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(54) **Title:** POCKET COIL SPRING ASSEMBLIES HAVING SEPARATED SEAMS AND SUPPORT CUSHIONS INCLUDING THE SAME

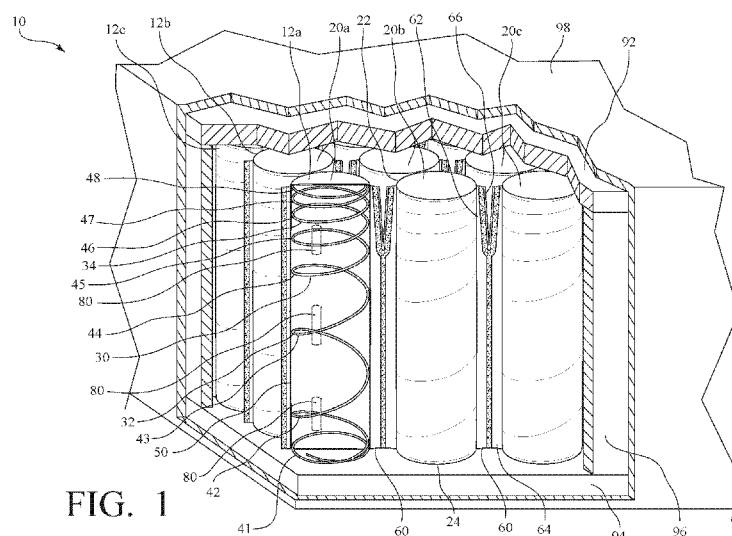


FIG. 1

(57) **Abstract:** A pocketed coil spring assembly is provided that comprises a plurality of pocketed coil springs arranged in a row. Each of the pocketed coil springs includes a coil spring surrounded by a flexible enclosure. A seam is positioned between each one of the plurality of pocketed coil springs and an adjacent one of the plurality of pocketed coil springs. Each seam is configured to allow one or more ends of each of the pocketed coil springs to move independently of the corresponding end of an adjacent one of the pocketed coil springs. Support cushions, such as mattresses, that include a plurality of such pocketed coil spring assemblies arranged in a matrix are further provided.



POCKET COIL SPRING ASSEMBLIES HAVING SEPARATED SEAMS AND SUPPORT CUSHIONS INCLUDING THE SAME

TECHNICAL FIELD

[0001] The present invention relates to pocketed coil spring assemblies and support cushions including the pocketed coil spring assemblies. In particular, the present invention relates to pocketed coil spring assemblies having seams that are positioned between each of the pocketed coil springs and that allow one or more ends of each pocketed coil spring to move independently of an adjacent pocketed coil spring.

BACKGROUND

[0002] Spring assemblies that make use of pocketed coil springs, which are also known as wrapped coils, encased coils, encased springs, or Marshall coils, are generally recognized as providing a unique feel to a mattress when used as a part of a spring assembly because each discrete coil is capable of moving independently to support the body of a user, or a portion thereof, resting on the mattress. In particular, in spring cores including a plurality of pocketed coil spring assemblies, each coil is wrapped in a fabric pocket and moves substantially independently of the other coils in the spring core to thereby provide individualized comfort and contouring to the body of a user. Moreover, as a result of moving substantially independently from one another, the pocketed coils also do not directly transfer motion from one pocketed coil to another, and, consequently, the movement of one user resting on a mattress assembly using pocketed coils will not disturb another user resting on the mattress assembly. In this regard, mattress assemblies constructed with a spring core using pocketed coil springs are generally recognized as providing a soft and luxurious feel, and are often more desirable than a traditional

inner spring mattress. Accordingly, a spring core that makes use of pocketed coil springs and that further improves the unique feel and support provided by traditional pocketed coil springs would be both highly desirable and beneficial.

SUMMARY

[0003] The present invention includes pocketed coil spring assemblies and support cushions including the pocketed coil spring assemblies. In particular, the present invention includes pocketed coil spring assemblies having seams that are positioned between each of the pocketed coil springs and that allow one or more ends of each pocketed coil spring to move independently of an adjacent pocketed coil spring.

[0004] In one exemplary embodiment of the present invention, a support cushion includes a plurality of rows of pocketed coil springs with each of the rows of pocketed coil springs being substantially identical to one another and arranged side-by-side to form a matrix. Each of the pocketed coil springs in each row are also substantially identical to one another with each of the pocketed coil springs including a coil spring surrounded by a flexible enclosure. A seam is also positioned between each one of the plurality of pocketed coil springs and an adjacent one of the plurality of pocketed coil springs such that the seam connects each of the flexible enclosures of the pocketed coil springs. Furthermore, an adhesive is also positioned between each row of pocketed coil springs and an adjacent row of pocketed coil springs to connect each of the rows of pocketed coils springs to one another.

[0005] With respect to the seams, each seam generally includes a top portion and a bottom portion and has a height substantially equal to the height of the each of the pocketed coil springs. In some embodiments, each seam defines a separation or further includes one or more welds that define a separation at the top portion of each seam to allow the upper ends of each of the

pocketed coil springs to move independently of one another. For example, in some embodiments, each seam includes a first weld that extends from adjacent the lower ends of two adjacent pocketed coil springs to a node positioned on the seam at a height less than the height of the seam. A second weld then extends from the node to the upper end of one pocketed coil spring, and a third weld extends from the node to the upper end of the adjacent pocketed coil spring, such that the separation of the seam is defined by the second weld and the third weld and such that the seam and the welds have a Y-shaped configuration.

[0006] As another example of a seam defining a separation at the top portion of each seam and between two adjacent pocketed coil springs, in other embodiments, the seam includes a first weld that extends from adjacent the lower end to adjacent the upper end of one of the plurality of pocketed coil springs and a second weld that extends from adjacent the lower end to adjacent the upper end of an adjacent one of the plurality of pocketed coil springs. The separation that is defined by the seam is then defined by the seam itself between the first weld and the second weld. As yet another example of a seam defining a separation at a top portion of the seam, in further embodiments, each seam comprises a first weld that extends from adjacent the lower end to adjacent the upper end of each one of the plurality of pocketed coil springs, a second weld that extends from adjacent the lower end to adjacent the upper end of an adjacent one of the plurality of pocketed coil springs, and a third weld that is positioned between the first weld and the second weld and that extends to a height less than that of the first weld and the second weld. The separation defined by the seam in such an embodiment is then again defined by the seam itself between the first weld and the second weld and above the third weld.

[0007] In addition to the upper end of one pocketed coil spring moving independently of the upper end of the adjacent one of the pocketed coil springs in a particular row, in arranging the

rows of pocketed coils springs in a matrix, the upper ends of each of the pocketed coils springs in one particular row are further configured to move independently of the upper ends of each of the pocketed coil springs in an adjacent row. In this regard, to connect a particular row of pocketed coil springs to an adjacent row of pocketed coil springs, an adhesive is applied to the flexible enclosures of each of the pocketed coils springs in a particular row and in an adjacent row. More specifically, the adhesive is generally positioned on the flexible enclosure of the pocketed coil springs below the upper end of each pocketed coil spring so as to allow the top ends of the pocketed coil springs in adjacent rows to move independent of one another. In this way, such an arrangement of the pocketed coils springs in the rows not only causes less interaction between the upper ends of the pocketed coil springs in a particular row and an adjacent row, but such an arrangement also provides a user resting on the mattress with an increased amount of conformance to his or her body and less motion transfer across the entirety of the mattress. Indeed, in some embodiments, an exemplary support cushion can also be provided where there is no separation formed in the seam at all, but yet, because of the configuration of the adhesive positioned between the rows of pocketed coil spring assemblies, the exemplary support cushion is still capable of providing increased amounts of conformance and less motion transfer.

[0008] With further respect to the flexible enclosures and the seams, the flexible enclosures and the seams are typically made of a non-woven fabric that can be joined or welded together by heat and pressure (e.g., via ultrasonic welding or similar thermal welding procedure) to form a generally cylindrical construction for each flexible enclosure and a generally planar construction for each seam. The coil spring of each of the pocketed coil springs, on the other hand, is generally made of a continuous wire having a length and forming a plurality of convolutions that are each made up of a portion of the continuous wire substantially equal to about one turn of the

continuous wire (i.e., about 360° of the helical path of the continuous wire). In some embodiments, the continuous wire of each coil spring forms an upper end convolution, a lower end convolution opposite the upper end convolution, and a number of intermediate helical convolutions that helically spiral between the lower end convolution and the upper end convolution. In some embodiments, the upper end convolution of each coil spring forms a substantially closed circular loop at the topmost portion of the coil spring, while the lower end convolution similarly forms a substantially closed circular loop at the lowermost portion of the coil spring. In this way, such a coil spring thus terminates at either end in a generally planar form that serves as the supporting end structures of the exemplary pocketed coil springs.

[0009] The upper end convolution, the intermediate helical convolutions, and the lower end convolution of each coil spring are generally arranged such that the coil spring has a lower section and an upper section. Further, by forming the coil spring from a continuous wire, the upper end convolution, the intermediate helical convolutions, and the lower end convolution each have a respective diameter, and the continuous wire also defines various pitches between the lower end convolution, the intermediate helical convolutions, and the upper end convolution. By varying the diameters, the pitches, or both the diameters and the pitches included in the coil springs that are utilized in the pocketed coil spring assemblies of the present invention, however, a variable and non-linear loading response is provided in some embodiments where the upper section has a first spring constant that provides a softer feel as the spring is initially compressed, and where the lower section has a second spring constant that provides a firmer feel as the compression of the coil spring increases.

[0010] As described above, the seams of the exemplary pocketed coil spring assemblies are typically further configured such that the bottom portion of each seam is positioned adjacent to

the lower end of the pocketed coil springs and, consequently, each seam is also positioned adjacent to the lower section of each coil spring. Similarly, the top portion of the seam (i.e., where the separation is defined, if present) is positioned adjacent to the upper end of each of the pocketed coils springs such that the separation defined by the seam is also positioned adjacent to the upper section of each coil spring. Moreover, and again as described above, the adhesive is also generally positioned adjacent to the lower end of the pocketed coil springs and, consequently, the adhesive is further positioned adjacent to the lower section of each coil spring. By virtue of this arrangement, the lower sections of each coil spring are thus generally secured in the lower end of the pocketed coil springs, while the upper sections of each coil spring are configured to move more independently. As such, not only is each coil spring able to partially compress without causing any compression in other coil springs, but because of the different spring constants between the upper section and the lower section of each coil spring, the lack of connection between each upper section of each coil spring provides for additional freedom of movement and thus a greater degree of comfort to a user during the initial compression.

[0011] Regardless of the particular configuration of the seams between each of the pocketed coil springs of the present invention, as noted above and because of the ability of the pocketed coil spring assemblies to provide a user with an increased amount of conformance to his or her body and less motion transfer, each of the pocketed coil spring assemblies described herein are particularly suited for use in a mattress and can be combined with one or more supporting or foundation layers. In some embodiments, an exemplary mattress is provided that further includes an upper body supporting layer positioned above the pocketed coil springs and a lower foundation layer positioned below the pocketed coil springs. In some embodiments, a sidewall then extends between the upper body supporting layer and the lower foundation layer and around

the entire periphery of the two layers, such that the pocketed coil springs are completely surrounded. In some embodiments, the mattress can also include a cover that surrounds the upper body supporting layer, the sidewall, and the lower foundation layer to protect the underlying layers and the pocketed coil spring assemblies of the mattress.

[0012] 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

[0013] FIG. 1 is a partial perspective view of a support cushion made in accordance with the present invention with a portion of the support cushion removed to show a plurality of rows of pocketed coil springs arranged to form a matrix;

[0014] FIG. 2 is a partial side view of the support cushion of FIG. 1 with a portion of the support cushion removed to show the pocketed coil springs connected by exemplary seams in accordance with the present invention;

[0015] FIG. 3 is a partial side view of another exemplary support cushion made in accordance with the present invention with a portion of the support cushion removed to show a plurality of pocketed coil springs connected by another seam;

[0016] FIG. 4 is a partial side view of another exemplary support cushion made in accordance with the present invention with a portion of the support cushion removed to show a plurality of pocketed coil springs connected by another seam; and

[0017] FIG. 5 is a partial perspective view of another exemplary support cushion made in accordance with the present invention with a portion of the support cushion removed to show a plurality of rows of pocketed coil springs arranged to form a matrix.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0018] The present invention includes pocketed coil spring assemblies and support cushions including the pocketed coil spring assemblies. In particular, the present invention includes pocketed coil spring assemblies having seams that are positioned between each of the pocketed coil springs and that allow one or more ends of each pocketed coil spring to move independently of an adjacent pocketed coil spring.

[0019] Referring first to FIG. 1, in one exemplary embodiment of the present invention, a support cushion in the form of a mattress 10 is provided that includes a plurality of rows 12a, 12b, 12c of pocketed coil springs 20a, 20b, 20c, where each of the rows 12a, 12b, 12c are substantially identical to one another and are arranged side-by-side to form a matrix that, in turn, forms the spring core of the mattress 10. Each of the pocketed coil springs 20a, 20b, 20c in each row 12a, 12b, 12c are also substantially identical to one another, with each of the pocketed coil springs 20a, 20b, 20c including a coil spring 30 surrounded by a flexible enclosure 50, and with each of the pocketed coil springs 20a, 20b, 20c having an upper end 22 and a lower end 24, as further discussed below. A seam 60 is also positioned between and connects each one of the plurality of pocketed coil springs 20a, 20b, 20c in each of the rows 12a, 12b, 12c. In this regard, while FIG. 1 shows only the initial two seams 60 and the initial pocketed coil springs 20a, 20b, 20c in three rows 12a, 12b, 12c, it is of course contemplated that support cushions, such as mattresses, can be produced including any number of seams as well as any number of pocketed coil springs or any number of rows in order to produce a support cushion having a desired length and/or width without departing from the spirit and scope of the present invention.

[0020] With further respect to the seams 60, and referring now to FIG. 2, each seam 60 includes a top portion 62 and a bottom portion 64 and has a height substantially equal to the

height of each of the pocketed coil springs 20a, 20b, 20c. Each seam 60 further includes a first weld 72, a second weld 74, and a third weld 76, with the second weld 74 and the third weld 76 collectively defining a separation 66 at the top portion 62 of each seam 60. More specifically, and as shown in the seam 60 positioned between the initial two pocketed coils springs 20a, 20b in FIG. 2, the first weld 72 extends from between and adjacent to the lower end 24 of the two pocketed coil springs 20a, 20b up to a node 73 that is positioned on the seam 60 at a height less than that of the height of the total height of the seam 60, as discussed further below. The second weld 74 then extends from the node 73 up to the upper end 22 of one of the pocketed coil springs 20a and a third weld 76 extends from the node 73 to the upper end 22 of the adjacent one of the pocketed coil springs 20b. In this regard, the separation 66 defined by the second weld 74 and the third weld 76 of the seam 60 thus extends downward from the uppermost end of the seam 60 substantially all of the way to the node 73, such that the seam 60 has a Y-shaped configuration. Such a Y-shaped configuration then, in turn, allows the upper end 22 of one of the pocketed coil springs 20a to move independently of the upper end 22 of the adjacent one of the pocketed coil springs 20b in the particular row 12a.

[0021] In addition to the upper end 22 of one of the pocketed coil spring 20a, 20b, 20c moving independently of the upper end 22 of the adjacent one of pocketed coil springs 20a, 20b, 20c in a particular one of the rows 12a, 12b, 12c, by arranging the rows 12a, 12b, 12c of the pocketed coil springs 20a, 20b, 20c in a matrix, the upper ends 22 of each of the pocketed coil springs 20a, 20b, 20c in a particular one of the rows 12a, 12b, 12c are further capable of moving independently of the upper ends 22 of each of the pocketed coil springs in an adjacent one of the rows 12a, 12b, 12c. In this regard, and referring now to the initial two rows 12a, 12b shown in FIG. 1, to connect the one particular row 12a of pocketed coil springs 20a, 20b, 20c to the

adjacent row 12b of pocketed coil springs, an adhesive 80 is applied to the flexible enclosures 50 of each of the pocketed coils springs 20a, 20b, 20c in the particular row 12a and in the adjacent row 12b. As shown on the initial pocketed coil spring 20a in the rows 12a, 12b, the adhesive 80 is generally positioned on the flexible enclosure 50 of the pocketed coil spring 20a below the upper end 22 of the pocketed coil spring and at a height substantially equal to or less than the height of the node 73 to allow the upper ends 22 of the pocketed coil spring 20a in each of the adjacent rows 12a, 12b to move independent of one another. In this way, such an arrangement of the pocketed coils springs 20a, 20b, 20c in the rows 12a, 12b not only causes less interaction between the upper ends 22 of the pocketed coil springs 20a, 20b, 20c in the particular row 12a and the adjacent row 12b, but such an arrangement also provides a user resting on the mattress 10 with an increased amount of conformance to his or her body and less motion transfer across the entirety of the mattress 10. Of course, while adhesives are used in the exemplary embodiment shown in FIG. 1, numerous other methods of joining together the flexible enclosure of pocketed coil springs, including stitching, welding, metal staples, snaps, buttons, hook and loop fasteners, and the like can also be used without departing from the spirit and scope of the subject matter described herein.

[0022] With further respect to the flexible enclosures 50 and the seams 60, the flexible enclosures 50 and the seams 60 are typically made of a non-woven fabric that can be joined or welded together by heat and pressure (e.g., via ultrasonic welding or similar thermal welding procedure) to form a generally cylindrical construction for each flexible enclosure 50 and a generally planar construction for each seam 60. For example, suitable fabrics that can be used for the flexible enclosures 50 and the seams 60 can include one of various thermoplastic fibers known in the art, such as non-woven polymer-based fabric, non-woven polypropylene material,

or non-woven polyester material. In embodiments where the flexible enclosures 50 and the seams 60 are made of such a non-woven fabric, the welds 72, 74, 76 of the seams 60 are typically formed via ultrasonic welding or other similar thermal welding procedures. Of course, both the flexible enclosures and the seams of the support cushions described herein can be made of other flexible fabrics as well including both woven and non-woven textiles, thin flexible elastomers, paper, or other materials that offer a flexible structure. Depending on the particular fabric or materials chosen, the exemplary welds can then be formed by making use of an adhesive, stitching, metal staples, snaps, buttons, hook and loop fasteners, or other such means. Accordingly, as used herein, the term “weld” is inclusive of any suitable means of securely joining together two overlapping fabric layers either permanently or temporarily.

[0023] Referring still to FIG. 1, the coil spring 30 of each of the pocketed coil springs 20a, 20b, 20c is typically made of a continuous wire having a length and forming a plurality of convolutions 41, 42, 43, 44, 45, 46, 47, 48 that are each made up of a portion of the continuous wire substantially equal to about one turn of the continuous wire (i.e., about 360° of the helical path of the continuous wire). In particular, the continuous wire of each coil spring 30 forms an upper end convolution 48, a lower end convolution 41 opposite the upper end convolution 48, and six intermediate helical convolutions 42, 43, 44, 45, 46, 47 that helically spiral between the lower end convolution 41 and the upper end convolution 48. The upper end convolution 48 of each coil spring 30 forms a substantially closed circular loop at the topmost portion of the coil spring 30, while the lower end convolution 41 similarly forms a substantially closed circular loop at the lowermost portion of the coil spring 30. In this way, the coil spring 30 thus terminates at either end in a generally planar form that serves as the supporting end structures of the exemplary pocketed coil springs 20a, 20b, 20c.

[0024] As further discussed below, the upper end convolution 48, the six intermediate helical convolutions 42, 43, 44, 45, 46, 47, and the lower end convolution 41 of each coil spring 30 are generally arranged such that the coil spring 30 has a lower section 32 and an upper section 34. The lower section 32 of the coil spring 30 includes the lower end convolution 41, the first intermediate helical convolution 42, the second intermediate helical convolution 43, and the third intermediate helical convolution 44 (i.e., the three lower helical convolutions) and the upper section 34 of the coil spring 30 includes the fourth helical intermediate convolution 45, the fifth helical intermediate convolution 46, the sixth intermediate convolution 47 (i.e., the three upper helical convolutions), and the upper end convolution 48.

[0025] As also shown in FIG. 1, by forming the coil spring 30 from a continuous wire, the upper end convolution 48, the six intermediate helical convolutions 42, 43, 44, 45, 46, 47, and the lower end convolution 41 each have a respective diameter. In this regard, the continuous wire also defines a pitch between the lower end convolution 41 and the first intermediate helical convolution 42, a pitch between each one of the plurality of intermediate helical convolutions 42, 43, 44, 45, 46, 47, and a pitch between the sixth intermediate helical convolution 47 and the upper end convolution 48.

[0026] With respect to the pitch between the convolutions and the diameter of the convolutions in an exemplary coil spring of the present invention, in most coil springs formed using helically-spiraling continuous wire, the spring constant and resultant feel of the coil spring are typically determined by the gauge of the wire forming the coil spring, the total number of convolutions in the coil spring, the size of the convolutions (diameter), and the pitch or vertical spacing (or pitch angle) between the convolutions. In this regard, the pitch (or vertical spacing) between each convolution of a coil spring is typically controlled by the rate at which the

continuous wire, which forms the coil spring, is drawn through a forming die in a coil-forming machine. Once formed, a larger pitch will typically produce a stiffer coil spring due to the increased vertical orientation of the wire, while a smaller pitch will typically produce a softer coil spring and allow for a larger number of total convolutions in the coil body. Similarly, larger diameter convolutions in a coil spring also contribute to a lower spring constant and consequentially softer feel than smaller diameter convolutions in coil springs. Of course, because the wire forming the coil spring is continuous, there is generally no defined beginning point or ending point of any single convolution. Furthermore, the diameter and pitch is typically adjusted gradually between one portion of the spring to another. As such, oftentimes a single convolution of a coil spring may not have just one single diameter or just one single pitch, but may include, for example, a beginning or end portion with a variable diameter and/or pitch that transitions to the adjacent convolution. Therefore, as used herein, the diameter and pitch of a convolution will typically refer to an average diameter and pitch, but can also be inclusive of a maximum diameter and pitch or a minimum diameter and pitch.

[0027] In the exemplary coil springs of the present invention described herein, the wire gauge of the coil springs generally has a range of about 10 awg to about 20 awg, which includes, in some embodiments, a range of about 11 awg to about 17 awg, and, in other embodiments, a range of about 12 awg to about 16 awg. By varying the diameters, the pitches, or both the diameters and the pitches included in the coil springs utilized in the pocketed coil spring assemblies of the present invention, however, a variable and non-linear loading response is provided in some embodiments where a first spring constant provides a softer feel as the spring is initially compressed and a second spring constant provides a firmer feel as the compression of the coil spring increases. In other words, by forming the continuous wire of a coil spring in an

exemplary pocketed coil spring assembly of the present invention in a manner where at least one of the pitches is different than another one of the pitches, where at least one of the diameters of the convolutions is different from another one of the diameters of the convolutions, or a combination thereof, an exemplary pocketed coil spring can be configured to provide a non-linear response to loading (i.e., where increased support is observed after the spring has been compressed an initial predetermined distance).

[0028] Referring still to FIG. 1, in each of the coil springs 30, the diameters of the intermediate helical convolutions 42, 43, 44, 45, 46, 47, the lower end convolution 41, and the upper end convolution 48 are substantially equal to one another. In this regard, to provide a non-linear loading response in each coil spring 30, the pitch between certain of the intermediate helical convolutions 42, 43, 44, 45, 46, 47 is varied. More specifically, in each coil spring 30, the pitch between the first intermediate helical convolution 42 and the second intermediate helical convolution 43 is greater than the pitch between the second intermediate helical convolution 43 and the third intermediate helical convolution 44, and the pitch between the second intermediate helical convolution 43 and the third intermediate helical convolution 44 is greater than the pitch between the third intermediate helical convolution 44 and the fourth intermediate helical convolution 45. However, in each coil spring 30, the pitch between the fourth intermediate helical convolution 45 and the fifth intermediate helical convolution 46 as and the pitch between the fifth intermediate helical convolution 46 and the sixth intermediate helical convolution 47 are substantially equal to one another, with the pitch between the fourth intermediate helical convolution 45 and the fifth intermediate helical convolution 46 and the pitch between the fifth intermediate helical convolution 46 and the sixth intermediate helical convolution 47 being smaller than the pitch between the first intermediate helical convolution 42

and the second intermediate helical convolution 43, the pitch between the second intermediate helical convolution 43 and the third intermediate helical convolution 44, as well as the pitch between the third intermediate helical convolution 44 and the fourth intermediate helical convolution 45. In other words, the pitches around the intermediate helical convolutions 42, 43, 44 that form the lower section 32 of the coil spring 30 are larger pitches that can, to a certain degree, be considered substantially equal to one another, such that the intermediate helical convolutions 42, 43, 44 that form the lower section 32 of each coil spring 30 exhibit a first spring constant. Similarly, the pitches around the intermediate helical convolutions 45, 46, 47 that form the upper section 34 of each coil spring 30 are substantially equal to one another, such that the intermediate helical convolutions 45, 46, 47 that form the upper section 34 exhibit a second spring constant. In this regard, and since the pitches between each of the intermediate helical convolutions 42, 43, 44 in the lower section 32 is greater than the pitches between the intermediate helical convolutions 45, 46, 47 in the upper section 34 of each coil spring 30, the second spring constant of the upper helical convolutions 45, 46, 47 is less than the first spring constant of the lower helical convolutions 42, 43, 44. This difference, in turn, causes the upper section 34 of each coil spring 30 to compress easier than the lower section 32 of each coil spring 30 such that, when the coil spring is initially compressed, the initial resistive force is largely provided by the “softer” upper section 34 of each coil spring 30. Then, once the upper section 34 is fully compressed, the compression of each coil spring 30 continues with the “harder” lower section 32 providing the resistive force. The resulting overall feel of each coil spring 30 is therefore a softer feel upon an initial compression and a firmer feel upon subsequent or continued compression.

[0029] With further respect to the exemplary coil spring 30 shown in FIG. 1, in that exemplary embodiment and in order to provide a coil spring that can readily be utilized as part of a pocketed coil spring assembly, the coil spring 30 has a diameter of about 60 mm and a total height of about 235 mm, with the continuous wire forming the coil spring 30 having a diameter of about 2 mm (i.e., a wire gauge of about 12 awg). Moreover, in the exemplary coil spring 30 and in order to provide a softer feel upon an initial compression and a firmer feel upon subsequent or continued compression, the pitch between first intermediate helical convolution 42 and the second intermediate helical convolution 43 is about 60 mm, the pitch between the second intermediate helical convolution 43 and the third intermediate helical convolution 44 is about 55 mm, the pitch between the third intermediate helical convolution 44 and the fourth intermediate helical convolution 45 is about 40 mm, the pitch between the fourth intermediate helical convolution 45 and the fifth intermediate helical convolution 46 is about 14 mm, the pitch between the fifth intermediate helical convolution 46 and the sixth intermediate helical convolution 47 is about 14 mm, and the pitch between the sixth intermediate helical convolution 47 and the upper end convolution 48 is about 14 mm. It is of course further contemplated though that coil springs having numerous other diameters, heights, and pitches can also be produced and utilized in an exemplary pocketed coil spring assembly of the present invention without departing from the spirit and scope of the subject matter described herein.

[0030] Referring still to FIG. 1, and as described above, the seams 60 of the exemplary mattress 10 are configured such that the bottom portion 64 of each seam 60 is positioned adjacent to the lower end 24 of the pocketed coil springs 20a, 20b, 20c and, consequently, each seam 60 is also positioned adjacent to the lower section 32 of each coil spring 30. Similarly, the top portion 62 of the seam 60 (i.e., where the separation 66 is defined) is positioned adjacent to

the upper end 22 of each of the pocketed coils springs 20a, 20b, 20c, such that the separation 66 defined by each seam 60 is also positioned adjacent to the upper section 34 of each coil spring 30. Moreover, and again as described above, the adhesive 80 is also generally positioned on the flexible enclosure 50 of each of the pocketed coil springs 20a, 20b, 20c below the upper end 22 of the pocketed coil springs 20a, 20b, 20c and at a height substantially equal to or less than the height of the node 73. Consequently, the adhesive 80 is further generally positioned adjacent to the lower section 32 of each coil spring 30. By virtue of this arrangement, the lower section 32 of each coil spring 30 is thus generally secured in the lower end 24 of each of the pocketed coil springs 20a, 20b, 20c, while the upper section 34 of each coil spring 30 is configured to move more independently. As such, not only is each coil spring 30 able to partially compress without necessarily causing any compression in other coil springs 30, but because of the different spring constants between the upper section 34 and the lower section 32 of each coil spring 30, the lack of connection between each upper section 34 of each coil spring 30 provides for additional freedom of movement and thus a greater degree of comfort to a user during the initial compression.

[0031] To provide an additional amount of independent movement in the pocketed coil spring assemblies of the present invention, in some embodiments, rather than an exemplary seam defining a separation at only the top portion of the seam, it is contemplated that a separation can also be defined by the bottom portion of the seam or at both the top portion of the seam and the bottom portion of the seam. For example, in some embodiments, a support cushion assembly can be provided similar to the embodiments described in FIGS. 1 and 2 above, but where the separation and the Y-shaped configuration of the seam or welds is positioned at the bottom portion of the seam instead of the top portion. As another example, in embodiments where the

separation is defined at both the top portion and the bottom portion of an exemplary seam, a seam can be provided that generally has an X-shaped configuration where two welds define a separation at the top portion of the seam and two additional welds define a separation at the bottom portion of the seam.

[0032] As an even further refinement, in additional embodiments of the support cushions of the present invention, the separation defined by a seam of an exemplary pocketed coil spring assembly of the present invention is not directly defined by one or more welds, but rather is positioned between various welds in a particular row of a pocketed coil spring assembly. For instance, and referring now to FIG. 3, in another exemplary embodiment of the present invention, a support cushion in the form of a mattress 110 is provided that, similar to the mattress 10 shown in FIGS. 1 and 2, includes a seam 160 that is positioned between one pocketed coil spring 120a and an adjacent pocketed coil spring 120b. The seam 160 likewise includes a top portion 162 and a bottom portion 164, and has a height that is substantially equal to the height of each of the pocketed coil springs 120a, 120b. The seam 160 also defines a separation 166 at the top portion 162 of the seam 160. Unlike the seam 60 shown in FIGS. 1 and 2, however, the seam 160 includes a first weld 172 that is positioned adjacent to one pocketed coil spring 120a and that has a height substantially equal to the pocketed coil spring 120a. In the seam 160, a second weld 174 is then positioned adjacent to the adjacent pocketed coil spring 120b and has a height substantially equal to that of the adjacent pocketed coil spring 120b. As shown in FIG. 3, the separation 166 of the seam 160 is then defined not by the first weld 172 and the second weld 174, but is rather defined by the seam 160 itself between the first weld 172 and the second weld 174 and at the top portion 162 of the seam 160.

[0033] As another refinement, in yet another exemplary embodiment of the present invention and referring now to FIG. 4, a support cushion in the form of a mattress 210 is provided, which is similar to the mattress 110 described above with reference to FIG. 3, and which includes a seam 260 extending between one pocketed coil spring 220a and an adjacent pocketed coil spring 220b, with the seam 260 further defining a first weld 172 that extends adjacent to one pocketed coil spring 220a and a second weld 274 that extends adjacent to the adjacent pocketed coil spring 220b. A separation 266 is also defined by the seam 260 between the first weld 272 and the second weld 274. In the mattress 210, however, the seam 260 further includes a third weld 276 that is positioned between the first weld 272 and the second weld 274 and that only extends to a height less than the total height of the seam 260. In this regard, the separation 266 defined by the seam 260 is thus further positioned above the third weld 276.

[0034] As yet another refinement, in some embodiments of the present invention, an exemplary support cushion can also be provided where there is no separation formed in the seam at all, but yet, because of the configuration of the adhesive positioned between the rows of pocketed coil spring assemblies, the exemplary support cushion is still capable of providing increased amounts of conformance and less motion transfer across the entirety of the support cushion. For example, and referring now to FIG. 5, in yet another exemplary embodiment of the present invention, a support cushion in the form of a mattress 310 is provided that includes a plurality of rows 312a, 312b, 312c of pocketed coil springs 320a, 320b, 320c, with each of the rows 312a, 312b, 312c being substantially identical to one another and arranged side-by-side to form a matrix. Each of the pocketed coil springs 320a, 320b, 320c in each row 312a, 312b, 312c are also substantially identical to one another, with each of the pocketed coil springs 320a, 320b, 320c including a coil spring 330 having an upper section 334 and a lower section 332 and

surrounded by a flexible enclosure 350, and with each of the pocketed coil springs 320a, 320b, 320c having an upper end 322 and a lower end 324. A seam 360 is also positioned between and connects each one of the plurality of pocketed coil springs 320a, 320b, 320c in each of the rows 312a, 312b, 312c.

[0035] With further respect to the seams 360, each seam 360 includes a top portion 362 and a bottom portion 364 and has a height substantially equal to the height of each of the pocketed coil springs 320a, 320b, 320c. Each seam 360 further includes a weld 372 that extends from the bottom portion 364 of each seam 360 to a height substantially less than the height of the seam 360 (e.g., to a height that is 50 to 75% the height of the seam 360) and, more specifically, to a height substantially equal to or less than a height of the lower section 332 of each coil spring 330. However, neither the weld 372 nor the seam 360 itself defines a separation that allows each of the upper end 322 of each pocketed coil spring 320a, 320b, 320c to move independently from an adjacent one of the pocketed coil springs 320a, 320b, 320c in one of the rows 312a, 312b, 312c. In this regard, to provide increased amounts of conformance and less motion transfer across the mattress 310, an adhesive 80 is still applied to the flexible enclosures 50 of each of the pocketed coils springs 20a, 20b, 20c in one of the particular rows 312a, 312b, 312c (e.g., the row 312a) and an adjacent one of the rows 312a, 312b, 312c (e.g., the row 312b), and is generally positioned on the flexible enclosure 50 of the pocketed coil spring 20a substantially below the upper end 322 of each of the pocketed coil springs 320a, 320b, 320c to allow the upper ends 22 of the pocketed coil springs 320a, 320b, 320c in one of the rows 312a, 312b, 312c to move independently of the upper ends 22 of the pocketed coil springs 320a, 320b, 320c in an adjacent one of the rows 312a, 312b, 312c.

[0036] Regardless of the particular configuration of the seams between each of the pocketed coil springs of the present invention, as noted above and by virtue of the ability of the pocketed coil spring assemblies to provide a user with an increased amount of conformance to his or her body and less motion transfer, each of the pocketed coil spring assemblies described herein are particularly suited for use in a mattress and can be combined with one or more supporting or foundation layers. For instance, and referring once again to the mattress 10 shown in FIG. 1, the mattress 10 further comprises an upper body supporting layer 92 positioned above the plurality of pocketed coil springs 20a, 20b, 20c in each of the rows 12a, 12b, 12c, and a lower foundation layer 94 positioned below each of the pocketed coil springs 20a, 20b, 20c in each of the rows 12a, 12b, 12c. Furthermore, a sidewall 96 extends between the upper body supporting layer 92 and the lower foundation layer 94 around the entire periphery of the two layers 92, 94, such that the pocketed coil springs 20a, 20b, 20c in each of the rows 12a, 12b, 12c are completely surrounded.

[0037] In the mattress 10 shown in FIG. 1, the upper body supporting layer 92 and the sidewall 96 are each comprised of a visco-elastic foam to support the body of a user and provide a sufficiently soft surface on which to rest. The lower foundation layer 94, on the other hand, is typically comprised of a piece of wood or other similarly rigid material capable of supporting the pocketed coil springs 20a, 20b, 20c in each of the rows 12a, 12b, 12c. However, it is of course contemplated that the upper body supporting layer 92 and the sidewall 96, as well as the lower foundation layer 94, can also be comprised of other materials or combinations of materials known to those skilled in the art, including, but not limited to foam, upholstery, and/or other flexible materials.

[0038] In addition to the various supporting and foundation layers, in some embodiments, the exemplary support cushions described herein can further include a cover that surrounds and protects the various layers and spring assemblies of the support cushions. For example, in the mattress 10 shown in FIG. 1, the mattress 10 further includes a cover 98 that surrounds the upper body supporting layer 92, the sidewall 96, and the lower foundation layer 94 to protect the underlying layers of the mattress 10. Such covers are typically comprised of one or more textiles having a sufficient amount of durability to protect the underlying layers, but are also sufficiently breathable to allow adequate airflow and comfort to a user positioned on the support cushion. In some embodiments, such covers can also be comprised of one more flame-retardant materials.

[0039] Finally, although the support cushions shown in FIGS. 1-5 are in the form of mattresses 10, 110, 210, 310 and are typically 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 seat cushions, seat backs, mattress toppers, 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.

[0040] 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.

CLAIMS

What is claimed is:

1. A pocketed coil spring assembly, comprising:
a plurality of pocketed coil springs arranged in a row, each one of the plurality of pocketed coil springs including a coil spring surrounded by a flexible enclosure, and each one of the plurality of pocketed coil springs including a lower end and an upper end; and
a seam positioned between each one of the plurality of pocketed coil springs and an adjacent one of the plurality of pocketed coil springs in the row, each seam having a top portion and a bottom portion, and each seam defining a separation at the top portion, the bottom portion, or both the top portion and the bottom portion of the respective seam to allow the upper end, the lower end, or both the upper end and the lower end of each one of the plurality of pocketed coil springs to move independently of the upper end, the lower end, or both the upper end and the lower end of the adjacent one of the plurality of pocketed coil springs.
2. The pocketed coil spring assembly of claim 1, wherein the separation is at the top portion of the seam or the bottom portion of the seam.
3. The pocketed coil spring assembly of claim 2, wherein the separation is at the top portion of the seam.
4. The pocketed coil spring assembly of claim 3, wherein each seam comprises:
a first weld extending from adjacent the lower end of each one of the plurality of pocketed coil springs to a node;

a second weld extending from the node to adjacent the upper end of one of the plurality of pocketed coil springs; and

a third weld extending from the node to adjacent the upper end of the adjacent one of the plurality of pocketed coil springs.

5. The pocketed coil spring assembly of claim 4, wherein the separation is defined by the second weld and the third weld such that the seam has a Y-shaped configuration.

6. The pocketed coil spring assembly of claim 1, wherein each seam comprises:

a first weld extending from adjacent the lower end to adjacent the upper end of each one of the plurality of pocketed coil springs; and

a second weld extending from adjacent the lower end to adjacent the upper end of the adjacent one of the plurality of pocketed coil springs; and

wherein the separation is defined by each seam between the first weld and the second weld.

7. The pocketed coil spring assembly of claim 1, wherein each seam comprises

a first weld extending from adjacent the lower end to adjacent the upper end of each one of the plurality of pocketed coil springs,

a second weld extending from adjacent the lower end to adjacent the upper end of the adjacent one of the plurality of pocketed coil springs, and

a third weld positioned between the first weld and the second weld, the third weld extending to a height less than that of the first weld and the second weld; and

wherein the separation is defined by the seam between the first weld and the second weld and above the third weld.

8. The pocketed coil spring assembly of claim 1, wherein each coil spring includes an upper section comprised of one or more upper helical convolutions and a lower section comprised of one or more lower helical convolutions; and

wherein the one or more lower helical convolutions has a first spring constant and the one or more upper helical convolutions has a second spring constant different than the first spring constant.

9. The pocketed coil spring assembly of claim 8, wherein the second spring constant is less than the first spring constant.

10. The pocketed coil spring assembly of claim 8, wherein the one or more lower helical convolutions define a first pitch between each of the one or more lower helical convolutions, and wherein the one or more upper helical convolutions define a second pitch between each of the one or more upper helical convolutions, the second pitch being less than the first pitch.

11. The pocketed coil spring assembly of claim 8, wherein the separation is positioned adjacent to the upper section of each coil spring.

12. The pocketed coil spring assembly of claim 1, wherein the flexible enclosure is comprised of a non-woven fabric.

13. The pocketed coil spring assembly of claim 1, wherein the seam includes one or more ultrasonic welds.

14. A support cushion, comprising:

a plurality of rows of pocketed coil springs arranged to form a matrix of pocketed coil springs, each of the pocketed coil springs including a coil spring surrounded by a flexible enclosure, and each of the pocketed coil springs including a lower end and an upper end; and

a seam positioned between each of the pocketed coil springs and an adjacent one of the pocketed coil springs in the respective row, each seam having a top portion and a bottom portion, and each seam defining a separation at the top portion, the bottom portion, or both the top portion and the bottom portion of the respective seam to allow the upper end, the lower end, or both the upper end and the lower end of each one of the pocketed coil springs to move independently of the respective upper end, the lower end, or both the upper end and the lower end of the adjacent one of the pocketed coil springs.

15. The support cushion of claim 14, further comprising an adhesive positioned between each of the rows of pocketed coils springs, the adhesive connecting the flexible enclosure of the pocketed coil springs in one of the plurality of rows of pocketed coil springs to the flexible enclosure of an adjacent one of the plurality rows of pocketed coil springs.

16. The support cushion of claim 15, wherein each coil spring includes an upper section including one or more upper helical convolutions and a lower section including one or more lower helical convolutions; and

wherein the adhesive is positioned adjacent to the lower section of each coil spring.

17. A mattress assembly, comprising:

a spring core including

a plurality of rows of pocketed coil springs arranged to form a matrix of pocketed coil springs, each of the pocketed coil springs including a coil spring surrounded by a flexible enclosure, and each of the pocketed coil springs including a lower end and an upper end; and

a seam positioned between each of the pocketed coil springs and an adjacent one of the pocketed coil springs in the respective row, each seam having a top portion and a bottom portion, and each seam defining a separation at the top portion, the bottom portion, or both the top portion and the bottom portion of the respective seam to allow the upper end, the lower end, or both the upper end and the lower end of each one of the pocketed coil springs to move independently of the respective upper end, the lower end, or both the upper end and the lower end of the adjacent one of the pocketed coil springs;

an upper body supporting layer positioned atop the spring core; and

a lower foundation layer positioned below the spring core.

18. The mattress assembly of claim 17, wherein each seam comprises

a first weld extending from adjacent the lower end of each one of the pocketed coil springs to a node,

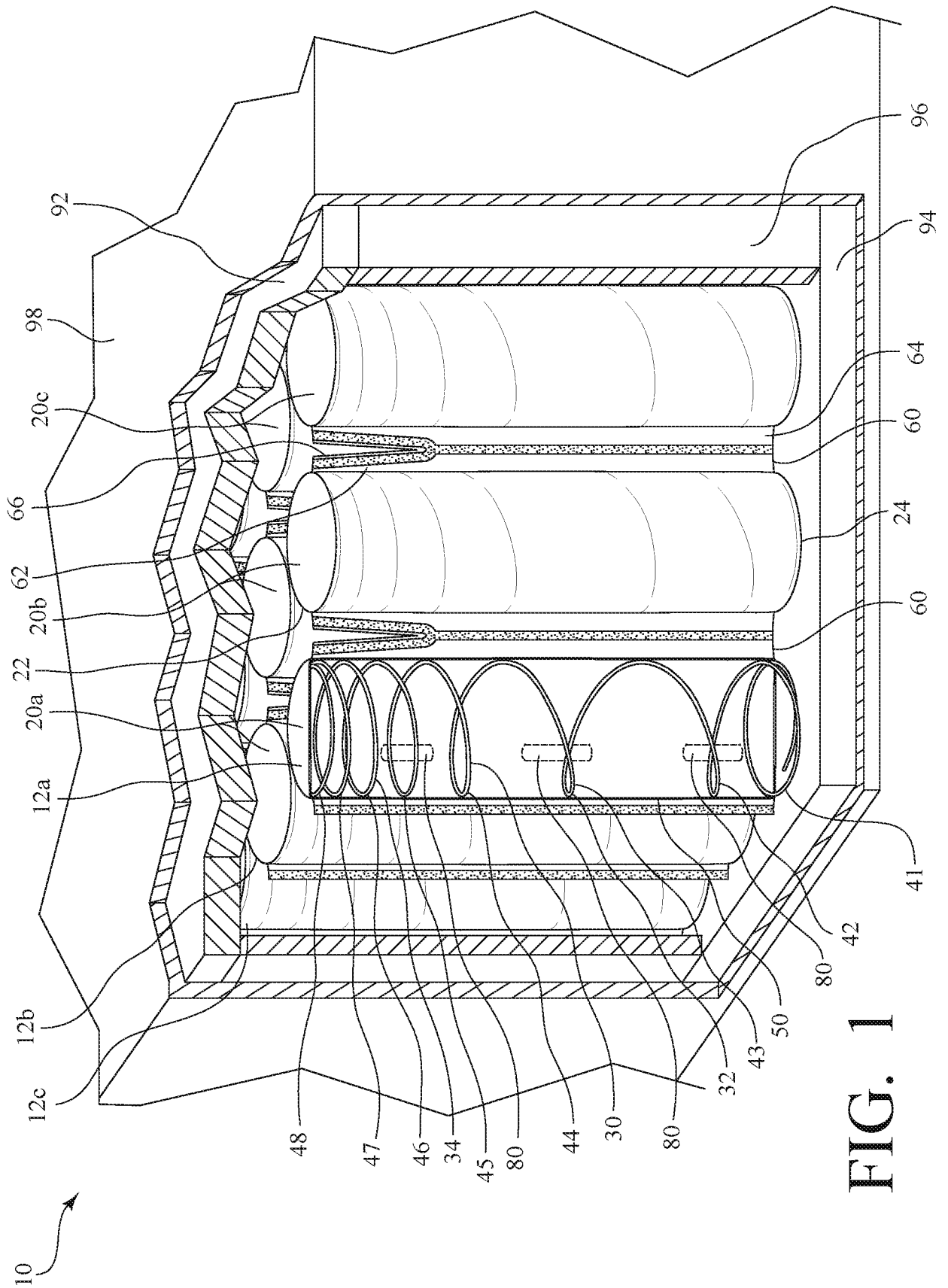
a second weld extending from the node to adjacent the upper end of one of the pocketed coil springs, and

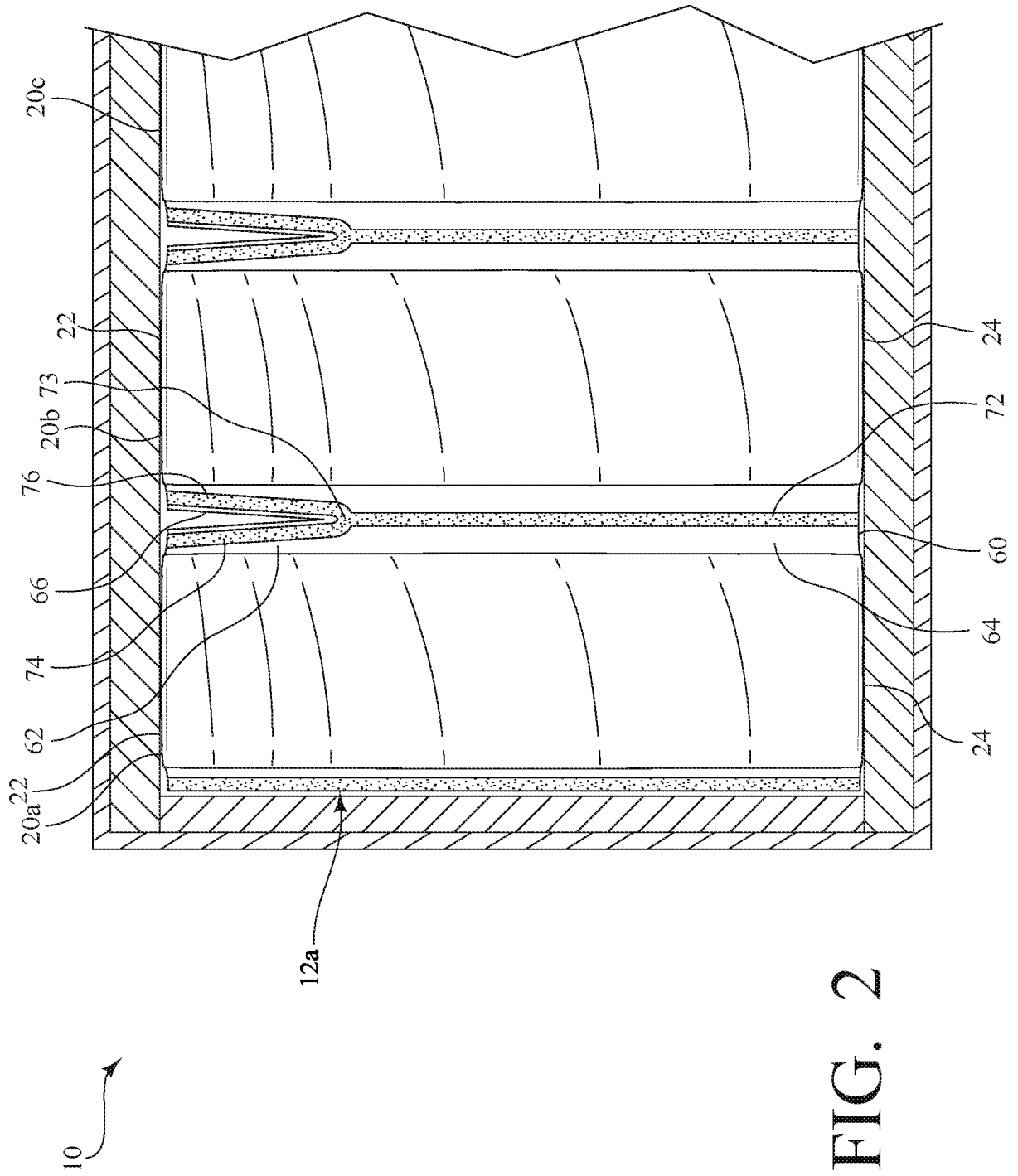
and a third weld extending from the node to adjacent the upper end of the adjacent one of the pocketed coil springs.

19. The mattress assembly of claim 17, wherein each coil spring includes an upper section including one or more upper helical convolutions and a lower section including one or more lower helical convolutions; and

wherein the one or more lower helical convolutions has a first spring constant and the one or more upper helical convolutions has a second spring constant different than the first spring constant.

20. The mattress assembly of claim 17, further comprising a cover for surrounding the spring core, the upper body supporting layer, and the lower foundation layer.





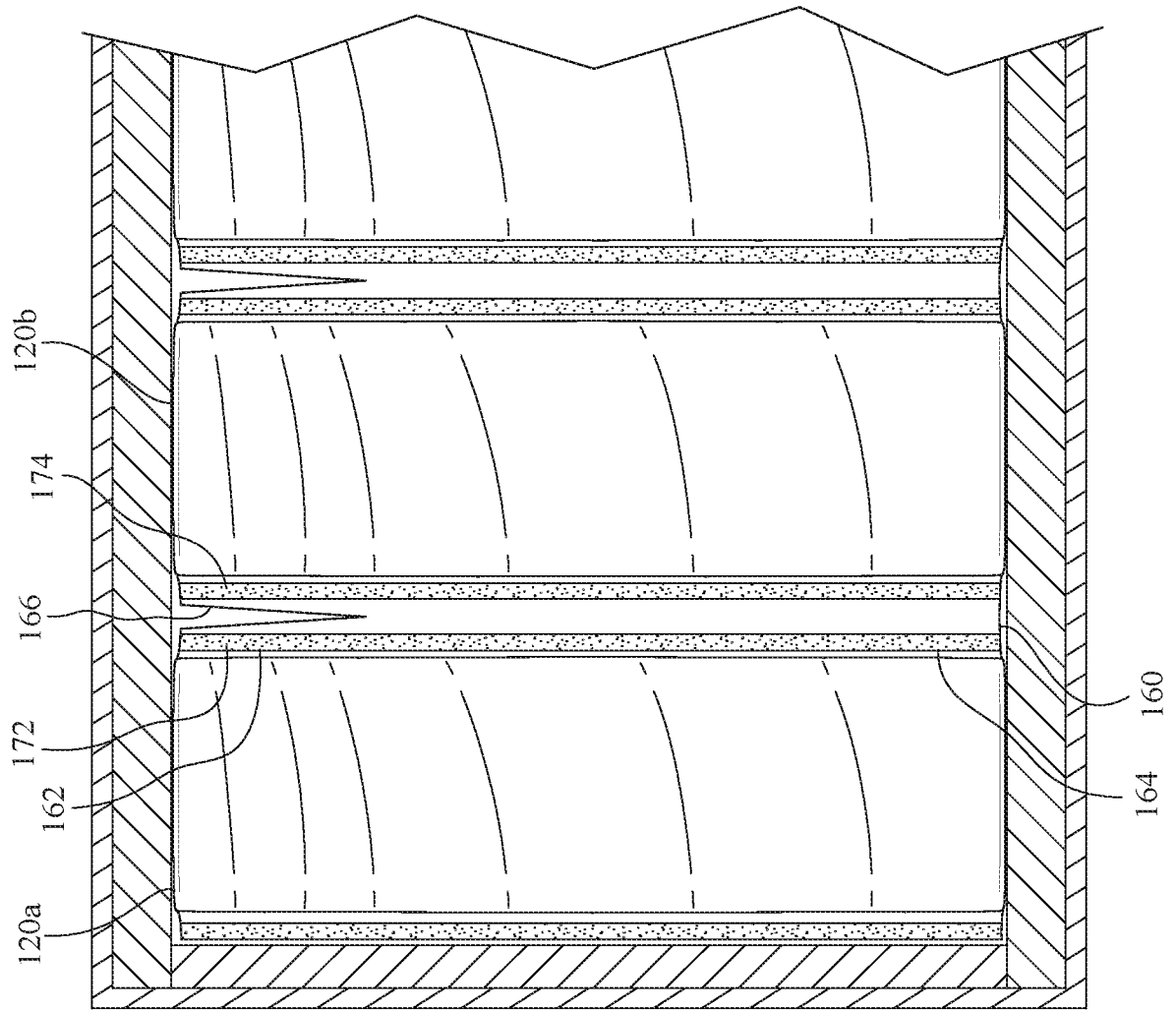


FIG. 3

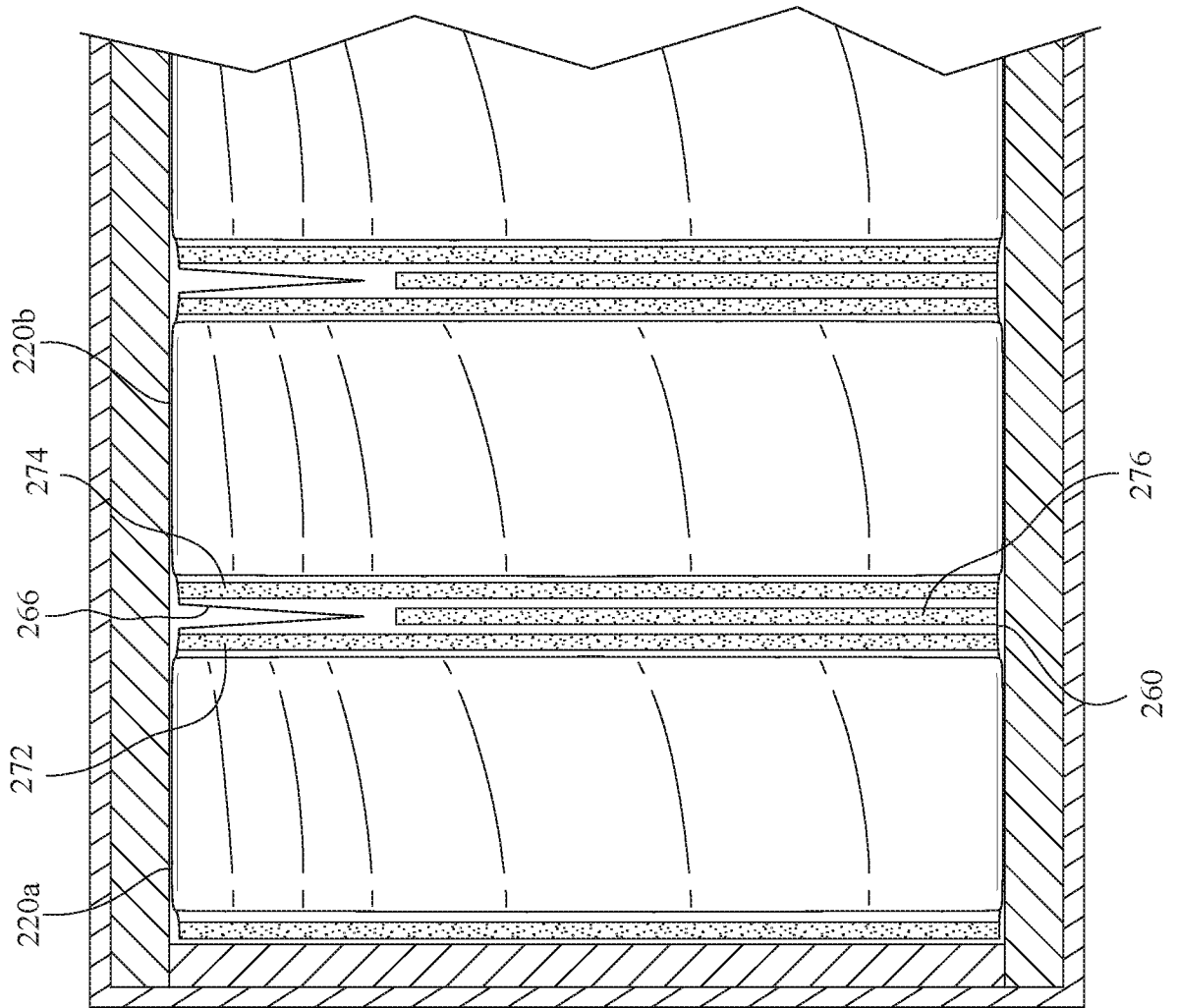


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/067775**A. CLASSIFICATION OF SUBJECT MATTER****A47C 27/06(2006.01)i, A47C 23/043(2006.01)i**

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47C 27/06; A47C 23/04; A47C 23/047; A47C 27/20; A47C 16/00; F16F 1/06; F16F 1/04; A47C 23/043

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & keywords: pocket, spring, seam, weld, separation, divide, convolution, helical

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 8978183 B1 (L&P PROPERTY MANAGEMENT COMPANY) 17 March 2015	1-3,6,7,12-17,20
Y	See column 4, line 26 - column 5, line 12, claims 1, 4, and figure 3A.	4,5,8-11,18,19
Y	US 2014-0373280 A1 (L&P PROPERTY MANAGEMENT COMPANY) 25 December 2014 See paragraph [0070], claims 2, 3 and figure 2.	4,5,18
Y	US 2011-0148018 A1 (DEFRANKS et al.) 23 June 2011 See paragraph [0032], claim 1, and figures 1A-1C.	8-11,19
A	US 2007-0124865 A1 (STJERNA, NILS ERIC) 07 June 2007 See paragraphs [0051], [0054] and figure 1.	1-20
A	US 2010-0212090 A1 (STJERNA, NILS ERIC) 26 August 2010 See paragraphs [0032]-[0034] and figure 1.	1-20



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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