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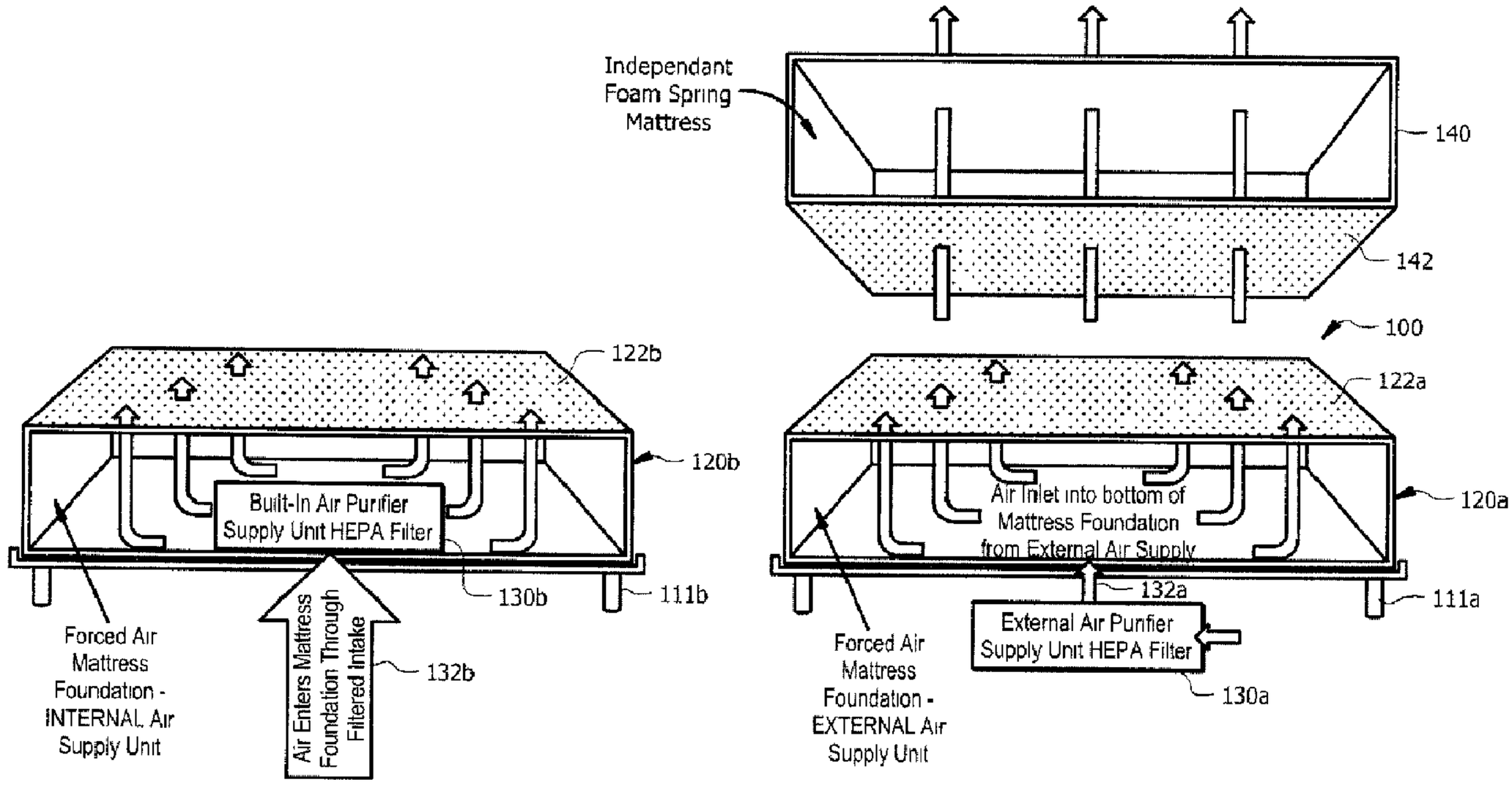
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(71) **Demandeur/Applicant:**
NEVEN SLEEP, LLC, US

(72) **Inventeur/Inventor:**
REYNOLDS, RANDY, US

(74) **Agent:** GOWLING WLG (CANADA) LLP

(54) **Titre : ENSEMBLE DE SOMMIER ET MATELAS A VENTILATION**
(54) **Title: MATTRESS VENTILATING FOUNDATION AND SLEEP SYSTEM**



(57) **Abrégé/Abstract:**
Embodiments of a mattress ventilation foundation and sleep system are disclosed. Foundation embodiments typically may be configured to provide ventilation to a supported mattress, for example through an upper surface of the foundation allowing airflow

CA 2933211 A1 2016/12/15

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(57) **Abrégé(suite)/Abstract(continued):**
therethrough. Sleep system embodiments typically have a mattress (which might be a ventilation mattress) atop such a ventilation foundation, with airflow therebetween.

ABSTRACT

Embodiments of a mattress ventilation foundation and sleep system are disclosed. Foundation embodiments typically may be configured to provide ventilation to a supported mattress, for example through an upper surface of the foundation allowing airflow therethrough. Sleep system embodiments typically have a mattress (which might be a ventilation mattress) atop such a ventilation foundation, with airflow therebetween.

MATTRESS VENTILATING FOUNDATION AND SLEEP SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a non-provisional of and claims priority to related U.S. provisional patent application serial no. 62/175,767 filed June 15, 2015 and entitled "Mattress Ventilating Foundation and Sleep System. The above-cited priority document is hereby incorporated by reference for all purposes as if reproduced in its entirety to the extent that it is compatible (e.g. not inconsistent) with and/or does not directly contradict disclosure herein (e.g. the explicit disclosure herein would always govern/trump in instances of contradiction, inconsistency, or incompatibility).

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

REFERENCE TO A MICROFICHE APPENDIX

[0003] Not applicable.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] For a more complete understanding of the present disclosure, reference is now made to the following brief description, taken in connection with the accompanying drawings and detailed description, wherein like reference numerals represent like parts.

[0005] Fig. 1A is a schematic diagram illustrating an exemplary sleep/bedding system, in which a mattress may be used atop one of two possible ventilating foundation exemplary variants;

[0006] Fig. 1B is a schematic diagram illustrating an alternate exemplary sleep/bedding system, in which a mattress may be used atop one of two possible ventilating foundation exemplary variants;

[0007] Fig. 1C illustrates a detailed embodiment of a sleep/bedding system similar to that of Fig. 1B and having an internal air input unit with optional HEPA filter and an access panel, with

Fig. 1Ca showing a side view, Fig. 1Cb showing an end view (from the foot of the bed), and Fig. 1Cc showing a top view;

[0008] Fig. 1D illustrates a detailed embodiment of a sleep/bedding system similar to that of Fig. 1B and having an external air input unit with optional HEPA filter and an access panel, with Fig. 1Da showing a side view, Fig. 1Db showing an end view (from the foot of the bed), and Fig. 1Dc showing a top view;

[0009] Fig. 1E illustrates a perspective view of an exemplary sleep/bedding system similar to Fig. 1C;

[0010] Figs. 2A1 and 2A2 illustrate an exemplary mattress embodiment (without the cover being shown, to allow viewing of internal components) which is an all-foam (e.g. spring-free) mattress configured for ventilation, with Fig. 2A1 showing an exploded perspective view of an exemplary mattress and Fig. 2A2 showing a cut-away (e.g. cross-section) elevation view of the exemplary mattress of Fig. 2A1;

[0011] Figs. 2B1 and 2B2 illustrate an exemplary mattress embodiment (similar to that of Fig. 2A1 in configuration, but comprising different foam materials for at least some of the layers) configured for ventilation, with Fig. 2B1 showing an exploded perspective view of an exemplary mattress and Fig. 2B2 showing a cut-away (e.g. cross-section) elevation view of the exemplary mattress of Fig. 2B1;

[0012] Fig. 3 illustrates a top/plan view of an exemplary base (sculpted) layer of foam (of the sort that might be used in Fig. 2A1, for example); and

[0013] Fig. 4 illustrates a bottom/plan view of an exemplary middle sculpted foam layer (of the sort that might be used in Fig. 2A1, for example).

DETAILED DESCRIPTION

[0014] It should be understood at the outset that although illustrative implementations of one or more embodiments are illustrated below, the disclosed systems and methods may be implemented using any number of techniques, whether currently known or not yet in existence. The disclosure should in no way be limited to the illustrative implementations, drawings, and techniques illustrated below, but may be modified within the scope of the appended claims along with their full scope of equivalents.

[0015] The following brief definition of terms shall apply throughout the application:

[0016] The term "comprising" means including but not limited to, and should be interpreted in the manner it is typically used in the patent context.

[0017] The term "foam" means a material in a lightweight cellular form, for example resulting from introduction of gas bubbles during manufacture to produce a consistent cell structure, and/or any of various light, porous, semirigid or spongy materials or cellular solids, usually the solidified form of a liquid full of gas bubbles, which may be used as a building material or for shock absorption, and includes open cell foams such as polyurethane foam, latex, memory foam, specialty memory foam, gel memory foam, gel latex foam or other gel foams, etc.;

[0018] The term "IFD" means indentation force deflection, and describes a well-known measurement system for foam firmness;

[0019] Directions, such as up (e.g. upward) and/or down (e.g. downward), typically are intended to be based on the mattress (or sleep system or foundation) in its normal sleeping position as understood by persons of skill; for example, the upper surface of the mattress might face the ceiling and/or serve as the sleep surface upon which the user might lie, while the bottom surface of the mattress might face the floor or ground and/or be placed atop a foundation;

[0020] The phrases "in one embodiment," "according to one embodiment," and the like generally mean that the particular feature, structure or characteristic following the phrase may be

included in at least one embodiment of the present invention, and may be included in more than one embodiment of the present invention (importantly, such phrases do not necessarily refer to the same embodiment);

[0021] If the specification describes something as "exemplary" or as an "example," it should be understood that refers to a non-exclusive example:

[0022] The terms "about" or "approximately" or the like, when used with a number may mean that specific number, or alternatively, a range in proximity to the specific number, as understood by persons of skill in the art field (for example, +/- 10%); and

[0023] If the specification states a component or feature "may," "can," "could", "should," "would," "preferably," "possibly," "typically," "optionally," "for example," "often," or "might" (or other such language) be included or have a characteristic, that particular component or feature is not required to be included or have the characteristic. Such component or feature may be optionally included in some embodiments, or it may be excluded.

[0024] Typical sleep or bedding systems may have a conventional (typically inner-spring) mattress located atop a conventional box spring foundation unit. In such conventional sleep systems, there is typically no interaction between the mattress and the box spring foundation, other than the fact that the box spring foundation supports (e.g. underlies) the mattress. While conventional sleep systems may be sufficient for some sleepers/users, many users might desire and are looking for an improved sleep experience.

[0025] For example, many users might find conventional sleep systems rather hot (especially when the mattress includes foam, and most especially when the mattress includes memory foam), resulting in a rather sweaty, uncomfortable night's sleep of the sort that may result in restlessness and lack of deep slumber. Other users may have allergy problems, and a conventional mattress may, over time, collect dust and other allergens that might trouble the user during sleep.

Additionally, conventional inner-spring mattresses may not support the user's body as effectively as desired, perhaps resulting in discomfort.

[0026] The presently disclosed embodiments may address one or more of these issues. For example, disclosed embodiments may provide ventilation (e.g. airflow), such that the mattress may better breathe and/or disperse heat (e.g. improving sleep comfort while a user is atop the mattress); disclosed embodiments may refresh the mattress, for example sucking out stale air with potential allergens (which could happen either when the user is atop the mattress or, alternatively, when the user is not on the mattress (for example, based on a timer)); and/or disclosed embodiments may provide superior comfort/support. Typically, disclosed embodiment sleep systems might have the mattress and foundation interact with each other (for example, being in fluid communication), to provide one or more such sleep benefits, as persons of skill will understand based on the disclosure below. Typical foundation embodiments might comprise an upper surface (of a cover) allowing airflow therethrough (and typically having an airflow unit (such as a fan or air pump) operable to direct air through the upper surface), while typical mattress embodiments might comprise a bottom surface (of a cover) (and in some embodiments, a top surface of the cover) allowing airflow therethrough (and often also including air pathways (such as pinholes) vertically throughout the mattress). So, most disclosed sleep system embodiments typically might have a ventilation mattress atop a ventilation foundation, with airflow therebetween.

[0027] Disclosed embodiments relate generally to mattress ventilation sleep systems (and/or related foundations and/or mattresses), which typically would include a mattress ventilation foundation in conjunction with a mattress (for example, typically located atop the foundation). Typically, the mattress ventilation foundation might comprise a support structure (such as support struts and structural frame, for example, which might be similar to a conventional box spring

foundation), operable to support a mattress in a manner similar to a conventional mattress foundation (and which typically might be hollow); an airflow unit (such as a forced air supply unit (e.g. fan) operable to either blow air into the supported mattress atop the foundation or suck air from the supported mattress); and a cover (including an upper, support surface upon which the mattress would lay), which would typically include a means for airflow between the foundation (e.g. the airflow unit) and the supported mattress (e.g. an air permeable element/panel, such as one or more panels of high airflow mesh fabric located in the upper surface of the foundation cover, for example). In some embodiments, the airflow unit might include filtration (such as a HEPA filter), which might, for example, be located at the intake and/or outtake for the airflow unit. The airflow unit might be housed within the support structure of the foundation (e.g. within the hollow cavity) in some embodiments, while in other embodiments the airflow unit might be external to (for example, mounted onto) the support structure (for example, mounted onto the bottom surface of the cover/support structure and in fluid communication with the hollow cavity within the cover/support structure by an opening).

[0028] Typically, the foundation cover would surround/enclose/encompass the support structure on all sides, and the foundation cover would be airtight/air impermeable (e.g. formed of an airtight material, such as fabric overtop a polyvinyl substrate, for example) except for the attachment/fluid communication port (e.g. inlet/outlet/opening) for the airflow unit (which allows fluid communication between the external environment and the hollow cavity within the foundation, for example) and the means for airflow between the foundation and the supported mattress (e.g. air permeable element/panel, such as high airflow mesh panel(s)). For example, the bottom and side surfaces of the foundation cover would typically be airtight (except for the inlet/outlet/opening for the airflow unit), while the upper surface of the foundation cover (which would typically support and/or contact the bottom surface of the mattress) would include the

means for airflow between the foundation (e.g. the airflow unit) and the supported mattress (e.g. at least one air permeable element/panel, such as one or more panels of high airflow mesh fabric located in the upper surface of the foundation cover, for example). In some embodiments, the entire upper surface of the foundation cover might be formed of high airflow mesh fabric, while in other embodiments, the upper surface might include a plurality of panels of such high airflow mesh fabric and/or other means for allowing airflow between the foundation and the supported mattress (such as air passageways). While some embodiments might have a cover that encompasses substantially the entire support structure, other embodiments might have a cover that only spans the upper surface of the support structure, while still other embodiments might have a cover which spans the upper surface and a portion or all of the vertical sides of the support structure.

[0029] Typically, air might flow through the hollow cavity of the foundation to the upper surface of the foundation cover (as directed by the airflow unit, for example), but alternatively, there could be tubing or ducts leading from the airflow unit to the upper surface of the foundation cover (e.g. to specific locations on the upper surface of the foundation cover corresponding to the pinholes in the supported mattress thereupon). In such embodiments, it might not be necessary for the bottom and sides of the foundation cover to be airtight.

[0030] Additionally, some embodiments of the airflow unit might optionally comprise a climate control unit, which might cool and/or heat air flowing through the airflow unit (for example, before the air flows into the supported mattress atop the foundation). In some embodiments, the climate control unit would be located within the housing for the airflow unit, while in other embodiments, the climate control unit might be located external to such housing (e.g. it may be either separate or combined with the blower portion of the airflow unit). Similarly, embodiments of the airflow unit might optionally comprise an air ionizer (for electric sterilization

of air prior to entering the foundation) and/or an ultraviolet germicidal irradiation light (for irradiating light sufficiently to substantially destroy harmful microbes, such as bacteria, prior to entering the foundation). As with the optional climate control unit, the air ionizer and/or UV germicidal irradiation light units could be located within the housing for the airflow unit or (in other embodiments) located externally to such housing (e.g. each may be either separate or combined with the blower portion of the airflow unit). Typically, the airflow unit might be controlled/operated by a controller, which might be a separate device and which might allow for remote control of the airflow device (e.g. the blower and/or climate control unit). In some embodiments, the controller and/or airflow unit may include a timer, for example, allowing the user to set the airflow unit for a regular (for example, daily or weekly) refresh cycle. And typically, the airflow unit would be electrically powered (for example, with a plug allowing power to be drawn from a standard electrical wall socket).

[0031] So, typically in operation, air might be drawn into the foundation (for example, by the airflow unit, through the intake opening/fluid communication port), and then forced out the upper surface (for example, through a high airflow mesh fabric upper surface or panel(s)) and into the supported mattress. This may allow for a supported mattress to be refreshed with clean air and/or may enhance sleep comfort for a user lying atop the mattress. Alternatively, air might be sucked out of the supported mattress (for example, by operating the airflow unit in reverse to create suction), into the foundation (for example, through the upper surface of the cover of the foundation, perhaps through one or more high airflow mesh panels), and out the airflow unit's outtake opening/fluid communication port (which might be the same intake opening if the airflow device is operated for blowing instead of suction in some embodiments). In some embodiments, the airflow unit might be operable to run in forward (e.g. blowing mode) and/or reverse (e.g. suction mode). So, in some embodiments, the airflow unit might be run in reverse (for example,

suction mode to suck air from the supported mattress) to refresh the mattress (e.g. a refresh cycle, which in some embodiments might be periodically run), while the airflow unit might be run in forward (for example, blowing mode to blow fresh (e.g. filtered) and/or climate controlled (e.g. cooled or heated) and/or ionized and/or UV sanitized air into the supported mattress) to enhance sleep comfort atop the supported mattress (for example, improving allergy conditions and/or temperature and/or airflow for the user atop the supported mattress, perhaps while the user is actually lying atop/sleeping on the mattress).

[0032] While it is possible that any sort of mattress might be used to some advantage atop such a ventilation foundation, more typically specialized air flow (e.g. ventilation) mattress embodiments might be used in conjunction with the disclosed foundation embodiments. For example, the mattress might comprise a mattress cover having a bottom surface which includes a means for airflow between the foundation and the supported mattress (e.g. into and/or out of the mattress, for example at least one air permeable member/element/panel). For example, in some embodiments, the bottom surface of the mattress cover might be formed of or include one or more panels of high airflow mesh fabric (or alternatively, the bottom surface of the mattress cover might include air passageways, which might correspond to those of the upper surface of the foundation cover). In some embodiments, the top surface of the mattress cover might also comprise air permeable member/element/panel or other means of airflow into/out of the mattress (e.g. high airflow mesh or loosely woven fabric panel(s)). And in some embodiments, the remainder of the mattress cover might be (substantially) air impermeable. Furthermore, the mattress might comprise one or more (and typically a plurality of) primarily vertical air pathways (e.g. pinholes), operable to allow air flow vertically throughout the mattress (for example, from the bottom of the mattress to the top of the mattress). In some embodiments, the mattress might be an all-foam and/or spring-free mattress. For example, the mattress might be formed entirely of layers of foam,

and each layer of foam might include vertical pinholes, at least some of which align to provide continuous airflow passages/pathways/pinholes vertically throughout the mattress.

[0033] Some such mattress embodiments might include one or more foam layers having a sculpted surface with a plurality of foam pillars. For example, some embodiments might have a base layer of foam (e.g. the bottom layer of foam) with an upward facing sculpted surface (e.g. the pillars of foam facing/projecting upward), and another layer of foam (typically a middle foam layer, located somewhere between the base foam layer and the uppermost (sleep surface) layer of foam) with a downward facing sculpted surface (e.g. the pillars of foam facing/projecting downward). Typically, the sculpted foam layers would each have scoring (e.g. a series of grooves/gaps) forming a grid on one surface (termed the sculpted surface), with the grid pattern resulting in a plurality of foam pillars projecting outward from a common, unified slab/base of foam (e.g. the surface opposite the sculpted surface typically would be flat, such that the foam pillars would all be joined together into an integral whole layer at their bases/bottoms). The sculpted foam layer(s) might effectively replace the support functionality of the springs while also often providing added benefits. For example, a sculpted foam surface (e.g. foam pillars) may provide more flexibility in adjusting to various body contours than metal springs, and therefore may be more effective in reducing pressure points against the human body than traditional metal springs in conventional mattresses. More specifically, the layer(s) of foam with a sculpted surface would typically include a plurality of foam pillars (or blocks), each of which is freestanding (e.g. independent) with respect to the other pillars, but all of which are joined together into a single integral base (which typically has a flat exterior surface). So, the base portion of the pillars are all joined together (e.g. a common base), while the remaining freestanding portion of the layer of foam comprise a plurality of independent pillars separated from one another by a gap or groove on all sides. Stated another way, the sculpted layer(s) of foam may comprise each a base portion

(which typically is a uniform flat sheet of foam) and a pillar portion (which typically comprises a plurality of independent pillars or blocks of foam, each of which is completely separate from the other pillars), with the pillar portion being securely attached to a surface of the base portion (so in effect the pillars project out from the flat base portion). Thus, the sculpted surface of the sculpted layer of foam would typically be the distal surface of the pillars (or pillar portion). Typically, the sculpted layer of foam may be formed by cutting a pattern of grooves in one surface (which would then become the sculpted surface) of an initially uniform (e.g. flat sheet with constant thickness) sheet of foam, thereby forming a plurality of foam pillars which extend out from the base portion (with the pillar portion and the base portion integrally forming a single layer of foam having different shapes/characteristics on opposing sides). Thus, the sculpted layer of foam might also be termed a contour cut layer of foam in some embodiments (since in many embodiments the layer of foam is sculpted via cutting, for example contour cutting). In other embodiments, it may be possible to form the sculpted layer of foam by molding (with the mold forming the pillar portion projecting outward from the base portion). Typically, the substantially one entire surface of the sculpted foam layer (e.g. the entire sculpted surface) would be entirely comprised of such pillars (e.g. substantially the entire sculpted surface of the sculpted foam layer would be formed of pillars), although in other embodiments the sculpted surface might have pillars only on a portion of the sculpted surface.

[0034] Typical mattress embodiments might have vertical pinholes passing through (at least) the base portion of the sculpted foam layers, and such pinholes might typically be positioned to align with the grooves/gaps between the foam pillars (so that air could flow continuously through the vertical pinholes and the grooves to pass from one surface of the sculpted foam layer all the way through to the other surface of the sculpted foam layer). In some embodiments, the base layer of foam would comprise a foam component having a sculpted surface (typically with pillars facing

upward) surrounded by foam edge support perimeter rails (which typically would be solid blocks of foam encompassing the sides of the base foam component with sculpted surface, and typically having an uncompressed height approximately equal to the uncompressed height of the base foam component (e.g. the upper surface of the edge support perimeter rails would typically be approximately the same as the uncompressed height of (e.g. flush with) the upper surface of the foam pillars of the base foam component with sculpted surface).

[0035] Typically, mattress embodiments would have at least one (foam) layer located between the base sculpted foam layer (which typically would have the sculpted surface (e.g. foam pillars) facing upward) and the middle sculpted foam layer (which typically would have the sculpted surface (e.g. foam pillars) facing downward), and would have at least one (foam) layer located above the middle sculpted foam layer (e.g. a sleep surface layer (typically of foam) would be located atop the middle sculpted foam layer). In some embodiments, the foam pillars of the base sculpted foam layer would be larger (e.g. the cross-section/footprint/outer surface of the pillars would be larger) than the foam pillars of the middle sculpted foam layer. And as mentioned above, typically the various (foam) layers of the mattress would each have vertical pinholes, at least some of which would align to provide continuous airflow from the bottom to the top of the mattress. For example, in some embodiments all (foam) layers located above the base layer of foam might have vertical pinholes which entirely align, even though the base foam layer might have less vertical pinholes spaced further apart such that only some of the pinholes in the remaining layers align with pinholes in the base layer. Although the base layer in some embodiments may have fewer pinholes spaced further apart than the other layers of foam, air may be operable in some such embodiments to move through the grooves in the base portion (e.g. since the pinholes in the base portion may be in fluid communication with the grooves in the base

portion) to the pinholes in the upper layers of foam which are not aligned with the pinholes in the base layer of foam.

[0036] Typically, the sculpted layer of foam would have a plurality of foam pillars forming the sculpted surface, and the pillars would be configured within the sculpted foam layer and the mattress as a whole to essentially be limited to movement only (or in some embodiments, primarily) in the vertical direction (e.g. without any horizontal/sideways movement of the pillars during use of the mattress). In other words, the configuration of the foam layers of the mattress (for example, with the layers placed in contact in such a way as to minimize shear or torsion in the pillars during construction (e.g. essentially placing the pillars only in compression) and with the layers perhaps laminated together) would typically ensure that compression on the top (e.g. sleep surface) of the mattress would be transmitted to the foam pillars entirely as a vertical (e.g. compression) force (without, for example, introducing any (e.g. substantial) horizontal, shear, or torsion forces to the foam pillars) for each affected foam pillar. Additionally, each pillar of foam in the sculpted layer would typically be configured for essentially independent movement (e.g. each pillar moves independent of the other, surrounding/proximate pillars). This independence might arise due to the contour cuts (e.g. grooves/gaps) separating the foam pillars and/or the fact that the base of the foam pillars would be linked by conformable foam (e.g. in the form of an integrated base of foam linking all pillars together). So, embodiments might have pillars of the sculpted foam layer configured for essentially independent movement and/or essentially only vertical movement during usage of the mattress (e.g. by a user lying atop the mattress). Typical embodiments might have the pillars configured for independent movement essentially only in the vertical direction. For example, each foam pillar might be operable to move vertically without substantially imparting any vertical movement to surrounding/proximate foam pillars in the sculpted foam layer. Thus, movement by one foam pillar typically might not impart any

movement to other foam pillars in proximity within the sculpted foam layer (such that each pillar movement would independently relate to its own loading from the sleep surface above). So, each foam pillar of an exemplary sculpted foam layer in a disclosed mattress embodiment may be operable to only (or in some embodiments primarily) carry/support compression forces from directly above the foam pillar. Of course, Applicant does not intend to be bound by theory, but rather simply notes that the presently-disclosed embodiments may perform/operate differently and/or better. Such configuration of the sculpted foam layer (with regard to movement) may be quite different from the typical movement allowed/provided by conventional metal springs (e.g. coil springs in a mattress). Conventional coil spring mattresses have a series of springs which typically are linked by wire across their top surfaces. Thus, the coil springs do not move independently (e.g. movement by one coil spring necessarily affects the surrounding coil springs due to the rigid nature of the linking wire frame), and the linking wire frame at the top of the coil springs may typically introduce non-vertical (e.g. non-compression) forces into the springs (such that the coil springs may flex and move horizontally and/or torsionally, for example, in response to a user atop the mattress sleep surface). Thus, the disclosed embodiments (with foam pillars in a spring-less mattress) may perform quite differently in operation than a conventional spring mattress. Applicant notes that disclosed mattress embodiments typically do not include traditional springs, but, for example, might be termed all-foam mattresses (e.g. all the cushion/support elements are foam) and/or (metal/coil) spring-free mattresses (e.g. no springs, even if the mattress embodiment may include some other cushion/support element(s) in addition to or instead of one or more foam elements).

[0037] While typical sleep system embodiments would comprise a mattress embodiment atop a foundation embodiment, other embodiments might be focused on only the mattress or only the foundation. In other words, disclosed mattress embodiments could alternatively be used with

conventional foundation elements (or even separately/alone), and disclosed foundation embodiments could alternatively be used with conventional mattress elements (although doing so might reduce some potential benefits available through the joint use of disclosed mattress embodiment(s) with disclosed foundation embodiment(s), since the joint use of ventilation mattress atop ventilation foundation may provide for improved fluid communication therebetween). A preferred embodiment, however, would typically place a mattress configured to allow airflow/air transfer through its bottom surface (and perhaps also typically having some means of air distribution throughout the mattress (e.g. pinholes) for air passing through the bottom surface of the mattress) atop a foundation configured to provide airflow/air transfer (for example, forced airflow, which might be suction and/or blowing) through its upper surface.

[0038] Turning now to the figures for specific exemplary embodiments, Fig. 1A illustrates exemplary embodiment(s) of a ventilated sleep system 100 (typically comprising a mattress and a foundation), with a ventilated mattress 140 used in conjunction with (typically directly atop) a ventilation foundation (such as either 120a or 120b, which basically differ regarding the location of the airflow unit). The mattress 140 has a bottom surface 142 which allows air flow into and/or out of the mattress. For example, the bottom surface of the mattress cover might be formed of or comprise high airflow mesh fabric (for example, 150gsm 100% polyester spacer mesh fabric restricting airflow CFM less than about 35% at 3 PSI). In some embodiments, the upper surface of the mattress 140 might also allow airflow into/out of the mattress (for example, with the upper surface of the mattress cover being formed of or comprising high airflow mesh fabric, similar to that used for the bottom surface of the mattress cover as described above).

[0039] Either foundation 120a (with an airflow unit 130a external to the support structure of the foundation and/or cover of the foundation, for example externally mounted on the foundation, perhaps underneath the foundation at or near the foot end of the bed, for example centered from

side to side, and in fluid communication with the foundation hollow cavity via inlet/intake/opening 132a) or foundation 120b (with airflow unit 130b located within the foundation support structure and/or cover, for example mounted internally on the bottom/base panel of the foundation, perhaps within the foundation at or near the foot end of the bed, for example on the left side when looking at the foundation from the foot, and in fluid communication with the external environment via inlet/intake/opening 132b) might optionally be used with the mattress 140, with the mattress 140 being located atop either foundation 120a or 120b to form the ventilated sleep system. In both foundation embodiments 120a and 120b, the upper surface of the foundation 122a or 122b respectively would be configured to allow airflow out of the foundation (for example, into a mattress 140 directly atop (and in contact with) the foundation. So for example, the upper surface 122a or 122b of the foundation cover might be formed of or comprise high airflow mesh fabric (similar to that described above with respect to the bottom surface of the mattress cover, for example, to allow airflow communication between the foundation and the mattress). And typically, the foundation might be held above the floor by a frame or legs 111a,b (which might be similar to conventional bed frames used for conventional box springs, for example, and which might provide sufficient clearance from the floor to allow the required airflow for operation of the ventilation mattress system). Typically, the frame would not interfere with or block the inlet/intake/opening for the airflow unit 130a,b.

[0040] So, in Fig. 1A, air might pass into the foundation 120a,b, for example through a filter such as a HEPA filter and/or through a climate control unit (which might, for example, be operable to cool and/or heat the air) via an airflow unit 130a,b, passing through the foundation (e.g. hollow cavity) to exit through the upper surface 122a,b of the foundation and enter the bottom surface 142 of the mattress 140 in order to pass (vertically) through at least a portion of the mattress 140. In such a system, the airflow unit 130a,b might pump air into the mattress through

the foundation. Alternatively, air might flow through the system in reverse, with the airflow unit sucking air out of the mattress and into the foundation (and then out to the external environment). The airflow unit typically might displace about 100 – 300 CFM, and typically might operate at less than about 6 dB.

[0041] In some embodiments, the upper surface of the mattress 140 might also allow for airflow (for example, being formed of or comprising high airflow mesh or loosely woven fabric panels, similar to those previously described). In some embodiments, the high airflow fabric panels throughout the sleep system (or at least for the upper foundation cover surface and lower mattress cover surface) might all be similar and/or formed of the same material. In some embodiments, a fabric material with sufficiently loose weave may allow the desired airflow between the foundation and the mattress and serve as the foundation air permeable element(s) and/or the mattress air permeable member(s). In other embodiments, the air permeable elements/members may be formed of any variety of sufficiently porous material. In some embodiments, the airflow unit 130a,b might be configured to allow for forward and reverse operation (e.g. operable to allow air to be blown into or sucked out of the mattress by the foundation). The arrows in Fig. 1A illustrate potential airflow in the system, as persons of skill would understand.

[0042] Typically, the foundation(s) 120a,b of Fig. 1A would comprise a hollow structure (with a cavity) (formed, for example, by support struts and a structural frame), and air would be pumped into/out of the hollow structure cavity (for example, by the airflow unit 130a,b). In other words, in such embodiments, air would simply flow through the hollow cavity of the foundation as it interacts with the mattress and the outside environment. So for example, external air might be drawn into the hollow cavity of the foundation through the inlet/intake/opening 132a,b, flow through the hollow cavity to the upper surface of the foundation 122a,b, flow out of the foundation

through the upper surface 122a,b and into the mattress through the mattress bottom 142, and then pass through at least a portion of the mattress 140 (and in some embodiments, air might flow all the way through the mattress and optionally might flow out the upper surface of the mattress). Alternatively, air might flow into the hollow cavity of the foundation 120a,b through the upper surface 122a,b (for example, sucking air from the mattress 140 through the bottom surface 142 of the mattress), through the hollow cavity of the foundation, and out of the foundation 120 via inlet/intake (which in this case would actually serve as an outtake)/opening 132a,b to the external environment.

[0043] Fig. 1B illustrates an alternative embodiment sleep/bedding system, similar to that of Fig. 1A. One version of the foundation 120b of Fig. 1B may have an access panel 132, which, for example, might allow for easy access to change the HEPA filter and/or to provide maintenance or repair to the airflow unit 130b. Fig. 1C illustrates in more detail an exemplary sleep/bedding system embodiment similar to Fig. 1B, having an internal (e.g. mounted/located within the foundation frame/cover) airflow unit 130b, with Fig. 1Ca showing a side view, Fig. 1Cb showing an end view of the foot of the bed, and Fig. 1Cc showing a top view. Typically, in the embodiment of Fig. 1C, the airflow unit 130b might be located at (e.g. in proximity to) the foot of the bed within the foundation. For example, the optional HEPA filter might be located over the air intake, with air then flowing through the blower to be expelled into the hollow cavity of the foundation. In some embodiments, there may be an access panel, for example located on the upper surface of the foundation above the HEPA filter or air intake or airflow unit. The access panel might be a hinged section (for example, operable to open by pivoting upward) of the upper foundation surface (although in some embodiments, the access panel portion of the upper foundation cover might not be air permeable, for example to help direct air through the blower and into the foundation).

[0044] Fig. 1D illustrates in more detail an exemplary sleep/bedding system embodiment similar to Fig. 1B, having an external (e.g. mounted/located outside the foundation frame/cover, for example mounted beneath the foundation) airflow unit 130a, with Fig. 1Da showing a side view, Fig. 1Db showing an end view of the foot of the bed, and Fig. 1Dc showing a top view. Typically, the airflow unit 130a of Fig. 1D might be mounted to the bottom surface of the foundation at or in proximity to the foot of the bed (perhaps located towards the center between the sides). And again, there may be an access panel, which, for example, might typically be located on the housing of the airflow unit to allow access to the HEPA filter and/or blower. Fig. 1E illustrates an exemplary sleep/bedding system in 3D perspective view, showing that externally the sleep/bedding system would resemble a conventional mattress atop a conventional box-spring foundation unit (e.g. a typical conventional bed).

[0045] Figs. 2A1 and 2A2 illustrate an exemplary ventilation mattress 240A, which is an all-foam (or spring-free) mattress formed of a plurality of foam layers (with the base layer being a sculpted foam layer having the sculpted surface (with foam pillars) facing upward, a middle sculpted foam layer having the sculpted surface (with foam pillars) facing downward, a sleep surface layer, at least one foam layer (e.g. transition layer) between the middle sculpted foam layer and the base sculpted foam layer, and/or a foam layer located between the sleep surface layer and the middle sculpted foam layer). While Fig. 2A1 shows the foam components of the mattress (e.g. with the cover removed) in perspective view, Fig. 2A2 shows a side cross-section view of the same mattress. Figs. 2B1 and 2B2 illustrate a similar all foam mattress (e.g. with the foam components removed from the cover), and differs primarily in the particular foam material selected (with the embodiment of Fig. 2A1 being formed of conventional high density foam (e.g. all component foam layers are formed of conventional high density foam), and the embodiment of Fig. 2B1 having the top two layers formed of memory foam, for example gel memory foam, while

the remaining layers are formed of conventional high density foam). And in some embodiments, all such foam layers would be adhered into an integrated whole (e.g. laminated) and/or enclosed/encased in a cover, thereby forming an integrated mattress.

[0046] So in Fig. 2A1, the mattress 240A comprises a base layer of foam 242 (which comprises a sculpted foam element with the sculpted surface (e.g. the foam pillars) facing/extending upward) located as the bottom layer of foam in the mattress, a middle sculpted foam layer 250 with the sculpted surface (e.g. foam pillars) facing/projecting downward and located above the base layer (although typically not directly above or in contact with the base layer), a transition foam layer 260 located between (and typically in contact with) the base layer of sculpted foam 242 and the middle sculpted foam layer 250, a top/sleep surface layer of foam 270 (typically located as the uppermost foam layer in the mattress), and (optionally) a second (e.g. penultimate) layer of foam 280 located between the sleep surface layer 270 and the middle sculpted foam layer 250. Fig. 2A1 shows the layers of foam of the mattress 240A without the cover (not shown), illustrating the order and orientation of the foam layers in this mattress embodiment. Typically, the foam layers are arranged one atop another in the order described above, with proximate layers contacting one another (e.g. the base layer 242 is the bottom layer, the transition layer 260 is located atop and in contact with the base layer, the middle sculpted foam layer 250 is located atop and in contact with the transition layer, the second (penultimate) layer 280 is located atop and in contact with the middle sculpted foam layer, and the top (sleep surface) layer 270 is located atop and in contact with the second (penultimate) layer and forms the upper foam layer of the mattress 240A). Typically, the layers would all be encased within a cover (not shown here), and typically the cover would have a bottom surface with means for airflow (for example, one or more panels of high airflow mesh fabric). Also, in some embodiments, the upper

surface of the cover might include means for airflow (for example, an air permeable element, such as one or more panels of high airflow mesh fabric).

[0047] In Fig. 2A1, the base layer comprises a sculpted foam element/layer 243 with upward facing sculpted surface (e.g. foam pillars 248 projecting upward and separated by a series (e.g. grid) of gaps or grooves or cuts 247), and edge perimeter rails of foam 244 which surround/encase the sculpted foam element 243 on all sides (e.g. about/around the perimeter of the sculpted foam element 243). Typically, the edge support perimeter rails 244 might be formed of the same foam as the base layer sculpted foam element 243 and/or might have the same uncompressed height as the sculpted foam element 243 (e.g. the upper surface of the edge support perimeter rails 244 might be approximately level with the upper surface of the foam pillars 248 of the sculpted foam element 243 when both are uncompressed). In the embodiment of Fig. 2A1, the foam pillars 248 would typically have a square rectangular outer surface (and/or cross-section) of about 4 inches by 4 inches, and the gaps/grooves 247 forming the grid resulting in the foam pillars might typically have a width of about 0.75 inches and a depth of about 3 inches. So, for example, the gaps/grooves in the base layer might typically have a depth ranging from about ½ to 2/3 the total height for the base layer, for example about 60% in some exemplary embodiments. In addition, the joined bases of the foam pillars of the sculpted foam element 243 typically would have a plurality of pinholes (e.g. essentially vertical air passageways), as will be described in greater detail below. In alternate embodiments, the pinholes might pass through both the base portion and the pillar portion of one or more of the sculpted foam layers.

[0048] In Fig. 2A1, the transition foam layer 260 would typically be a flat sheet of foam with a plurality of pinholes 265 (e.g. essentially vertical air passageways). In the embodiment of Fig. 2A1, the transition layer 260 would typically have the same width and length dimensions (e.g. depending on whether the mattress is a twin, full/double, queen, king, etc.) as the base layer 242

(e.g. including both the sculpted foam element 243 and the surrounding edge support perimeter rails 244), although in other embodiments (in which the foam pillars are lower than the surrounding edge support perimeter rails, for example by a height approximately equal to the thickness of the transition layer, the transition layer 260 might be sized to fit over just the sculpted foam element 243 of the base layer 242 (e.g. so that it would be located within the edge support perimeter rails 244 as well).

[0049] The middle sculpted foam layer 250 of Fig. 2A1 would typically be sized (e.g. width and length) approximately the same as the base layer 242 and/or the transition layer 260 (and typically the same as the layers atop it as well), and would be oriented with the sculpted surface (e.g. foam pillars 258) facing/projecting downward. In the embodiment of Fig. 2A1, the foam pillars 258 would typically have a square rectangular outer surface (and/or cross-section) of about 2 inches by 2 inches, and the gaps/grooves 257 forming the grid resulting in the foam pillars might typically have a width of about 0.375 inches and a depth of about 1.75 inches. So for example, the gaps/grooves in the middle sculpted layer might typically have a depth ranging from about ½ to 2/3 the total height for the middle sculpted layer, for example about 55-60% in some exemplary embodiments. In addition, the joined bases of the foam pillars of the middle sculpted layer 250 typically would have a plurality of pinholes 255 (e.g. essentially vertical air passageways), as will be described in greater detail below. Typically, the pinholes 255 of the middle sculpted foam layer 250 would be spaced and/or oriented/located the same (identically) as the pinholes 265 in the transition foam layer 260 (and typically also the same as the layers located above it), with the pinholes 255 aligning vertically with the pinholes 265. And typically, at least some of the pinholes 255/265 would also align with the pinholes 245 in the base layer 242 (e.g. the sculpted foam element 243 of the base layer). For example, every other pinhole 255,265 might align with a pinhole 245 (and groove/gap 247) in the sculpted foam element of the base layer. In some

embodiments, the middle sculpted foam layer might also (or instead) comprise an upper surface that is sculpted (for example, with foam pillars formed by a grid of grooves, as discussed earlier).

[0050] The second (penultimate) foam layer 280 and the upper (sleep surface) foam layer 270 would typically each be a flat sheet of foam with a plurality of pinholes 285, 275 respectively (e.g. essentially vertical air passageways). In the embodiment of Fig. 2A1, both the second (penultimate) foam layer 280 and the upper (sleep surface) foam layer 270 would typically have the same width and length dimensions (e.g. depending on whether the mattress is a twin, full/double, queen, king, etc.) as the base layer 242, the transition layer 260, and/or the middle sculpted layer 250. And, the pinholes 285, 275 of the second (penultimate) foam layer 280 and the top (sleep surface) layer 270 respectively would typically be spaced and/or oriented/located the same (identically) as the pinholes 265 in the transition foam layer 260 and the pinholes 255 in the middle sculpted foam layer 250, with the pinholes 285, 275 aligning vertically with the pinholes 265, 255. Thus, the pinholes 265, 255, 285, and 275 of Fig. 2A1 would typically align to form continuous airflow pathways from the upper surface of the base layer upward to the upper surface of the mattress (although in other embodiments, only some of the pinholes might align). And typically, at least some of the pinholes 285/275 would also align with the pinholes 245 in the base layer 242 (e.g. the sculpted foam element 243 of the base layer). For example, every other pinhole 285,275 might align with a pinhole 245 (and groove/gap 247) in the sculpted foam element of the base layer. In other embodiments, the pinholes 265, 255, 285, and 275 might all align with the pinholes 245 in the base layer (e.g. the pinholes in all the layers could be spaced equally so they all align to form continuous airflow pathways from the bottom surface of the mattress to the upper surface of the mattress).

[0051] Similarly, Fig. 2A2 shows a cross-section view of the foam elements of the mattress 240A shown in Fig. 2A1. In this embodiment, the base layer 242 typically would have an

uncompressed height of about 5 inches, the transition layer 260 typically would have an uncompressed height of about 1.25 inches, the middle sculpted foam layer 250 typically would have an uncompressed height of about 3 inches, the second (penultimate) foam layer 280 typically would have an uncompressed height of about 1.75 inches, and the top (sleep surface) layer 270 typically would have an uncompressed height of about 1.25 inches. In Fig. 2A2, the foam layers would typically vary in firmness, from softest at the top to hardest/firmest at the bottom. For example, the top (sleep surface) layer 270 would typically be the softest layer of foam (for example, IFD of about 14), the second (penultimate) layer 280 would typically be somewhat firmer that the top layer (for example, IFD of about 20), the middle sculpted foam layer 250 would typically be somewhat firmer than the second (penultimate) layer (for example, IFD of about 35), the transition layer 260 typically would be somewhat firmer than the middle sculpted layer (for example, IFD of about 45), while the base layer 242 might typically have the same firmness as the transition layer (for example, IFD of about 45). In other embodiments, the base layer 242 might be somewhat firmer than then transition layer 260. Typically, the edge support perimeter rails 244 would have the same firmness (e.g. IFD) and/or be formed of the same foam as the sculpted foam element 243 of the base layer. In other embodiments, the firmness of the various layers may differ and/or may vary differently from the descriptions above. And in Fig. 2A2, the thickness (e.g. lateral width) of the edge support perimeter rails typically would be about 4 inches (or in other embodiments, about the same size as one of the foam pillar's 248 square rectangular outer surface (and/or cross-section) sides).

[0052] Fig. 2A2 also shows the alignment of the pinholes 265, 255 (and gap 257), 285, and 275, and the fact that every other pinhole 265, 255, 285, 275 aligns with a pinhole 245 (and gap 247) of the base layer 242 in this embodiment. The alignment of pinholes may allow continuous airflow upward from the bottom surface of the mattress to the upper surface of the mattress 240A

and/or downward from the upper surface of the mattress to the bottom surface of the mattress, as illustrated by the exemplary airflow arrows (except along the perimeter edges where the edge support perimeter rails may not have pinholes, in some embodiments). In some embodiments, the pinholes may be hole punched into the foam sheets/layers, while in other embodiments the pinholes might be formed, for example, by molding of the foam sheets/layers). And in some embodiments, the gaps/grooves 247, 257 might be cut/scored into the foam to form the sculpted surface(s), while in other embodiments the gaps/grooves might be formed, for example, by molding (e.g. due to the shape of the foam mold forming the layer(s)). The upper surface of the top layer of foam 270 forms the sleep surface 272 (although typically there would be a cover, not shown here, lying atop/encasing the foam).

[0053] So in some embodiments, the mattress might comprise at least two sculpted foam layers (with each having a sculpted surface with a plurality of pillars) with a transition foam layer (and typically only one such transition foam layer) therebetween. The upper sculpted foam layer would typically be oriented with its sculpted surface facing downward (although in other embodiments, it could face upward and/or there might not be a foam (transition) layer between the two sculpted foam layers), while the lower/bottom sculpted foam layer (e.g. the base layer) would typically be oriented with its sculpted surface facing upward. And typically (although optionally), there would be one or more foam layers located above the uppermost sculpted foam layer (e.g. the middle sculpted foam layer), with these top foam layers having a softer IFD than that of the middle sculpted foam layer. A series of pinholes in the foam layers (perhaps in conjunction with the gaps/grooves forming the sculpted surface of the sculpted foam layers) would allow for airflow vertically throughout the mattress (or at least through a plurality of foam layers of the mattress). And typically, the foam layers would be enclosed/encased within a cover, which typically would have a bottom/lower surface which is air permeable (for example, formed of or comprising high

airflow mesh fabric, typically allowing airflow comparable to the upper/top surface of the ventilation foundation upon which such a mattress would typically operate). So as discussed above, the mattress embodiment would typically have a bottom cover surface allowing airflow therethrough (e.g. one or more panels restricting airflow cubic feet per minute less than about 35% at 3 PSI), and the ventilation foundation (upon/atop which the mattress embodiment would typically be used) typically would also have an upper/top cover surface allowing airflow therethrough (for example, similar to the airflow allowed by the bottom surface of the cover of the mattress), such that the joint mattress-foundation sleep/bedding system embodiment typically would effectively allow airflow between the foundation and the mattress (for example, based on an airflow unit in or on the foundation).

[0054] Figs. 2B1 and 2B2 show a similar foam mattress 240B formed of multiple layers of foam (typically within a cover (not shown)). The embodiment of Fig. 2B1 and 2B2 is substantially the same in structure as the embodiment of Fig. 2A1 and 2A2, primarily differing in the foam material used. For example, in Fig. 2B1, the top two layers might be memory foam (for example, gel memory foam). Persons of skill will understand that the foam materials and/or characteristics of the layers of foam for such exemplary mattresses may differ, for example being selected based on the specific needs of the particular mattress.

[0055] Fig. 3 illustrates an exemplary base foam layer 242 (similar to that of Fig. 2A1, for example), showing the sculpted surface (e.g. upper surface) of the sculpted foam element 243 (with foam pillars 248 separated by gaps/grooves 247 in a grid) and the edge support perimeter rails 244 in plan view (of the upper, sculpted surface). As noted above, the foam edge support rails 244 surround and abut all four sides of the sculpted foam element 243, and they each may typically have a width (e.g. lateral dimension) approximately equal to one of the sides of the square rectangular outer surface (and/or cross-section) of the foam pillars 248. Typically (as

shown in Fig. 3), all of the foam pillars 248 would be equally sized (for example, they might all be equally sized with a square cross-section, as, for example, formed by a grid of grooves/gaps 247 in which the longitudinal grooves/gaps 247 are equally spaced, and the lateral gaps/grooves are also equally spaced apart by the same amount as the longitudinal gaps, for example forming a grid that resembles a checkerboard). So, for example, in the embodiment of Fig. 3, the foam pillars 248 would typically have a square rectangular outer surface (and/or cross-section) of about 4 inches by 4 inches, and the gaps/grooves 247 forming the grid resulting in the foam pillars might typically have a width of about 0.75 inches and a depth of about 3 inches.

[0056] Fig. 3 also shows the pinholes 245 in the base layer, which are typically located in the joined base portion of the foam pillars of the base layer so that they exit into the gaps/grooves 247 separating the foam pillars 248. In other words, the pinholes 245 typically do not pass through the projecting foam pillar portion of the base layer sculpted foam element 243, but rather pass only though the integral base portion of the sculpted foam element 243 (e.g. the bottom portion where the foam pillars are joined together into an integral whole) such that the pinholes extend upward from the bottom of the base layer 242 to exit within the gaps/grooves 247 between the foam pillars 248. The pinholes 245 of Fig. 3 typically might have a diameter of about 0.5 inches (and typically would all be about the same size), and typically would be spaced apart approximately 3.937 inches. So, for example, the pinholes 245 typically might be located within the gaps/grooves 247 at locations in proximity to the corners of each foam pillar 248 of the base layer 242.

[0057] Similarly, Fig. 4 illustrates an exemplary middle sculpted surface layer 250 (similar to that of Fig. 2A1, for example), showing the sculpted surface (e.g. the bottom surface) (with foam pillars 258 separated by gaps/grooves 257 in a grid) in plan view (of the sculpted surface). Typically (as shown in Fig. 4), all of the foam pillars 258 would be equally sized (for example, they might all be equally sized with a square cross-section, as, for example, formed by a grid of

grooves/gaps 257 in which the longitudinal grooves/gaps 257 are equally spaced, and the lateral gaps/grooves are also equally spaced apart by the same amount as the longitudinal gaps, for example forming a grid that resembles a checkerboard). So, for example, in the embodiment of Fig. 4, the foam pillars 258 would typically have a square rectangular outer surface (and/or cross-section) of about 2 inches by 2 inches, and the gaps/grooves 257 forming the grid resulting in the foam pillars might typically have a width of about 0.375 inches and a depth of about 1.75 inches. While the embodiment of Fig. 2A1, for example, has the foam pillars 258 of the middle sculpted foam layer sized to be about 1/4 the size of the foam pillars 248 of the base layer (e.g. 2 inches by 2 inches versus 4 inches by 4 inches, such that each 4x4 pillar in the base layer of Fig. 2A1, for example, might have four 2x2 pillars in the middle sculpted layer located above it), in other embodiments, the ratio of the foam pillar sizing may vary (for example, the foam pillars 258 could be the same size as the foam pillars 248 in some embodiments, or the foam pillars 258 might be ½, 1/3, 1/8, or 1/16 the size of the foam pillars 248 in other embodiments). Typically, the sizing ratio would be such that at least some of the gaps/grooves 257 in the middle sculpted foam layer would align with at least some of the gaps/grooves 247 of the base layer (since that may be important to aid in alignment of pinholes in some embodiments, as well as perhaps providing consistent support and/or comfort characteristics).

[0058] Fig. 4 also shows the pinholes 255 in the middle sculpted layer, which are typically located in the joined base portion of the foam pillars 258 of the middle sculpted layer so that they exit into the gaps/grooves 257 separating the foam pillars 258. In other words, the pinholes 255 typically do not pass through the projecting foam pillar portion of the middle sculpted foam layer, but rather pass only through the integral base portion of the middle sculpted layer 250 (e.g. the bottom portion where the foam pillars are joined together into an integral whole) such that the pinholes 255 extend downward from the top of the middle sculpted layer 250 to exit within the

gaps/grooves 257 between the foam pillars 258. The pinholes 255 of Fig. 4 typically might have a diameter of about 0.25 inches (and typically would all be about the same size), and typically would be spaced apart approximately 1.9685 inches. So for example, the pinholes 255 typically might be located within the gaps/grooves 257 at locations in proximity to the corners of each foam pillar 258 in the middle sculpted layer 250. As discussed above, the pinholes in the foam layers (of an exemplary mattress) above the middle sculpted layer (as well as perhaps an underlying transition layer) typically would be sized and spaced (e.g. located) identical to those in the middle sculpted layer, in order to form continuous airflow pathways upward.

[0059] For additional details that may be relevant for some embodiments (particularly some mattress embodiments and/or systems having mattress embodiments), U.S. Patent Application Serial No. 14/681,278 (entitled "Independent Foam Spring Mattress" and filed April 8, 2015, along with related provisional patent application serial no. 61/977,989 entitled "Independent Foam Spring Mattress" and filed April 10, 2014) is hereby incorporated by reference for all purposes as if reproduced in its entirety to the extent that it is compatible (e.g. not inconsistent) with and/or does not directly contradict disclosure herein (e.g. the explicit disclosure herein would always govern/trump in instances of contradiction, inconsistency, or incompatibility). Specifically, details about the foam layers and/or formation of the foam layers from the incorporated by reference U.S. patent applications might be used in some embodiments (for example, within a mattress cover as described herein).

[0060] Having described above various embodiments (especially those explicitly shown in the figures), various additional embodiments may include, but are not limited to, the following:

[0061] In a first embodiment, a mattress foundation comprising a support structure; an airflow unit; and a foundation cover for the support structure comprising an upper surface, and wherein the upper surface comprises an air permeable element. In a second embodiment, the foundation of

the first embodiment wherein the foundation cover encases the support structure to form a hollow cavity; wherein the foundation cover further comprises one or more port allowing fluid communication between the hollow cavity and the outside environment; and wherein the airflow unit is configured to induce fluid flow between the hollow cavity and the outside environment via the one or more port. In a third embodiment, the foundation of embodiments 1-2 wherein the air permeable element comprises one or more high airflow mesh fabric panels. In a fourth embodiment, the foundation of embodiments 1-3 wherein the entire upper surface of the foundation cover is formed of high airflow mesh fabric. In a fifth embodiment, the foundation of embodiments 1-4 wherein the one or more port is located on a bottom surface of the foundation cover. In a sixth embodiment, the foundation of embodiments 1-5 wherein the airflow unit is located within the support structure. In a seventh embodiment, the foundation of embodiments 1-6 wherein the airflow unit is located within the hollow cavity over the port. In an eighth embodiment, the foundation of embodiments 1-7, wherein the airflow unit comprises a HEPA filter. In a ninth embodiment, the foundation of embodiments 1-8 wherein the airflow unit comprises a climate control unit operable to cool or heat air. In a tenth embodiment, the foundation of embodiments 1-9 wherein the cover is air impermeable except for the upper surface and the one or more port. In an eleventh embodiment, a sleep system comprising a foundation as in embodiments 1-10 and a mattress, wherein the mattress is located atop and in contact with the foundation and wherein the mattress and foundation are in fluid communication with each other. In a twelfth embodiment, the sleep system of embodiment 11 wherein the mattress comprises a mattress cover encompassing the mattress (e.g. encompassing/enveloping the support elements – such as springs and/or foam by way of non-exclusive example); wherein the mattress cover comprises a bottom surface, and wherein the bottom surface comprises a mattress air permeable member. In a thirteenth embodiment, the sleep system of embodiments 11-12 wherein the

mattress air permeable member comprises one or more high airflow mesh fabric panels. In a fourteenth embodiment, the sleep system of embodiments 11-13 wherein the mattress cover further comprises an upper surface, and wherein the upper surface comprises a second mattress air permeable member. In a fifteenth embodiment, the sleep system of embodiments 11-14 further comprising one or more foam layers within the mattress cover; wherein the one or more foam layers each comprises a plurality of vertical air pathways which pass through the entire thickness of the corresponding foam layer. In a sixteenth embodiment, the sleep system of embodiments 11-15 wherein the mattress comprises a plurality of foam layers; and wherein at least some of the vertical air pathways in the foam layers align to provide continuous airflow paths from the bottom surface of the mattress to an upper surface of the mattress. In a seventeenth embodiment, the sleep system of embodiments 11-16 wherein the foundation cover encases the support structure to form a hollow cavity; wherein the foundation cover further comprises one or more port allowing fluid communication between the hollow cavity and the outside environment; and wherein the airflow unit is configured to induce fluid flow between the hollow cavity and the outside environment via the one or more port. In an eighteenth embodiment, the sleep system of embodiments 11-17 wherein the one or more port is located on a bottom surface of the cover; and wherein the airflow unit is located within the hollow cavity. In a nineteenth embodiment, the sleep system of embodiments 11-18 wherein the airflow unit comprises a HEPA filter; and wherein the airflow unit comprises a climate control unit. In a twentieth embodiment, the sleep system of embodiments 11-19 wherein the one or more foam layers of the mattress (for example for an all-foam mattress and/or a metal spring-free mattress) comprise a base layer of foam comprising a sculpted upper surface (e.g. having a plurality of foam pillars projecting upward (for example, with the foam pillars formed by a grid pattern of gaps/grooves in the upper surface of the base layer of foam)); a transition layer of foam (which typically is a uniform thickness (e.g. flat) sheet/slab of

foam) located atop and in contact with the upper surface of the base foam layer; a middle sculpted layer of foam having a sculpted lower surface (e.g. having a plurality of foam pillars projecting downward (for example, with the foam pillars formed by a grid pattern of gaps/grooves in the lower surface of the middle sculpted layer of foam)), wherein the middle sculpted layer of foam is located atop and in contact with the transition layer of foam; and a top (sleep surface) layer of foam (which typically is a uniform thickness (e.g. flat) sheet/slab of foam) located above the middle sculpted layer. In a twenty-first embodiment, the sleep system of embodiments 11-20 wherein the one or more foam layers further comprises a second (penultimate) foam layer (which typically is a uniform thickness (e.g. flat) sheet/slab of foam) located atop and in contact with the middle sculpted layer and beneath and in contact with the top (sleep surface) layer of foam. In a twenty-second embodiment, the sleep system of embodiments 11-21 wherein the foundation is operable/configured to suck air out of the mattress (such that air flows out of the mattress through the bottom surface of the mattress cover (e.g. through the one or more high airflow mesh fabric panels), into the foundation through the upper surface of the foundation cover (e.g. through the one or more high airflow mesh fabric panels), and out to external environment via the airflow unit/opening/port. In a twenty-third embodiment, the sleep system of embodiments 11-22 wherein the foundation is operable/configured to blow air into the mattress (such that air is drawn into the hollow cavity of the foundation by the airflow unit, out of the foundation through the upper surface of the foundation cover (e.g. through the one or more high airflow mesh fabric panels), into the mattress through the bottom surface of the mattress cover (e.g. through the one or more high airflow mesh fabric panels); (and optionally, out the mattress through the upper surface of the mattress cover (e.g. through the one or more optional high airflow mesh fabric panels). In a twenty-fourth embodiment, the sleep system of embodiments 11-23 wherein the support structure further comprises legs operable to hold the foundation above a floor (e.g. at a sufficient height to

allow for effective airflow). In a twenty-fifth embodiment, the sleep system of embodiments 11-24 wherein the middle sculpted layer of foam further comprises a sculpted upper surface (e.g. having a plurality of foam pillars projecting upward (for example, with the foam pillars formed by a grid pattern of gaps/grooves in the upper surface of the middle sculpted layer of foam)).

[0062] While various embodiments in accordance with the principles disclosed herein have been shown and described above, modifications thereof may be made by one skilled in the art without departing from the spirit and the teachings of the disclosure. The embodiments described herein are representative only and are not intended to be limiting. Many variations, combinations, and modifications are possible and are within the scope of the disclosure. Alternative embodiments that result from combining, integrating, and/or omitting features of the embodiment(s) are also within the scope of the disclosure. Accordingly, the scope of protection is not limited by the description set out above, but is defined by the claims which follow, that scope including all equivalents of the subject matter of the claims. Each and every claim is incorporated as further disclosure into the specification and the claims are embodiment(s) of the present invention(s). Furthermore, any advantages and features described above may relate to specific embodiments, but shall not limit the application of such issued claims to processes and structures accomplishing any or all of the above advantages or having any or all of the above features.

[0063] Additionally, the section headings used herein are provided for consistency with the suggestions under 37 C.F.R. 1.77 or to otherwise provide organizational cues. These headings shall not limit or characterize the invention(s) set out in any claims that may issue from this disclosure. Specifically and by way of example, although the headings might refer to a "Field," the claims should not be limited by the language chosen under this heading to describe the so-called field. Further, a description of a technology in the "Background" is not to be construed as an admission that certain technology is prior art to any invention(s) in this disclosure. Neither is the "Summary"

to be considered as a limiting characterization of the invention(s) set forth in issued claims. Furthermore, any reference in this disclosure to "invention" in the singular should not be used to argue that there is only a single point of novelty in this disclosure. Multiple inventions may be set forth according to the limitations of the multiple claims issuing from this disclosure, and such claims accordingly define the invention(s), and their equivalents, that are protected thereby. In all instances, the scope of the claims shall be considered on their own merits in light of this disclosure, but should not be constrained by the headings set forth herein.

[0064] Use of broader terms such as comprises, includes, and having should be understood to provide support for narrower terms such as consisting of, consisting essentially of, and comprised substantially of. Use of the terms "optionally," "may," "might," "possibly," and the like with respect to any element of an embodiment means that the element is not required, or alternatively, the element is required, both alternatives being within the scope of the embodiment(s). Also, references to examples are merely provided for illustrative purposes, and are not intended to be exclusive.

[0065] While several embodiments have been provided in the present disclosure, it should be understood that the disclosed systems and methods may be embodied in many other specific forms without departing from the spirit or scope of the present disclosure. The present examples are to be considered as illustrative and not restrictive, and the intention is not to be limited to the details given herein. For example, the various elements or components may be combined or integrated in another system, or certain features may be omitted or not implemented.

[0066] Also, techniques, systems, subsystems, and methods described and illustrated in the various embodiments as discrete or separate may be combined or integrated with other systems, modules, techniques, or methods without departing from the scope of the present disclosure. Other items shown or discussed as directly coupled or communicating with each other may be indirectly coupled or communicating through some interface, device, or intermediate component, whether

electrically, mechanically, or otherwise. Other examples of changes, substitutions, and alterations are ascertainable by one skilled in the art and could be made without departing from the spirit and scope disclosed herein.

CLAIMS

What is claimed is:

1. A mattress foundation comprising:

a support structure;

an airflow unit; and

a foundation cover for the support structure comprising an upper surface;

wherein the upper surface comprises an air permeable element;

wherein the foundation cover encases the support structure to form a hollow cavity;

wherein the foundation cover further comprises one or more port allowing fluid communication between the hollow cavity and an outside environment;

wherein the airflow unit is configured to induce fluid flow between the hollow cavity and the outside environment via the one or more port; and

wherein the airflow unit is located within the hollow cavity.

2. A mattress foundation comprising:

a support structure;

an airflow unit; and

a foundation cover for the support structure comprising an upper surface, and wherein the upper surface comprises an air permeable element.

3. The foundation of claim 2 wherein the foundation cover encases the support structure to form a hollow cavity; wherein the foundation cover further comprises one or more port allowing fluid communication between the hollow cavity and an outside environment; and wherein the airflow unit is configured to induce fluid flow between the hollow cavity and the outside environment via the one or more port.

4. The foundation of claim 2, wherein the air permeable element comprises one or more high airflow mesh fabric panels.

5. The foundation of claim 4, wherein the entire upper surface of the foundation cover is formed of high airflow mesh fabric.

6. The foundation of claim 3, wherein the one or more port is located on a bottom surface of the foundation cover.

7. The foundation of claim 2, wherein the airflow unit is located within the support structure.

8. The foundation of claim 6, wherein the airflow unit is located within the hollow cavity over the port.

9. The foundation of claim 2, wherein the airflow unit comprises a HEPA filter.

10. The foundation of claim 2, wherein the airflow unit comprises a climate control unit operable to cool or heat air.

11. The foundation of claim 3, wherein the cover is air impermeable except for the upper surface and the one or more port.

12. A sleep system comprising a foundation as in claim 2 and a mattress, wherein the mattress is located atop and in contact with the foundation and wherein the mattress and foundation are in fluid communication with each other.

13. The sleep system of claim 12, wherein the mattress comprises:

a mattress cover encompassing the mattress;

wherein the mattress cover comprises a bottom surface, and wherein the bottom surface comprises a mattress air permeable member.

14. The sleep system of claim 13, wherein the mattress air permeable member comprises one or more high airflow mesh fabric panels.

15. The sleep system of claim 13, wherein the mattress cover further comprises an upper surface, and wherein the upper surface comprises a second mattress air permeable member.

16. The sleep system of claim 13 further comprising one or more foam layers within the mattress cover; wherein the one or more foam layers each comprises a plurality of vertical air pathways which pass through the entire thickness of the corresponding foam layer.

17. The sleep system of claim 16, wherein the mattress comprises a plurality of foam layers; and wherein at least some of the vertical air pathways in the foam layers align to provide continuous airflow paths from the bottom surface of the mattress to an upper surface of the mattress.

18. The sleep system of claim 17, wherein the foundation cover encases the support structure to form a hollow cavity; wherein the foundation cover further comprises one or more port allowing fluid communication between the hollow cavity and the outside environment; and wherein the airflow unit is configured to induce fluid flow between the hollow cavity and the outside environment via the one or more port.

19. The sleep system of claim 18, wherein the one or more port is located on a bottom surface of the cover; and wherein the airflow unit is located within the hollow cavity.

20. The sleep system of claim 19, wherein the airflow unit comprises a HEPA filter; and wherein the airflow unit comprises a climate control unit.

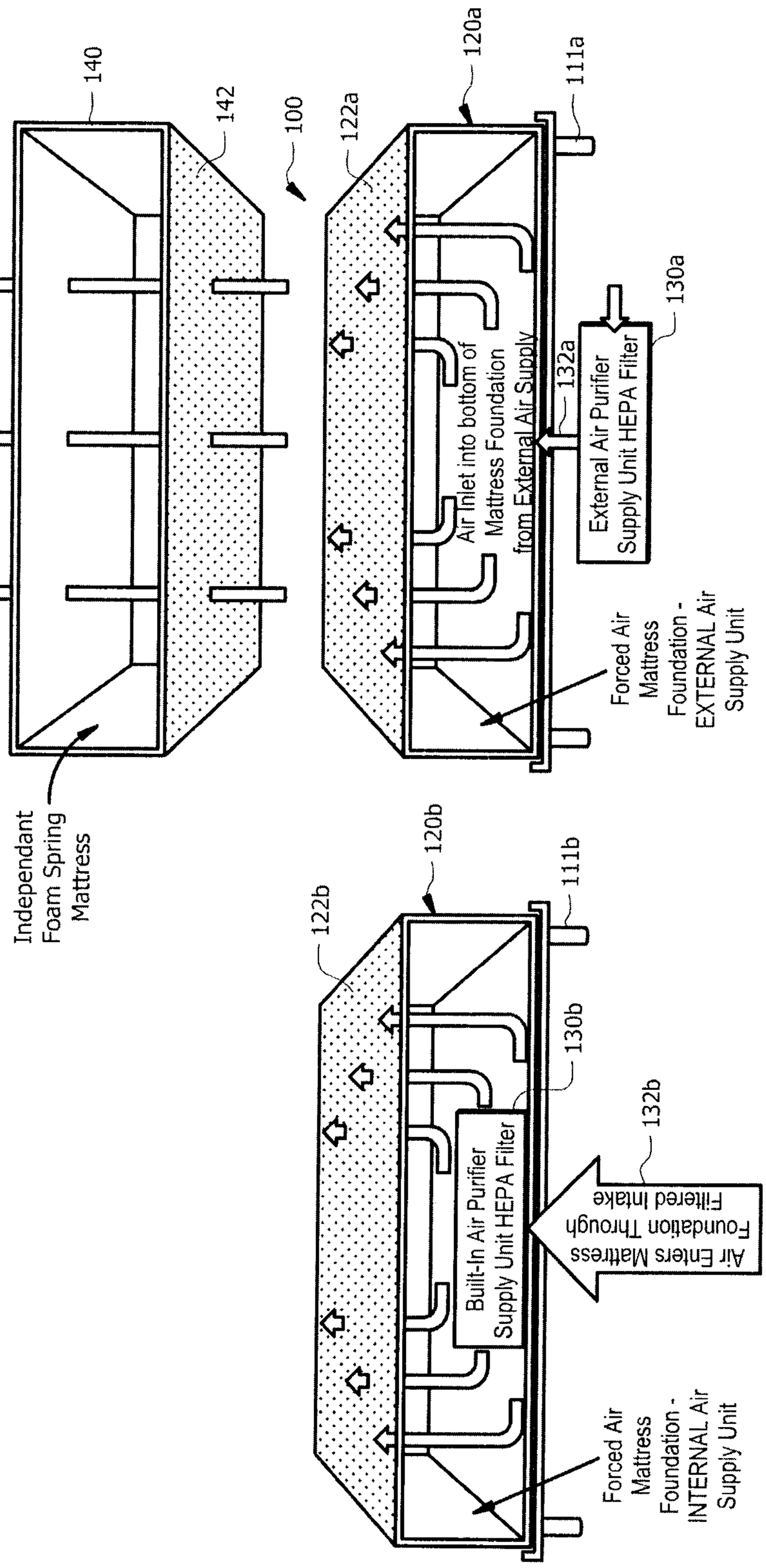

140
142
100
122a
120a
111a
Air Inlet into bottom of Mattress Foundation from External Air Supply
132a
External Air Purifier Supply Unit HEPA Filter
130a
Forced Air Mattress Foundation - EXTERNAL Air Supply Unit
Independant Foam Spring Mattress
120b
122b
111b
130b
132b
Built-In Air Purifier Supply Unit HEPA Filter
Air Enters Mattress Foundation Through Filtered Intake
Forced Air Mattress Foundation - INTERNAL Air Supply Unit

FIG. 1A

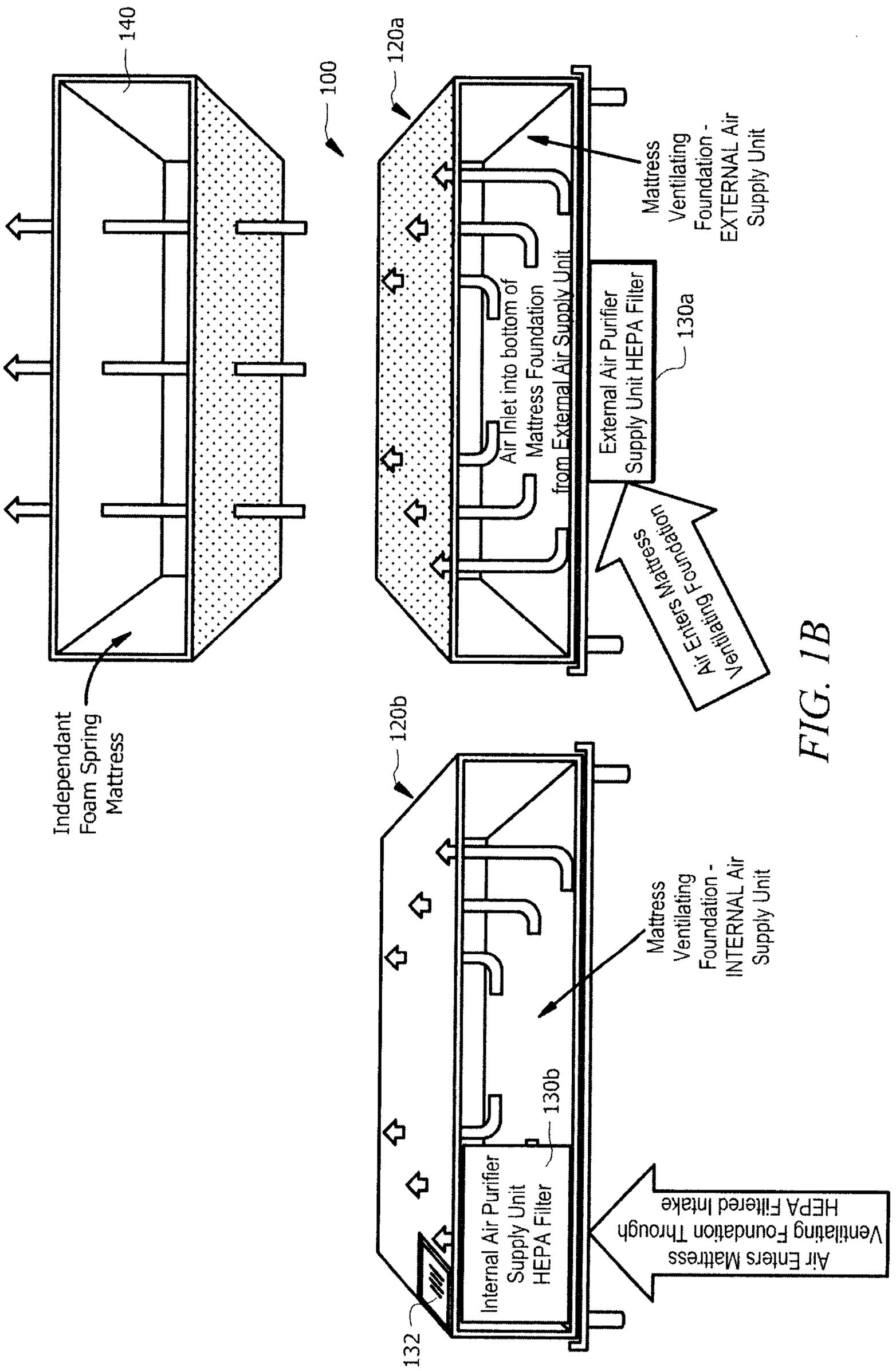

140
100
120a
Independant Foam Spring Mattress
Mattress Ventilating Foundation - EXTERNAL Air Supply Unit
Air Inlet into bottom of Mattress Foundation from External Air Supply Unit
External Air Purifier Supply Unit HEPA Filter
130a
Air Enters Mattress Ventilating Foundation
120b
Mattress Ventilating Foundation - INTERNAL Air Supply Unit
130b
Internal Air Purifier Supply Unit HEPA Filter
Air Enters Mattress Ventilating Foundation Through HEPA Filtered Intake
132

FIG. 1B

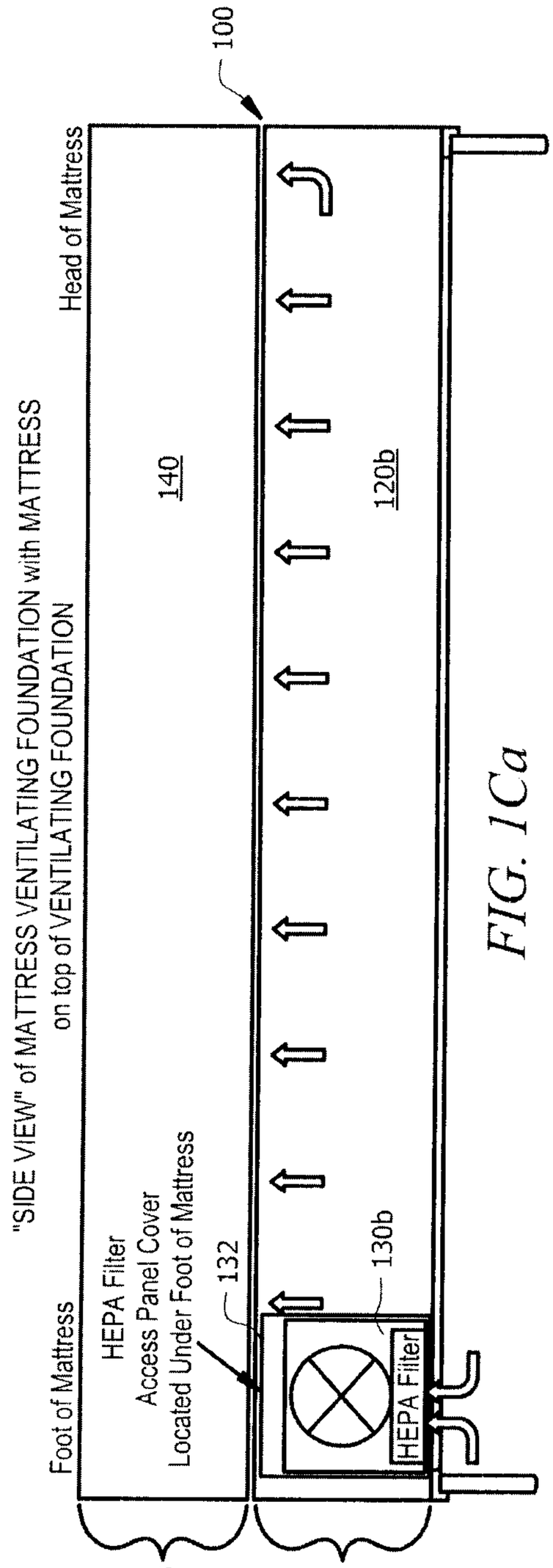


FIG. 1Ca

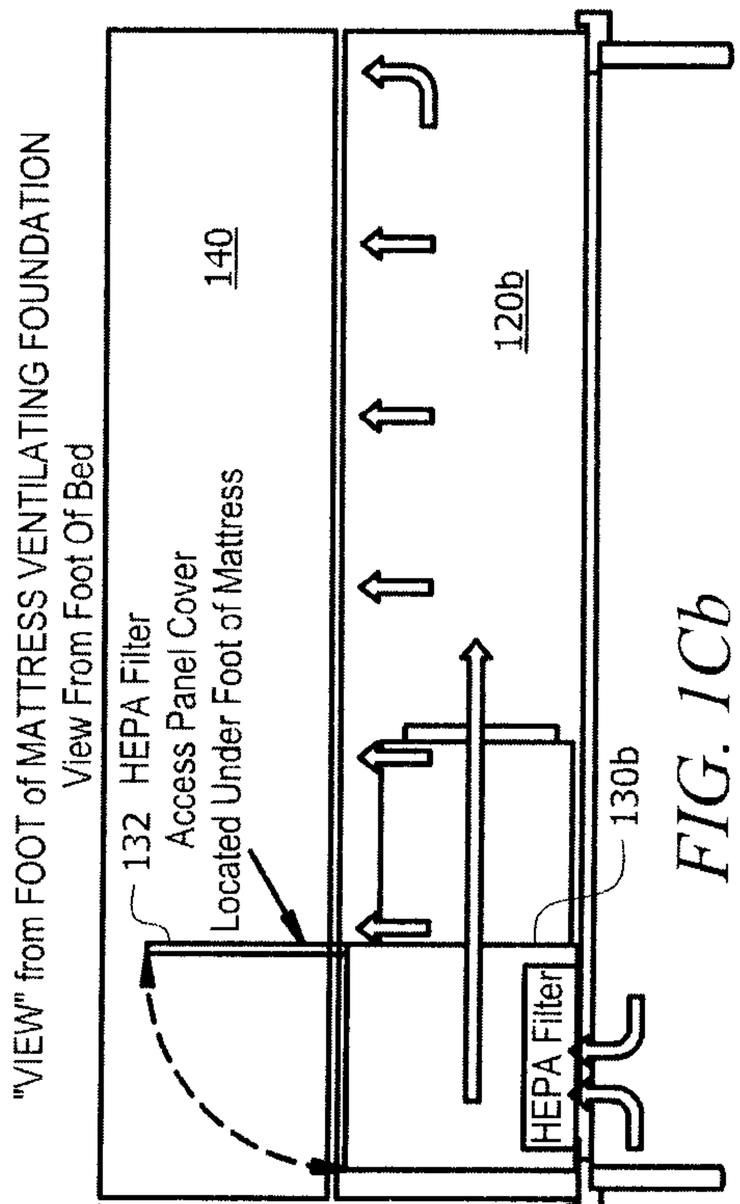


FIG. 1Cb

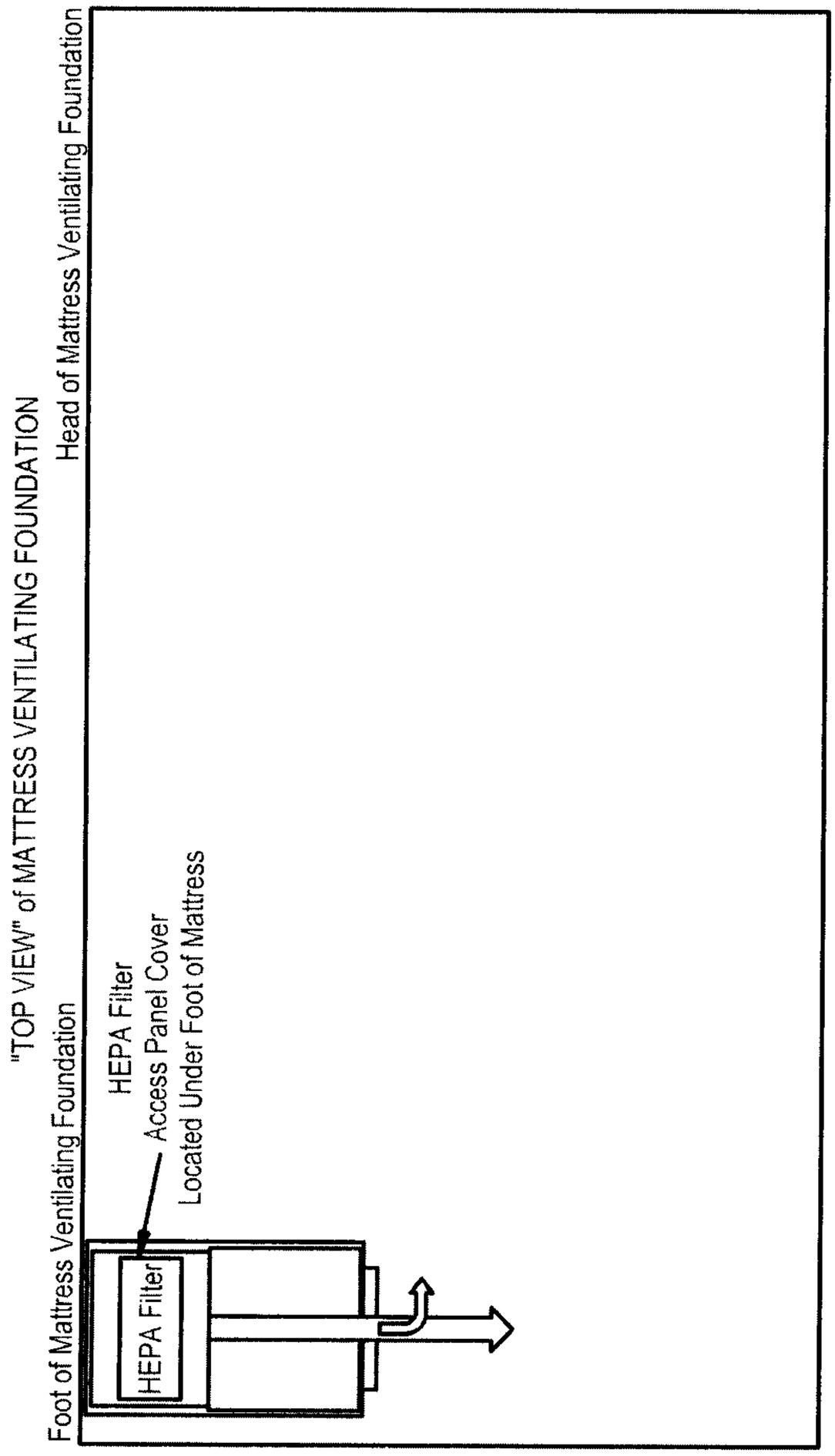

"TOP VIEW" of MATTRESS VENTILATING FOUNDATION
Head of Mattress Ventilating Foundation
Foot of Mattress Ventilating Foundation
HEPA Filter
Access Panel Cover
Located Under Foot of Mattress
HEPA Filter

FIG. 1Cc

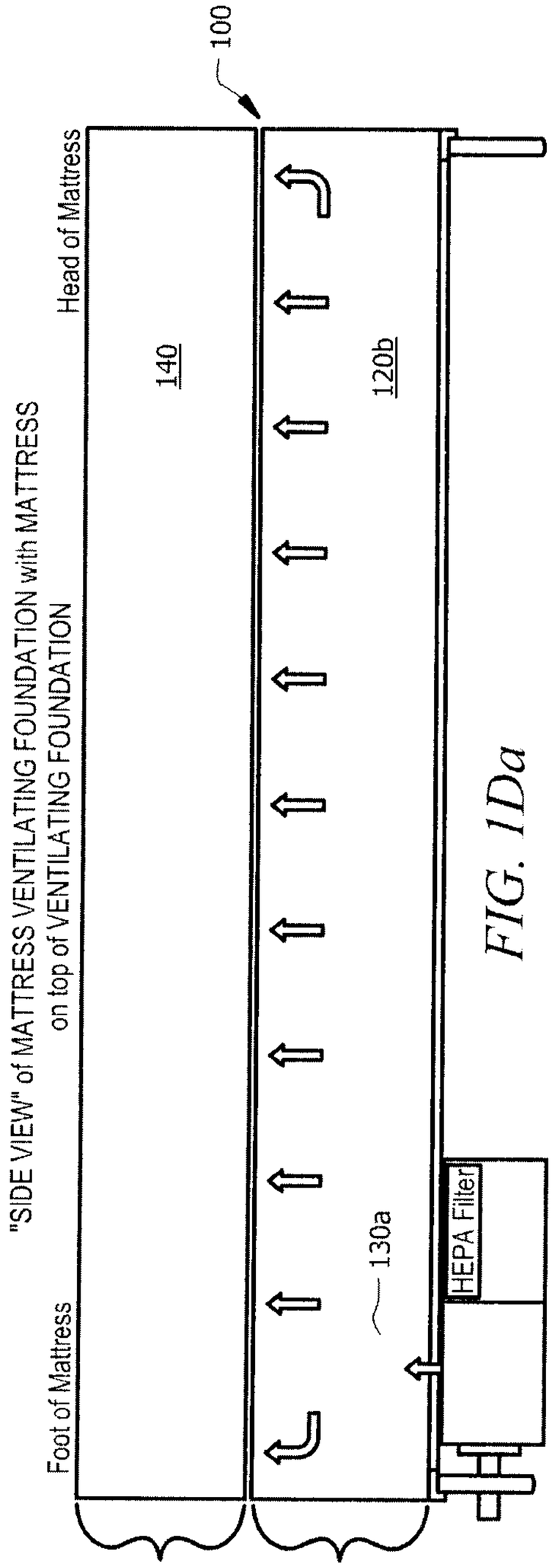


FIG. 1Da

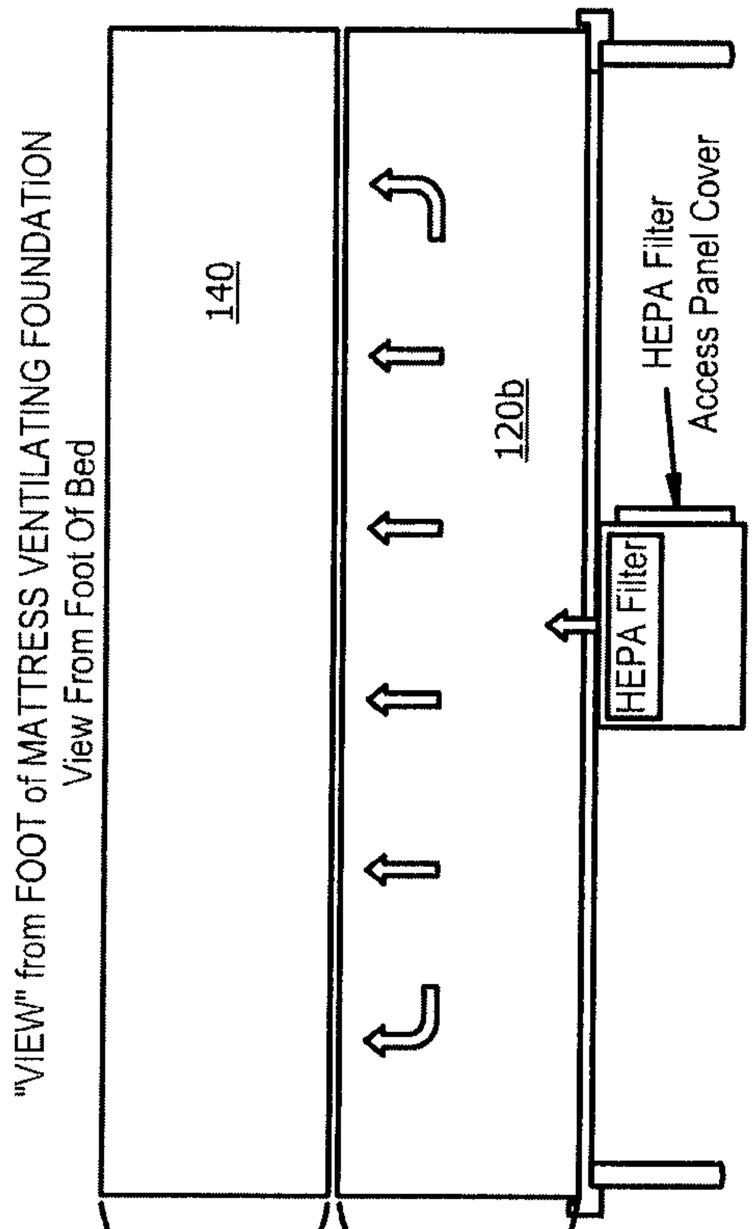


FIG. 1Db

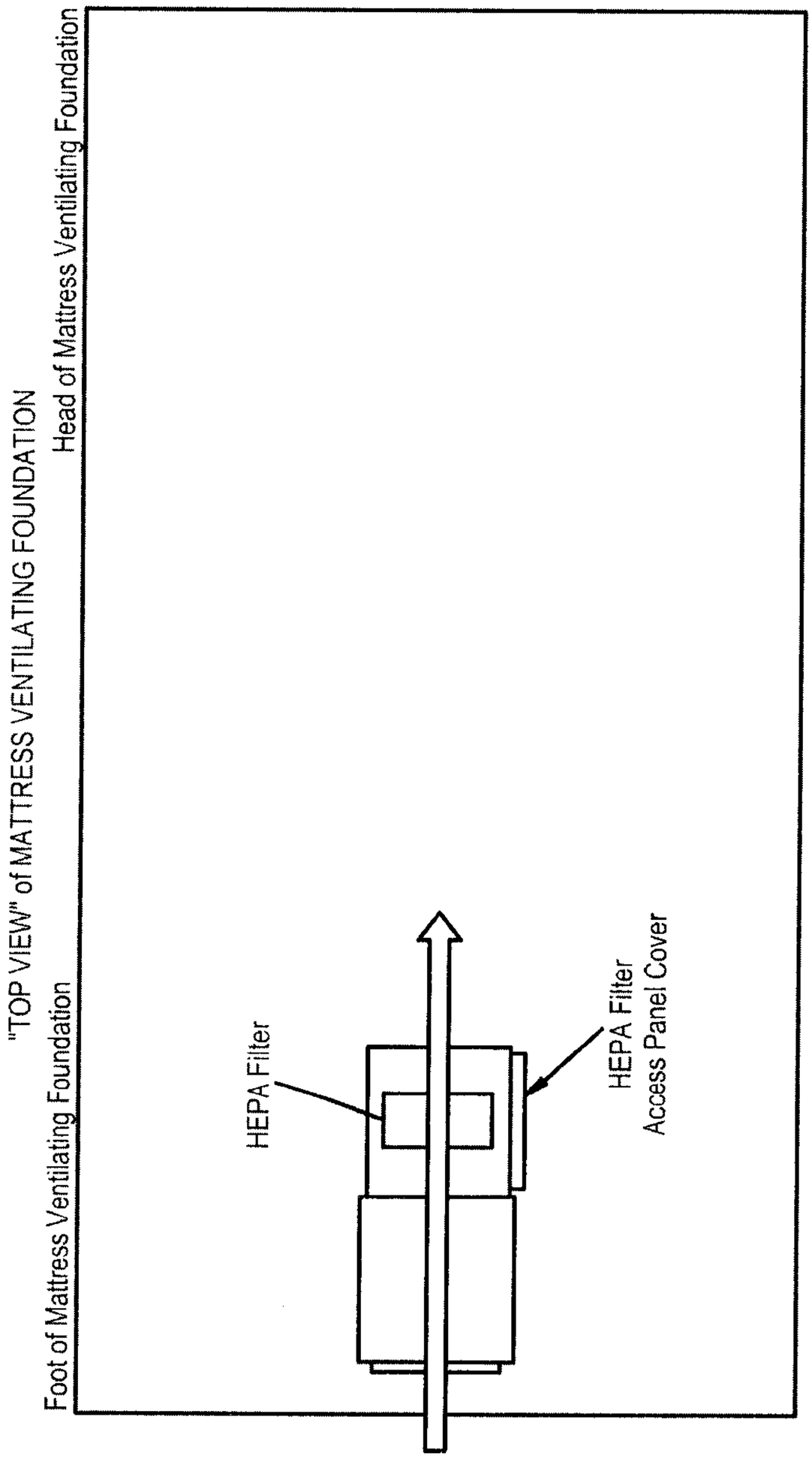

"TOP VIEW" of MATTRESS VENTILATING FOUNDATION
Head of Mattress Ventilating Foundation
Foot of Mattress Ventilating Foundation
HEPA Filter
HEPA Filter
Access Panel Cover

FIG. 1Dc

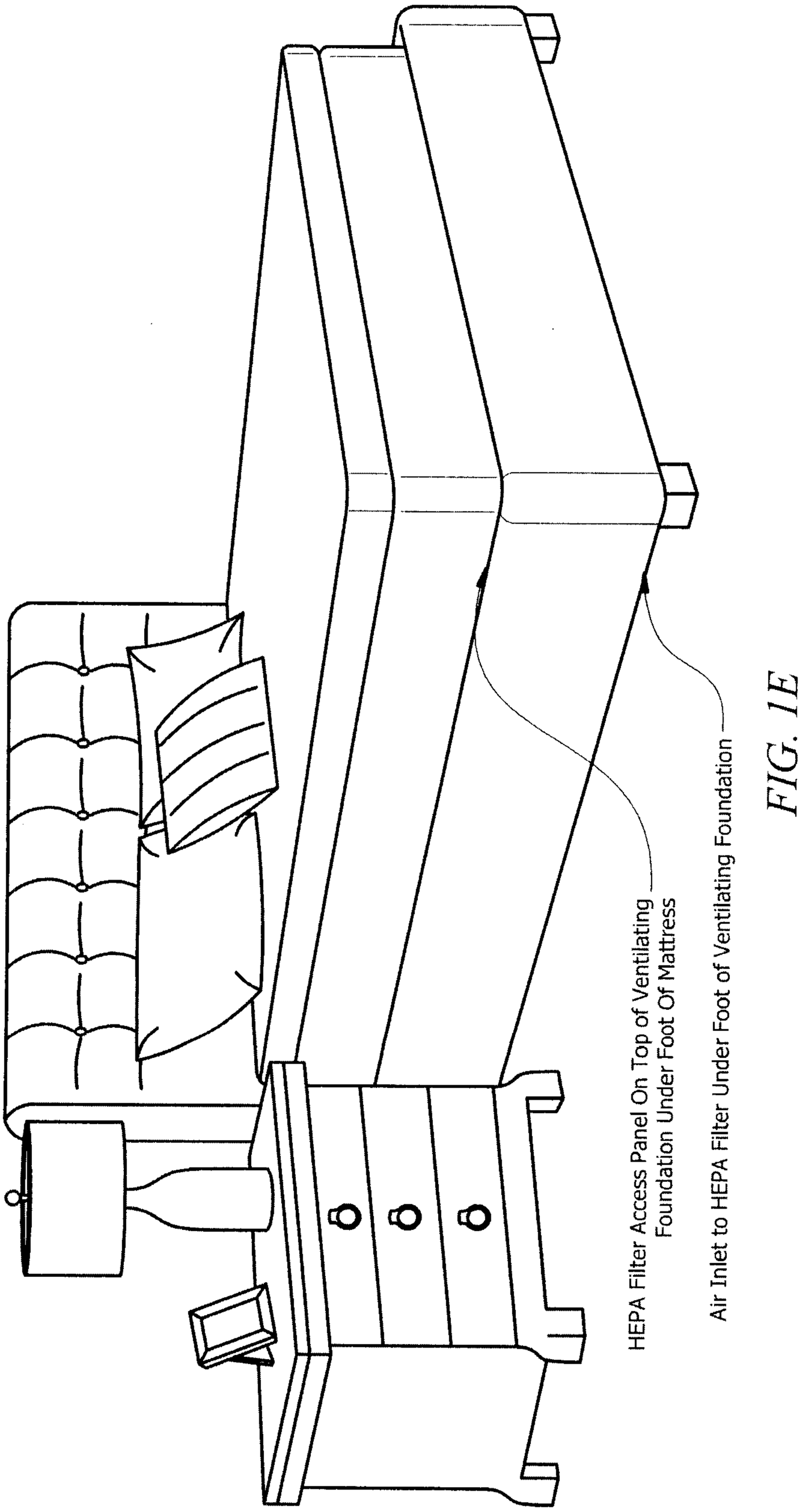

HEPA Filter Access Panel On Top of Ventilating Foundation Under Foot Of Mattress
Air Inlet to HEPA Filter Under Foot of Ventilating Foundation

FIG. 1E

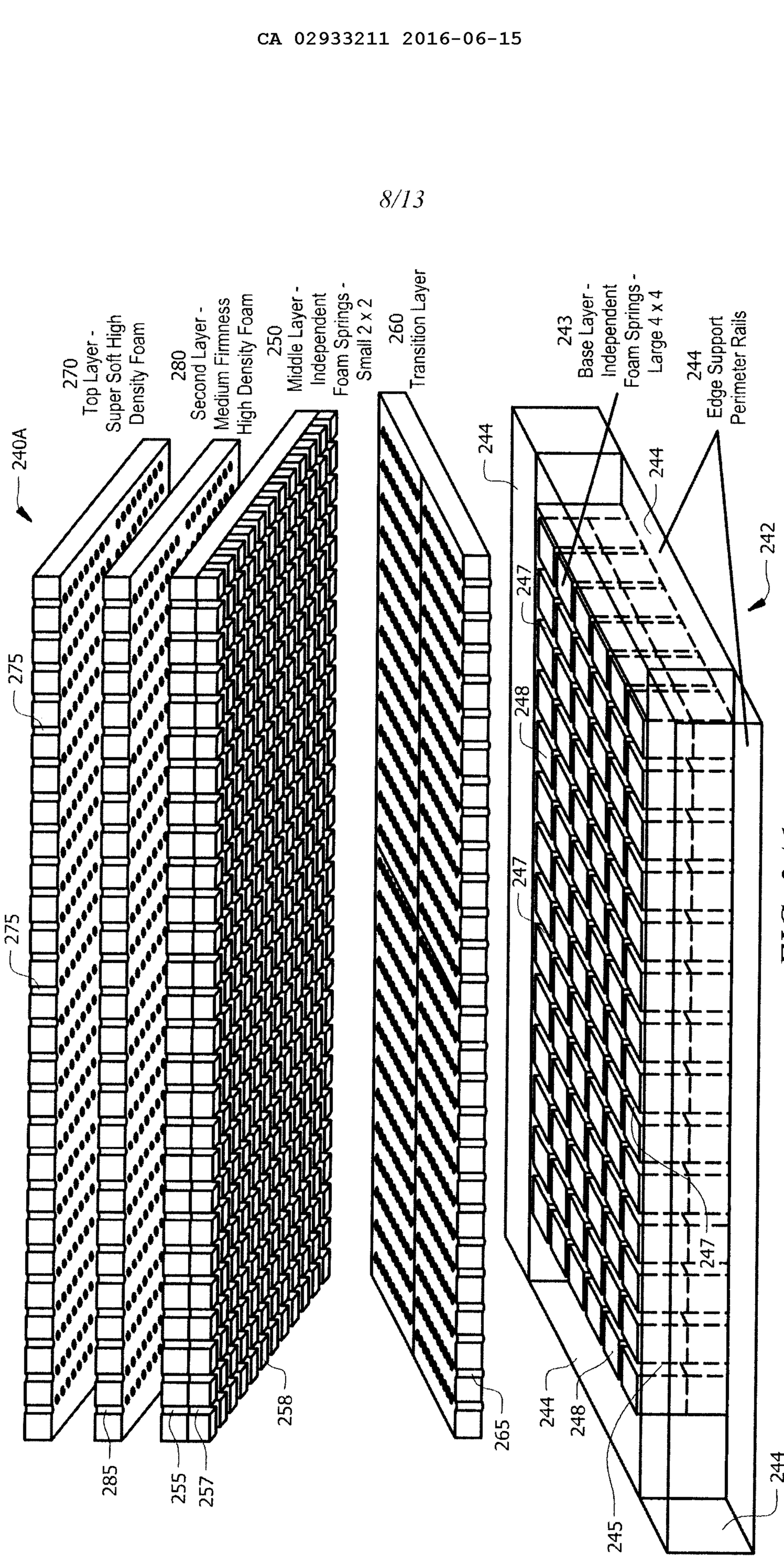
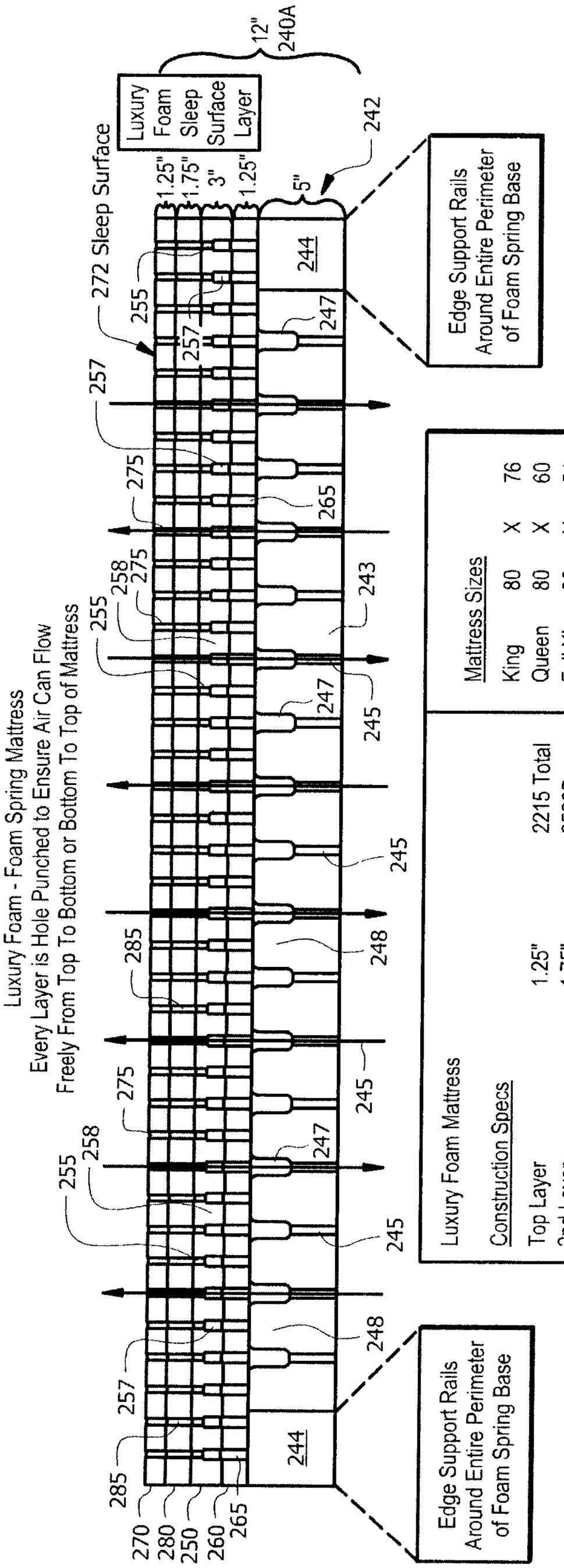

240A
270
Top Layer - Super Soft High Density Foam
280
Second Layer - Medium Firmness High Density Foam
250
Middle Layer - Independent Foam Springs - Small 2 x 2
260
Transition Layer
243
Base Layer - Independent Foam Springs - Large 4 x 4
244
Edge Support Perimeter Rails
242
275
275
258
285
255
257
265
244
247
248
247
247
244
248
244
245
244

FIG. 2A1



Mattress Sizes			
King	80	X	76
Queen	80	X	60
Full XL	80	X	54
Twin XL	80	X	38

All Side Rail Sizes			
	5 x 4	X	72
End Rail Sizes			
King	5 x 4	X	68
Queen	5 x 4	X	52
Full XL	5 x 4	X	48
Twin XL	5 x 4	X	30

Luxury Foam Mattress		
Construction Specs		
Top Layer	1.25"	2215 Total
2nd Layer	1.75"	2520B
3rd Layer - Small Grid	3"	2550B
4th Layer - Transition Layer	1.25"	2560B
Base - Large Grid	5"	2560B
Side Rails	5 x 4 x 80	2560B
End Rails	5 x 4 x Various	2560B

FIG. 242

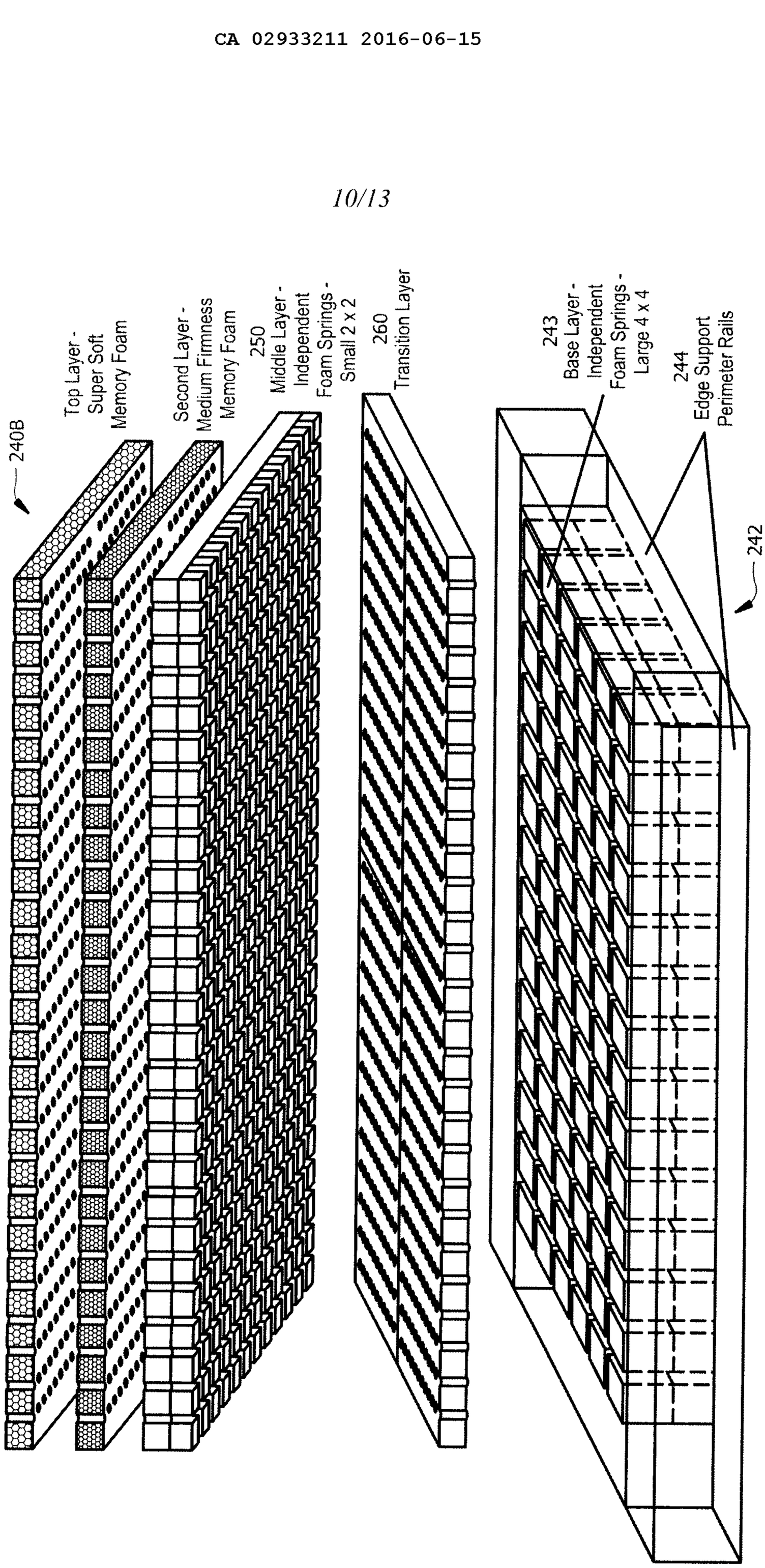
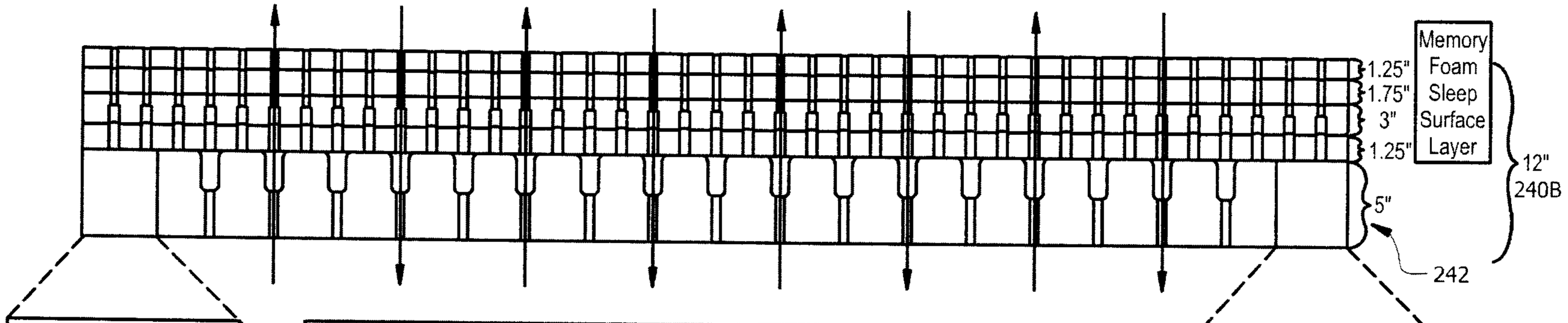

3D VIEW OF INDEPENDENT FOAM SPRING MATTRESS
Memory Foam Mattress (Top 2 Layers are Gel Memory - All other Layers and Rails are Conventional High Density Foam)
240B
Top Layer - Super Soft Memory Foam
Second Layer - Medium Firmness Memory Foam
250
Middle Layer - Independent Foam Springs - Small 2 x 2
260
Transition Layer
243
Base Layer - Independent Foam Springs - Large 4 x 4
244
Edge Support Perimeter Rails
242

FIG. 2B1

Memory Foam - Foam Spring Mattress
Every Layer is Hole Punched to Ensure Air Can Flow
Freely From Top To Bottom or Bottom To Top of Mattress



Memory Foam Mattress		
Construction Specs		
Top Layer	1.25"	2215 Total
2nd Layer	1.75"	2520B
3rd Layer - Small Grid	3"	2550B
4th Layer - Transition Layer	1.25"	2560B
Base - Large Grid	5"	2560B
Side Rails	5 x 4 x 80	2560B
End Rails	5 x 4 x Various	2560B

Mattress Sizes			
King	80	X	76
Queen	80	X	60
Full XL	80	X	54
Twin XL	80	X	38

All Side Rail Sizes			
	5 x 4	X	72

End Rail Sizes			
King	5 x 4	X	68
Queen	5 x 4	X	52
Full XL	5 x 4	X	48
Twin XL	5 x 4	X	30

FIG. 2B2

11/13

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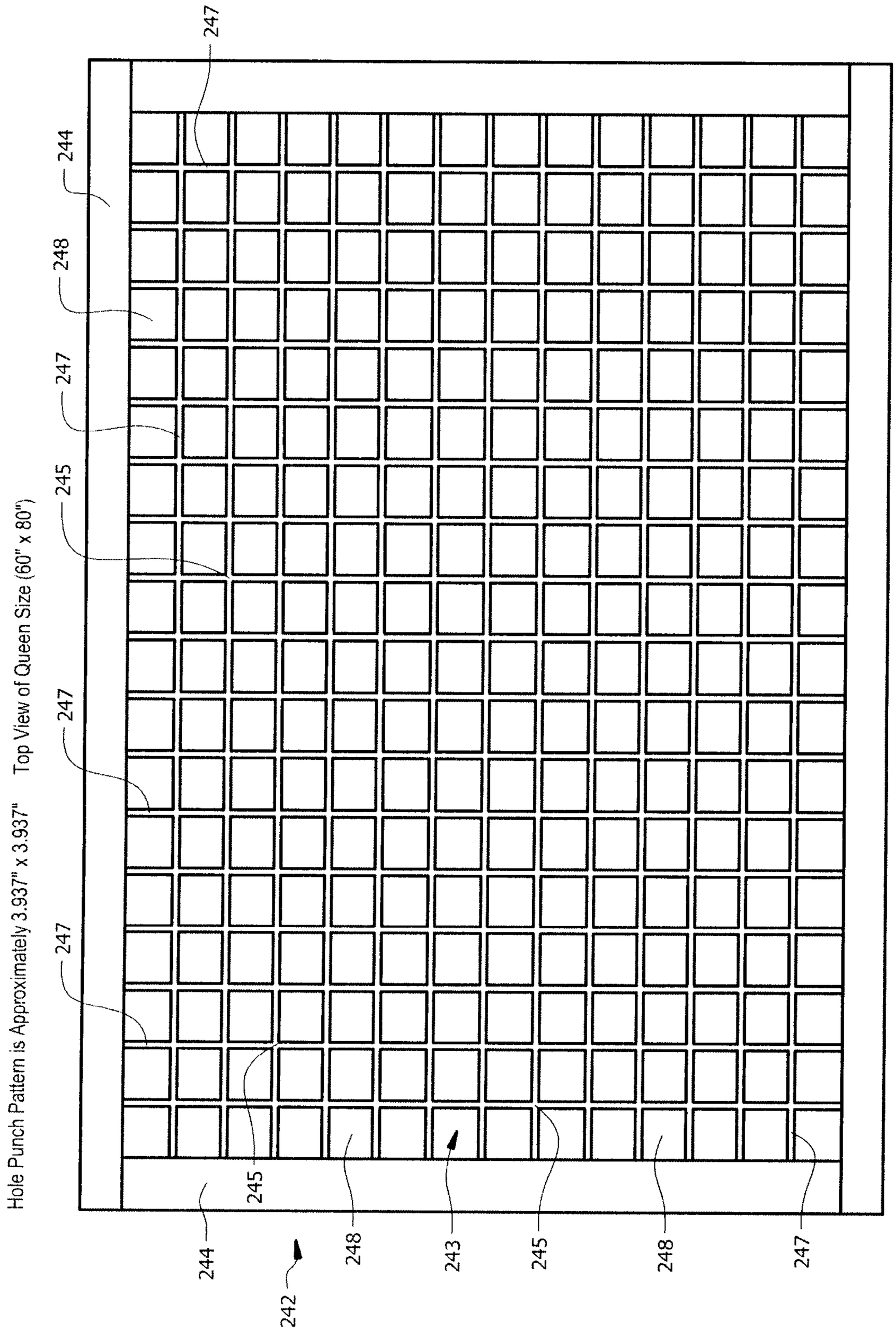

247
244
248
247
245
247
247
Hole Punch Pattern is Approximately 3.937" x 3.937"
Top View of Queen Size (60" x 80")
245
244
242
248
243
245
248
247

FIG. 3

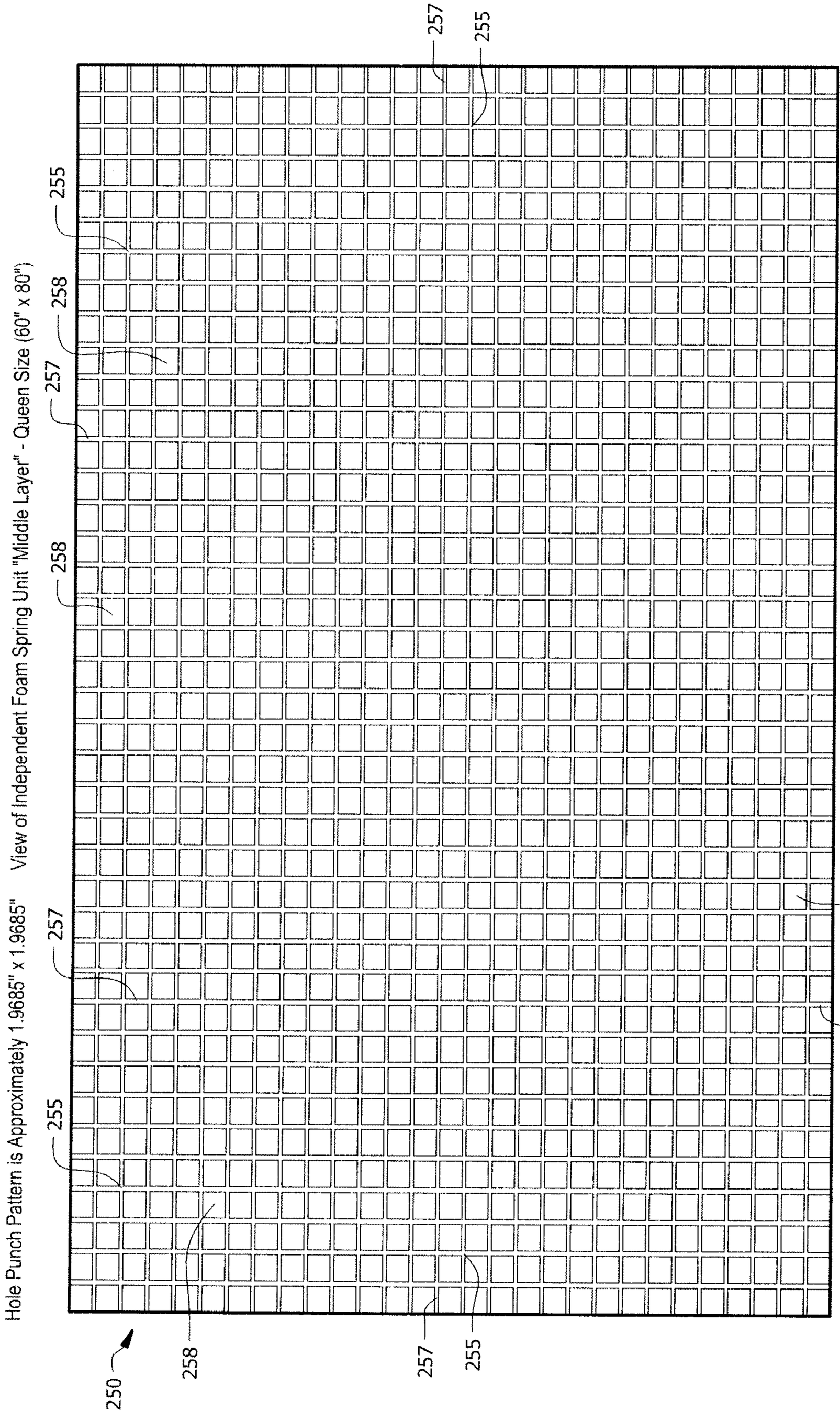
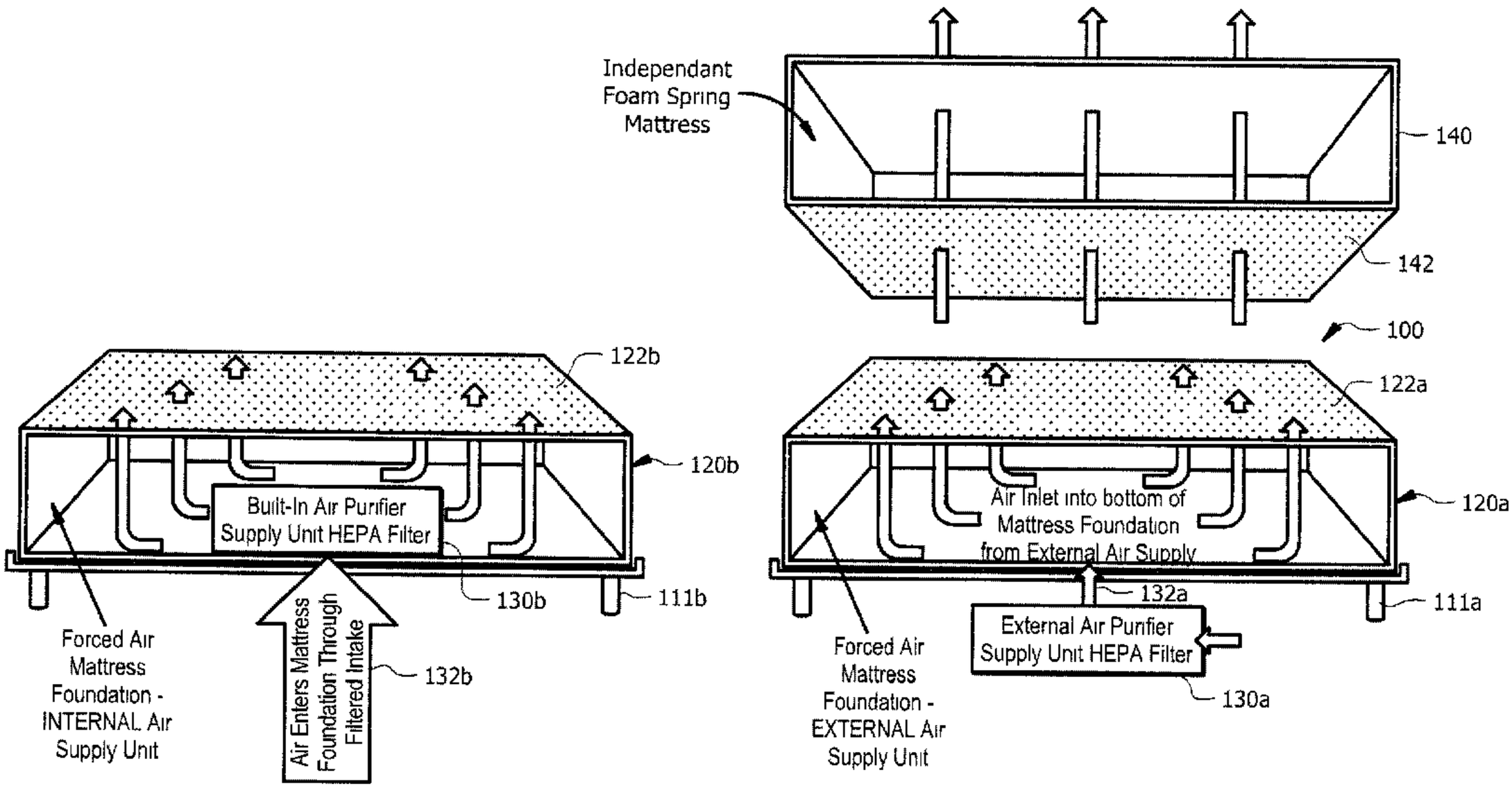

257
255
255
258
257
258
Hole Punch Pattern is Approximately 1.9685" x 1.9685" View of Independent Foam Spring Unit "Middle Layer" - Queen Size (60" x 80")
255
257
258
257
255
250
258
257
255

FIG. 4


Independant
Foam Spring
Mattress
140
142
100
122b
120b
Built-In Air Purifier
Supply Unit HEPA Filter
130b
111b
Forced Air
Mattress
Foundation -
INTERNAL Air
Supply Unit
Air Enters Mattress
Foundation Through
Filtered Intake
132b
122a
120a
Air Inlet into bottom of
Mattress Foundation
from External Air Supply
132a
111a
External Air Purifier
Supply Unit HEPA Filter
130a
Forced Air
Mattress
Foundation -
EXTERNAL Air
Supply Unit