layer and a corresponding area of the heat transfer layer, and each removable portion housing an array of thermoelectric elements.

32. The mattress assembly of claim **29**, wherein the body supporting layer, the heat transfer layer, and the base layer are each comprised of a flexible foam, and wherein the flexible foam comprising the heat transfer layer has a porosity greater than that of the flexible foam comprising the base layer.

33. A mattress assembly, comprising:

a body supporting layer having a first surface and a second surface opposite the first surface;

a plurality of thermoelectric elements positioned and configured to selectively provide heating or cooling at the first surface of the body supporting layer;

a heat transfer layer positioned adjacent to the second surface of the body supporting layer, the heat transfer layer operably connected to the thermoelectric elements;

a base layer positioned adjacent to the heat transfer layer opposite the body supporting layer, the base layer defining one or more inlet conduits in fluid communication with the heat transfer layer, and the base layer further defining one or more outlet conduits in fluid communication with the heat transfer layer and spaced at a predetermined distance from the one or more inlet conduits;

a flexible foam insert positioned in each of the one or more inlet conduit and in each of the one or more outlet conduits, each flexible foam insert having a porosity greater than that of the base layer; and

a fan operably connected to each of the one or more outlet conduits.

34. The mattress assembly of claim **33**, wherein the one or more inlet conduits comprises a first inlet conduit extending longitudinally through a first side of the base layer and a second inlet conduit extending longitudinally through a second side of the base layer; and

wherein the one or more outlet conduits comprises a middle outlet conduit positioned between the first inlet conduit and the second inlet conduit and extending longitudinally through a central portion of the base layer.

35. The mattress assembly of claim **33**, wherein each of the one or more inlet conduits comprises a substantially rectangular area at a head end of the base layer, and wherein each of the one or more outlet conduits comprises a substantially rectangular area at a foot end of the base layer.

36. The mattress assembly of claim **35**, wherein the one or more inlet conduits comprises a first inlet conduit positioned on a first side of the base layer and a second inlet conduit positioned on a second side of the base layer opposite the first side; and wherein the one or more outlet conduits comprises a first outlet conduit positioned on the first side of the base layer and a second outlet conduit positioned on the second side of the base layer.

37. The mattress assembly of claim **35**, wherein the body supporting layer, the heat transfer layer, and the base layer are each comprised of a flexible foam, and wherein the flexible foam comprising the heat transfer layer has a porosity greater than that of the flexible foam comprising the base layer.

38. The mattress assembly of claim **35**, wherein the mattress assembly includes one or more removable portions, each removable portion comprised of an area of the body supporting layer and a corresponding area of the heat transfer layer, and each removable portion housing an array of thermoelectric elements.

39. A mattress assembly, comprising:

a body supporting layer having a first surface and a second surface opposite the first surface;

a plurality of thermoelectric elements positioned and configured to selectively provide heating or cooling at the first surface of the body supporting layer;

a heat transfer layer positioned adjacent to the second surface of the body supporting layer, the heat transfer layer operably connected to the thermoelectric elements;

a base layer having a bottom surface and positioned adjacent to the heat transfer layer opposite the body supporting layer, the base layer defining one or more inlet conduits extending from the bottom surface of the base layer to the heat transfer layer, and the base layer further defining one or more outlet conduits extending from the bottom surface of the base layer to the heat transfer layer and spaced at a predetermined distance from each of the one or more inlet conduits; and

a fan operably connected to each of the one or more outlet conduits.

40. The mattress assembly of claim **39**, wherein the one or more inlet conduits comprises a first inlet conduit extending longitudinally through a first side of the base layer and a second inlet conduit extending longitudinally through a second side of the base layer, and

wherein the one or more outlet conduits comprises a middle outlet conduit positioned between the first inlet conduit and the second inlet conduit.

41. The mattress assembly of claim **39**, wherein the one or more inlet conduits comprises a first inlet conduit extending longitudinally through a first side of the base layer, a second inlet conduit extending longitudinally through a central portion of the base layer, a third inlet conduit spaced apart from the second inlet conduit and extending longitudinally through the central portion of the base layer, and a fourth inlet conduit extending longitudinally through a second side of the base layer opposite the first side; and

wherein the one or more outlet conduits comprises a first outlet conduit positioned between the first inlet conduit and the second inlet conduit, and a second outlet conduit positioned between the third inlet conduit and the fourth inlet conduit.

42. The mattress assembly of claim **39**, wherein each of the one or more inlet conduits are in the form of a columnar void.

43. The mattress assembly of claim **42**, wherein the one or more inlet conduits comprises at least two inlet conduits extending through a first side of the base layer and at least two inlet conduits extending through a second side of the base layer opposite the first side of the base layer, and

wherein each of the one or more outlet conduits extends longitudinally through the base layer and is positioned between the at least two inlet conduits on the first side of the base layer and the at least two inlet conduits on the second side of the base layer.

44. The mattress assembly of claim **39**, wherein each of the one or more inlet conduits and each of the one or more outlet conduits are in the form of a columnar void.

45. The mattress assembly of claim **44**, wherein the one or more outlet conduits comprises at least two outlet conduits positioned on a first side of the base layer and at least two outlet conduits positioned on a second side of the base layer opposite the first side, and wherein the one or more inlet conduits comprises at least two inlet conduits positioned in a central portion of the base layer.

46. The mattress assembly of claim **39**, further comprising a flexible foam insert positioned in each of the one or more inlet conduits and in each of the one or more outlet conduits, each flexible foam insert having a porosity greater than that of the base layer.

47. The mattress assembly of claim **39**, wherein each of the one or more outlet conduits are in the form of a columnar void.

48. The mattress assembly of claim **47**, wherein the one or more outlet conduits comprises at least two outlet conduits positioned on a first side of the base layer, and wherein the one or more inlet conduits comprises at least one inlet conduit extending longitudinally through the base layer.

49. The mattress assembly of claim **47**, wherein the one or more outlet conduits comprises at least two outlet conduits positioned on a first side of the base layer and at least two outlet conduits positioned on a second side of the base layer opposite the first side, and wherein the inlet conduit extends longitudinally through a central portion of the base layer.

50. The mattress assembly of claim **39**, wherein the base layer and the heat transfer layer each include a continuous side panel, and

wherein the mattress assembly further comprises a barrier covering the continuous side panel of the base layer, the continuous side panel of the heat transfer layer, or both.

51. The mattress assembly of claim **50**, wherein the barrier further covers the bottom surface of the base layer.

52. The mattress assembly of claim **51**, wherein the base layer is comprised of a porous flexible foam, and wherein the barrier further covers a top surface of the base layer such that the barrier is positioned between the top surface of the base layer and the heat transfer layer.

53. The mattress assembly of claim **50**, wherein the base layer can be characterized as including one or more walls defining the one or more inlet conduits and the one or more outlet conduits, and wherein the barrier further covers each of the one or more walls.

54. The mattress assembly of claim **39**, wherein each fan is angled to direct air away from the mattress assembly.

55. A method of controlling a surface temperature of a support cushion, comprising the steps of:

providing a support cushion having

a body supporting layer having a first surface and a second surface,

a heat transfer layer,

a base layer positioned adjacent to the heat transfer layer opposite the body supporting layer and having a porosity less than that of the heat transfer layer, the base layer defining one or more inlet conduits in fluid communication with the heat transfer layer, and the base layer further defining one or more outlet conduits in fluid communication with the heat transfer layer and spaced at a predetermined distance from each of the one or more inlet conduits, and

a fan operably connected to each of the one or more outlet conduits; and

supplying an electrical current to each fan such that each fan draws an amount of air from a particular inlet conduit, through the heat transfer layer, and into a particular outlet conduit.

56. The method of claim **55**, wherein the support cushion further comprises a plurality of Peltier elements positioned and configured to selectively provide heating or cooling at the first surface of the body supporting layer.

57. The method of claim **56**, further comprising the step of supplying an electrical current to the plurality of Peltier elements, such that electrical current is supplied in a first direction to decrease the surface temperature of the body supporting layer, and such that electrical current is supplied in a second direction to increase the surface temperature of the body supporting layer.

58. The method of claim **56**, further comprising the step of controlling an amount of electrical current supplied to the Peltier elements to control an amount of heating or cooling of the support cushion.

59. The method of claim **57**, further comprising a step of supplying electrical current in the second direction for a predetermined amount of time following a cooling period.

60. The method of claim **56**, further comprising the steps of:

receiving feedback from a temperature sensor positioned in the body supporting layer; and

supplying electrical current to the fan, the plurality of Peltier elements, or both based on the feedback received from the temperature sensor.

61. The method of claim **55**, wherein the body supporting layer is comprised of a visco-elastic foam.

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