(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
30 September 2021 (30.09.2021)

WIPO | PCT

(10) International Publication Number
WO 2021/195164 A1

(51) International Patent Classification:
A47C 23/043 (2006.01) *A47C 27/06* (2006.01)
A47C 27/00 (2006.01)

(21) International Application Number:
PCT/US2021/023807

(22) International Filing Date:
24 March 2021 (24.03.2021)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/994,462 25 March 2020 (25.03.2020) US
17/168,630 05 February 2021 (05.02.2021) US

(71) Applicant: **L&P PROPERTY MANAGEMENT COMPANY** [US/US]; 4095 Firestone Boulevard, South Gate, CA 90280 (US).

(72) Inventors: **JEWETT, Jason, V.**; 7777 County Road 110, Carthage, MO 64836 (US). **LONG, Austin, G.**; 1873 Lawrence 2120, Sarcoxie, MO 64862 (US).

(74) Agent: **POFFENBERGER., J., Dwight, Jr.** et al.; Wood Herron & Evans LLP, 441 Vine Street, Suite 2700, Cincinnati, OH 45202-2917 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH,

WO 2021/195164 A1

(54) Title: POCKETED SPRING ASSEMBLY

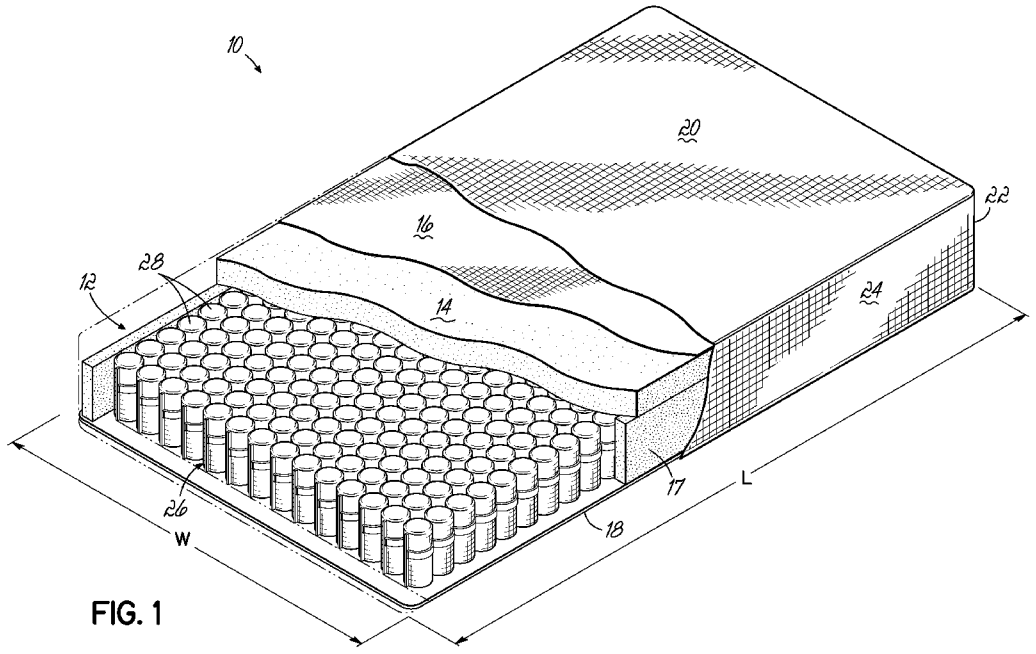


FIG. 1

(57) Abstract: A pocketed spring assembly comprises a plurality of parallel strings of individually pocketed springs. Each string is joined to at least one adjacent string. Each string comprises one piece of fabric joined to itself to create first and second opposed plies on opposite side of coil springs. The plies are joined by transverse seams to form a plurality of pockets along a length of the string. At least one spring is positioned in each of the pockets. The piece of fabric is a non-woven ultrasonically weldable fabric made with at least some used or recycled fibers.

[Continued on next page]

GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

POCKETED SPRING ASSEMBLY

Cross-Reference To Related Applications

[0001] This application claims the benefit of priority to U.S. Provisional Patent Application Serial No. 62/994,462 filed March 25, 2020 (pending), the disclosure of which is incorporated by reference herein.

Field Of The Invention

[0002] This invention relates generally to fabric for use in bedding and seating products and, more particularly, to fabric used in pocketed spring assemblies and comfort layers used in bedding and seating products.

Background Of The Invention

[0003] Mattress spring core construction over the years has been a continuously improving art with advancements in materials and machine technology. A well-known form of spring core construction is known as a Marshall spring construction wherein metal coil springs are encapsulated in individual pockets of fabric and formed as elongate or continuous strings of pocketed coil springs. In an earlier form, these strings of coil springs were manufactured by folding an elongate piece of fabric in half lengthwise to form two plies of fabric and stitching transverse and longitudinal seams to join the plies of fabric to define pockets within which the springs were enveloped.

[0004] Improvements in spring core constructions have involved the use of fabrics which are thermally or ultrasonically weldable to themselves. By using such welding techniques, these fabrics have been advantageously used to create strings of individually pocketed coil springs wherein transverse and longitudinal welds,

instead of stitching, are used to form the pockets encapsulating the springs. A fabric which has been used and proven to ultrasonically weld to itself is a non-woven spun-bonded polypropylene fabric.

[0005] Due to its low cost, a single-layer of non-woven spun-bonded polypropylene fabric is the most common fabric used in the manufacture of strings of springs used in pocketed spring assemblies. The weight of such a single-layer of non-woven spun-bonded polypropylene fabric is commonly between 1-3 ounces per square yard. While single layer non-woven spun-bonded polypropylene fabric has been attractive to many pocketed spring core manufacturers because of its accessibility and low cost, such fabric is not as desirable as "green" fabric made at least partially of recycled or used fibers.

[0006] In today's world many customers would prefer a bedding or seating product made at least partially of recycled or used fibers, even if the cost is slightly higher than the cost of a new bedding or seating product made entirely of "new" fabric containing no recycled or used fibers.

[0007] It is therefore an objective of this invention to provide a pocketed spring assembly made, at least partially, with ultrasonically weldable fabric which has adequate strength for processing the fabric during manufacture of strings of springs and is made at least partially with recycled or used polymer fibers.

[0008] It is another objective of this invention to provide a pocketed spring comfort layer made, at least partially, with ultrasonically weldable fabric which has adequate strength for processing the fabric during manufacture of the comfort layer and is made at least partially with recycled or used fibers.

Summary Of The Invention

[0009] According to one aspect of the present invention, a bedding or seating product incorporates a novel pocketed spring assembly. The pocketed spring assembly comprises a plurality of parallel strings of springs joined together. Each string is joined to at least one adjacent string, most of the time with adhesive. Each string comprises a plurality of aligned individually pocketed springs. Each string comprises an ultrasonically weldable fabric folded around multiple springs to create first and second opposed sides of fabric covering opposite surfaces of the springs. The ultrasonically weldable fabric is joined to itself along a longitudinal seam which may extend along one of the sides of the string of springs. Pockets are formed along the length of the string of springs by transverse or separating seams joining the first and second sides covering opposite surfaces of the springs, at least one spring being positioned in each pocket. The ultrasonically weldable fabric is made at least partially with recycled or used fibers. The recycled or used fibers are typically polymer fibers but may be any synthetic fibers.

[00010] The bedding or seating product may further comprise cushioning material and a covering encasing the pocketed spring assembly and cushioning materials.

[00011] In some embodiments, the fabric used to make at least one of the strings of springs comprises a non-woven stitchbond fabric made at least partially with recycled or used fibers. In some embodiments, the fabric used to make at least one of the strings of springs comprises a non-woven spunlaced fabric made at least partially with recycled or used fibers. In still other embodiments, the fabric used to make at least one of the strings of springs comprises a non-woven needle-punched fabric made at least partially with recycled or used fibers.

[00012] In some embodiments, the recycled polymer fibers are made of

polyethylene terephthalate. In some embodiments, the ultrasonically weldable fabric has a weight of 1.0 to 4.0 ounces per square yard.

[00013] In most embodiments, the adhesive is a standard hotmelt adhesive. In some embodiments, the adhesive used to join adjacent strings may have at least some bio-based material. In other embodiments, the adhesive used to join adjacent strings may have at least some recycled material.

[00014] According to another aspect of the invention, a pocketed spring assembly for use in a bedding or seating product comprises a plurality of parallel strings of springs joined together. Each string is joined to at least one adjacent string. Each string comprises a plurality of aligned individually pocketed springs. Each string is formed from a piece of non-woven ultrasonically weldable fabric made with at least some recycled polymer fibers. The piece of fabric is joined to itself along a longitudinal seam and has first and second opposed sides of fabric covering opposite surfaces of the springs. A plurality of pockets is formed along a length of the string by transverse seams joining the first and second sides of the fabric, at least one spring being positioned in each of the pockets. The longitudinal seam and each of the transverse seams joins the piece of non-woven ultrasonically weldable fabric to itself.

[00015] According to another aspect of the invention, the non-woven ultrasonically weldable fabric used to make a string of springs is made at least partially of recycled or used fibers. In some embodiments, non-woven ultrasonically weldable fabric is made at least partially of recycled polymer fibers. In some embodiments, the ultrasonically weldable fabric has a weight of between 1.0 to 4.0 ounces per square yard. The recycled polymer fibers may be made of polyethylene terephthalate or any other desired material. The recycled polymer fibers may

comprise any desired percentage of the fabric. In some embodiments, the fabric may be a mixture of non-woven stitchbond ultrasonically weldable recycled synthetic fibers and non-ultrasonically weldable fibers.

[00016] According to another aspect, a string of springs for use in a bedding or seating product comprises a plurality of individually pocketed springs. The string of springs comprises an ultrasonically weldable fabric joined to itself along a longitudinal seam to create first and second opposed plies of the ultrasonically weldable fabric on opposite sides of the springs. A plurality of pockets is formed along a length of the string by transverse seams joining the first and second plies of the ultrasonically weldable fabric. At least one spring is positioned in each of the pockets. The ultrasonically weldable fabric comprises non-woven stitchbond fabric made with at least some recycled synthetic fibers. The non-woven stitchbond fabric may be made entirely of recycled synthetic fibers.

[00017] According to another aspect, a comfort layer or blanket adapted to cover a spring core of a bedding or seating cushion product comprises a matrix of interconnected pocketed mini coil springs. Each mini coil spring is contained within a pocket of non-woven fabric between top and bottom plies of ultrasonically weldable non-woven fabric. The top and bottom plies of non-woven fabric are joined by seams around the pockets. At least one of the plies comprises a non-woven fabric made at least partially with recycled polymer fibers. At least one of the plies may comprise non-woven stitchbond fabric. The seams of the pockets may be circular or straight seams.

[00018] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the summary of the invention given above, and the detailed description of the

drawings given below, explain the principles of the present invention.

Brief Description Of The Drawings

[00019] Fig. 1 is a perspective view, partially broken away, of a bedding or seating product incorporating a pocketed spring assembly made in accordance with the present invention.

[00020] Fig. 1A is a perspective view, partially broken away, of a bedding or seating product incorporating another pocketed spring assembly.

[00021] Fig. 1B is a perspective view, partially broken away, of another bedding product incorporating the pocketed spring assembly of Fig. 1A.

[00022] Fig. 1C is a perspective view, partially broken away, of two-sided bedding product incorporating the pocketed spring assembly of Fig. 1A.

[00023] Fig. 2 is a perspective view, partially broken away, of a portion of one of the strings of springs of Fig. 1, in an unloaded condition.

[00024] Fig. 2A is an enlarged view of a stitchbond fabric used in the string of springs of Fig. 2.

[00025] Fig. 3A is a top view of a pocketed spring assembly made in accordance with the present invention.

[00026] Fig. 3B is a top view of another pocketed spring assembly made in accordance with the present invention.

[00027] Fig. 4 is a top plan view of a portion of a comfort layer having at least one ply made of one of the fabrics of the present invention.

[00028] Fig. 4A is a cross-sectional view taken along the line 4A-4A of Fig. 4.

[00029] Fig. 5 is a top plan view of a portion of another embodiment of comfort layer having at least one ply made of one of the fabrics of the present invention.

[00030] Fig. 5A is a cross-sectional view taken along the line 5A-5A of Fig. 5.

[00031] Fig. 6 is a top plan view of a portion of another embodiment of comfort layer having at least one ply made of one of the fabrics of the present invention.

[00032] Fig. 6A is a cross-sectional view taken along the line 6A-6A of Fig. 6.

[00033] Fig. 7 is a top plan view of a corner portion of another embodiment of comfort layer having at least one ply made of one of the fabrics of the present invention.

[00034] Fig. 7A top plan view of a corner portion of another embodiment of comfort layer having at least one ply made of one of the fabrics of the present invention.

Detailed Description Of The Invention

[00035] Referring first to Fig. 1, there is illustrated a bedding product in the form of a single-sided mattress 10 incorporating the principles of the present invention. This product or mattress 10 comprises a pocketed spring assembly 12 over the top of which lays conventional padding or cushioning layers 14, 16 which may be foam, fiber, gel, a pocketed spring blanket or comfort layer, one or more scrim sheets or any other suitable materials or any combination thereof. The pocketed spring assembly 12 may be surrounded with a border 17 made of foam or any other suitable material (only a portion being shown in Fig. 1). Although one type of border 17 is illustrated in Figs. 1, 1A, 1B and 1C, the border may assume other forms or shapes of any desired size, such as pocketed coil springs. In place of a foam border, it is common to at least partially surround a pocketed spring assembly with springs of a different diameter, height, gauge wire or firmness than the pocketed springs of the interior of the pocketed spring assembly. In any product shown or

described herein incorporating any embodiment of pocketed spring assembly shown or described herein, a border may be omitted.

[00036] Pocketed spring assembly 12 resides upon a base 18 and all components enclosed within an upholstered covering material 20. The base 18 and border 17 are known in the industry as a "bucket" into which a pocketed spring assembly 12 is inserted before the "bucket" is covered with one or more padding or cushioning layers. The base 18 may be foam, a scrim sheet, a substrate, plastic, wood or any other known material.

[00037] As shown in Fig. 1, fully assembled, the product 10 has a length "L" defined as the linear distance between opposed end surfaces 22 (only one being shown in Fig. 1). Similarly, the assembled product 10 has a width "W" defined as the linear distance between opposed side surfaces 24 (only one being shown in Fig. 1). In the product shown in Fig. 1, the length is illustrated as being greater than the width. However, it is within the scope of the present invention that the length and width may be identical, as in a square product.

[00038] As shown in Figs. 1 and 2, pocketed spring assembly 12 is manufactured from multiple strings 26 of pocketed springs 28 joined together. In pocketed spring assembly 12 shown in Fig. 1, each string 26 of pocketed springs 28 extends longitudinally or from head-to-foot along the full length of the pocketed spring assembly 12. Although the strings 26 of pocketed springs 28 are illustrated as extending longitudinally or from head-to-foot in the pocketed spring assembly 12 of Fig. 1, the strings may extend transversely or from side-to-side as shown in a pocketed spring assembly 12a shown in the products 10a, 10c shown in Figs. 1A and 1C, respectively. The pocketed spring assembly 12a comprises multiple strings 26a of pocketed springs 28, identical to the strings of springs 26, but shorter in

length. In any of the embodiments shown or described herein, the strings may extend either longitudinally (from end-to-end) or transversely (from side-to-side).

[00039] Fig. 1B illustrates a single-sided mattress 10b comprising a pocketed spring assembly 12 and border 17 identical to those shown in the mattress 10 of Fig. 1. However, the mattress 10b of Fig. 1B has a pocketed topper or comfort layer 30 employing miniature or small coil springs individually pocketed, in addition to padding layers 14 above and below the pocketed topper 30. Although one configuration of pocketed topper 30 is illustrated, any pocketed topper known in the art may be used.

[00040] Fig. 1C illustrates a double-sided mattress 10c comprising a pocketed spring assembly 12a and border 17. The mattress 10c of Fig. 1B has pocketed toppers 30 above and below the pocketed spring assembly 12a in addition to padding layers 14 above and below each pocketed topper 30. While the mattresses 10, 10a and 10b illustrated in Figs. 1, 1A and 1B, respectively, are single-sided mattresses, any pocketed spring assembly shown or described herein may be incorporated into any bedding or seating product shown or described herein, including a double-sided mattress or seating cushion, such as the mattress 10c shown in Fig. 1C. If desired, any of the padding or cushioning layers, including one or more pocketed topper 30, may be omitted in any of the embodiments shown or described herein.

[00041] Strings of pocketed springs 26, 26a and any other strings of springs described or shown herein, may be connected in side-by-side relationship as, for example, by gluing the sides of the strings together in an assembly machine, to create an assembly or matrix of springs having multiple rows and columns of pocketed springs bound together as by gluing, welding or any other conventional assembly process commonly used to create pocketed spring cores or assemblies.

[00042] Referring to Fig. 3A, the longitudinally extending strings 26 of pocketed spring assembly 12, along with any other strings described or shown herein, including transversely extending strings 26a of pocketed spring assembly 12a, may be joined so that the individually pocketed springs 28 are aligned in transversely extending rows 32 (extending from side-to-side) and longitudinally extending columns 34 (extending from head-to-foot).

[00043] Alternatively, as shown in Fig. 3B, the longitudinally extending strings 26 of pocketed spring assembly 12b, along with any other strings described or shown herein, including transversely extending strings 26a of pocketed spring assembly 12a, may be offset from one another. In such an arrangement, shown in Fig. 3B, the individually pocketed springs 28 are not aligned in rows and columns; instead the individually pocketed springs 28 fill voids 36 of the adjacent strings. Either alignment of strings may be incorporated into any of the pocketed spring assemblies or cores illustrated or described herein.

[00044] Fig. 2 illustrates a perspective view of the portion of a string 26 of pocketed springs 28 in a relaxed condition under no external load. As best illustrated in Fig. 2, each string 26 of pocketed springs 28 comprises a row of interconnected fabric pockets 38. Each of the fabric pockets 38 contains at least one resilient member, such as a coil spring 40. The resilient member need not be a coil spring; it may be made of foam or other resilient material. The coil spring 40 is preferably made of one piece of wire of a uniform diameter, but may be made of other materials, multiple strands of twisted wire and/or may be a non-uniform diameter, such as a barrel-shaped spring.

[00045] As best shown in Fig. 2, each coil spring 40 has a central or longitudinal axis A, an upper end turn 42, a lower end turn 44 and a plurality of

central convolutions 46 between the end turns. Fig. 2 illustrates a coil spring 40 in which the diameter of the end turns 42, 44 is generally identical to the diameter of the central convolutions 46. However, any known coil spring may be used inside any the fabric pockets 38. Not all coil springs within a pocketed spring assembly need be identical. The pocketed spring assembly of the present invention may use pieces of foam or other resilient members, rather than coil springs. One or more pockets may have more than one spring, such as a coil spring with at least cushion such as a foam insert inside, above or below the coil spring or any combination thereof.

[00046] An ultrasonically weldable fabric 70 is used to create the string of pocketed springs 26. The ultrasonically weldable fabric 70 is permeable to airflow through the fabric itself due to the nature of the fabric 70. Air moves between adjacent fabric pockets 38 and into and out of the string 26 through the ultrasonically weldable fabric 70.

[00047] As is known in the art, ultrasonically weldable fabric 70 is folded over onto itself around multiple coil springs 40. As best shown in Fig. 2, opposite sides 48, 50 of the ultrasonically weldable fabric 70 are welded or otherwise secured together in segments to create a longitudinal segmented seam 52 joining two plies, o ply 72 being on each side 48, 50 of the string. Similarly, opposite sides 48, 50 of the ultrasonically weldable fabric 70 covering opposed surfaces of the springs 40 are welded or otherwise secured together in segments to create a plurality of separating or transverse segmented seams 54, each separating or transverse segmented seam 54 joining two plies, one ply 72 being on each side 48, 50 of the string. Fig. 2 illustrates side 48 being closest to the reader and side 50 being behind the coil springs 40.

[00048] As best shown in Fig. 2, opposed edges 56 of the ultrasonically

weldable fabric 70 used to create the string 26 of pocketed springs 28 are aligned and spaced from the longitudinal side seam 52 a distance indicated by numeral 58. Although the drawings indicated the longitudinal seam 52 being below the free edges 56 of the ultrasonically weldable fabric 70, the longitudinal seam 52 may be above the free edges 56 of the ultrasonically weldable fabric 70. This is known in the industry as a side seam of a string of springs. As shown in Fig. 2 in dashed lines, edge welds 86 as described below, may be located proximate the longitudinal seam 52.

[00049] As shown in Fig. 2, in the absence of being subjected to a load, the string 26 of pocketed springs 28 has a generally planar top surface 60 in a top plane P1 and a parallel generally planar bottom surface 62 in a bottom plane P2. The linear distance between the top and bottom surfaces of the string 26 of pocketed springs 28 defines a height H of the string 26 of pocketed springs 28. This linear distance further defines the height H of the pocketed spring assembly 12 because each of the strings 26 has the same height. However, it is within the contemplation of the present invention that the strings be different heights.

[00050] As best shown in Fig. 2, the longitudinal seam 52 comprises multiple spaced linear weld segments 64 formed using an ultrasonic welding horn and anvil (not shown) as known in the art. At least some of the longitudinal seams 52 of a string may not be segmented or be only partially segmented. For example, the longitudinal seam 52 of a string may not be segmented at all.

[00051] As best shown in Fig. 2, each transverse or separating seam 54 comprises multiple spaced linear weld segments 66 formed using an ultrasonic welding horn and anvil (not shown) to join the opposed sides 48, 50 of the ultrasonically weldable fabric 70. Again, at least some of the transverse or

separating seams 54 of a string may not be segmented or may be only partially segmented. For example, one or more transverse seams 54 of a string may be partially segmented or not be segmented at all.

[00052] Although the weld segments in the embodiments shown are illustrated as being heat-welded spaced rectangular-shaped segments, any of the seam segments may be other shapes, such as spaced dots, ovals or triangles of any desired sizes.

[00053] As shown in Fig. 2A, one type of ultrasonically weldable fabric of each of the strings 26 may be a stitchbond ultrasonically weldable fabric 70 comprising recycled fibers 72 shown in Fig. 2A in a random pattern and linear stitches 74. In some embodiments the recycled fibers 72 are polymer fibers such as polyethylene terephthalate. However, the recycled polymer fibers 72 may be made of any polymer. One stitchbond fabric is commercially available from Pratrivero in Italy at www.pratrivero.com.

[00054] In some embodiments, the ultrasonically weldable fabric comprises at least thirty (30) percent recycled fibers. In another embodiment, the ultrasonically weldable fabric comprises one hundred (100) percent recycled fibers. Most of the time, at least some of the recycled fibers are polymer fibers.

[00055] In other embodiments, the ultrasonically weldable fabric may be a non-woven spunlaced fabric made with at least some recycled fibers. In yet other embodiments, the ultrasonically weldable fabric may be a non-woven needle-punched fabric made with at least some recycled fibers. In some embodiments the fabric has a weight of between 1.0 and 4.0 ounces per square yard. However, any of the fabrics may have any desired weight. At least some of the recycled fibers may be polymer fibers.

[00056] Although Figs. 2 and 2A illustrate a portion of a string 26 of springs used in pocketed spring assembly 12, any of the non-woven ultrasonically weldable fabrics described herein may be used in any string of spring shown or described herein, such as strings of springs 26a used in pocketed spring assembly 12a.

[00057] Any of the fabrics described herein having at least some recycled polymer fibers may be used in any comfort layer described in U.S. Patent Nos. 9,943,173; 9,968,202 and 10,405,665, each one of which is incorporated by reference herein. Figs. 6 and 6A illustrate one embodiment of comfort layer 30 incorporated into the mattress 10c shown in Fig. 1C. However, comfort layer 30 may be incorporated into any bedding or seating product including any mattress shown or described herein.

[00058] Figs. 4 and 4A illustrate an embodiment of comfort layer 71 which may be incorporated into any bedding or seating product including any mattress shown or described herein. As best shown in Fig. 4A, comfort layer 71 comprises a first or upper ply of fabric 72 and a second or lower ply of fabric 74 with a plurality of mini coil springs 76 therebetween. The fabric plies 72, 74 are joined with circular containments or weld seams 80, each weld seam 80 surrounding a mini coil spring 76. Each circular weld seam 80 comprises multiple arced or curved segments 82 with gaps 81 therebetween. The first and second plies of fabric 72, 74 are joined along each arced or curved segment 82 of each circular weld seam 80. The first and second plies of fabric 72, 74 are not joined along each gap 81 between adjacent segments 82 of each circular weld seam 80. The curved segments 82 are strategically placed around a mini coil spring 76 and create the circular weld seam 80. The two plies of fabric 72, 74, in combination with one of the circular weld seams 80, define a cylindrical-shaped pocket 84, inside of which is at least one resilient

member such as a mini coil spring 76.

[00059] During the welding process, the mini coil springs 76 may be at least partially compressed before pocket 84 is closed and thereafter. If desired, resilient members other than mini coil springs, such as foam or plastic or gel or a combination thereof, may be used. Each of the resilient members may return to its original configuration after a load is removed from the pockets in which the resilient members are located.

[00060] The size of the curved segments 82 of weld seams 80 are not intended to be limited by the illustrations; they may be any desired size depending upon the airflow desired inside the comfort layer. Similarly, the size, i.e., diameter of the illustrated weld seams 80, is not intended to be limiting. The placement of the weld seams 80 shown in the drawings is not intended to be limiting either. For example, the weld seams 80 may be organized into aligned rows and columns, as shown in Figs. 4 and 4A or organized with adjacent columns being offset from each other, as illustrated in Figs. 5 and 5A. Any desired arrangement of weld seams may be incorporated into any embodiment shown or described herein.

[00061] As best illustrated in Fig. 4, the individual pockets 84 of comfort layer 70 may be arranged in longitudinally extending columns 86 extending from head-to-foot of the bedding product and transversely extending rows 88 extending from side-to-side of the bedding product. As shown in Figs. 4 and 4A, the individual pockets 84 of one column 86 are aligned with the pockets 84 of adjacent columns 66.

[00062] The weld segments may assume shapes other than the curved weld segments illustrated. For example, the weld seams may be circular around mini coil springs, but the weld segments may assume other shapes, such as triangles or circles or ovals of the desired size and pattern to obtain the desired airflow between

adjacent pockets inside the comfort layer and into or out of the perimeter of the comfort layer.

[00063] At least one of the two plies of fabric 72, 74 of comfort layer 71 is made of an ultrasonically weldable non-woven fabric made at least partially of recycled polymer fibers. The fabric may be stitchbond, spunlaced or needle-punched. In some embodiments both plies of fabric 72, 74 of comfort layer 71 are made of an ultrasonically weldable non-woven fabric made at least partially of recycled fibers. In some embodiments, at least some of the recycled fibers are polymer fibers.

[00064] Figs. 5 and 5A illustrate another comfort layer 71' having the same pockets 84 and same springs 76 as does the embodiment of comfort layer 71 of Figs. 4 and 4A. As best illustrated in Fig. 5, the individual pockets 84 of comfort layer 71' are arranged in longitudinally extending columns 73 extending from head-to-foot of the bedding product and transversely extending rows 75 extending from side-to-side of the bedding product. As shown in Figs. 5 and 5A, the individual pockets 84 of one column 73 are offset from, rather than aligned with, the pockets 84 of the adjacent columns 73.

[00065] At least one of the two plies of fabric 72, 74 of comfort layer 71' is made of an ultrasonically weldable non-woven fabric made at least partially of recycled fibers. The fabric may be stitchbond, spunlaced or needle-punched. In some embodiments both plies of fabric 72, 74 of comfort layer 71' are made of an ultrasonically weldable non-woven fabric made at least partially of recycled polymer fibers.

[00066] Figs. 6 and 6A illustrate comfort layer 30 which may be incorporated into any bedding or seating product including any mattress shown or described herein. Comfort layer 30 comprises linear or straight intersecting weld seams 98

defining the spring-containing pockets 90 of the comfort layer 30, each mini coil spring 76 is contained within its own individual pocket 90. As best shown in Fig. 6A, comfort layer 30 comprises a first or upper ply of fabric 91 and a second or lower ply of fabric 93 with a plurality of mini coil springs 76 therebetween. The fabric plies 91, 93 are joined with rectangular containments or weld seams 95, each weld seam 95 surrounding a mini coil spring 76. Each rectangular weld seam 95 comprises multiple straight segments 96 with gaps 97 therebetween. The first and second plies of fabric 91, 93 are joined along each straight segment 96 of each rectangular weld seam 98. The first and second plies of fabric 91, 93 are not joined along each gap 97 between adjacent weld segments 96 of each rectangular weld seam 98. The straight weld segments 96 are strategically placed around a mini coil spring 76 and create the rectangular weld seam 98.

[00067] As best illustrated in Fig. 6, the individual pockets 90 of comfort layer 30 may be arranged in longitudinally extending columns 92 extending from head-to-foot of the bedding product and transversely extending rows 94 extending from side-to-side of the bedding product. As shown in Figs. 6 and 6A, the individual pockets 90 of one column 92 are aligned with the pockets 90 of the adjacent columns 92.

[00068] At least one of the two plies of fabric 91, 93 of comfort layer 30 is made of an ultrasonically weldable non-woven fabric made at least partially of recycled polymer fibers. The fabric may be stitchbond, spunlaced or needle-punched. In some embodiments both plies of fabric 91, 93 of comfort layer 30 are made of an ultrasonically weldable non-woven fabric made at least partially of recycled polymer fibers.

[00069] Fig. 7 illustrates one corner of an alternative embodiment of comfort layer 71a, which may be used in any bedding or seating product. The comfort layer

71a comprises aligned rows 100 and columns 102 of pockets 84a, each pocket 84a comprising a circular seam 80a joining upper and lower plies of fabric 72, 74, as described above. However, each of the circular seams 80a is a continuous seam, as opposed to a seam having curved weld segments with gaps therebetween. These circular seams 80a of pockets 84a allow no airflow through the seams 80a. Therefore, the fabric material of the first and second plies 72, 74 of pockets 84a of comfort layer 16a must be made of semi-impermeable material to manage or control airflow into and out of the pockets 84a of comfort layer 71a. The type of material used for comfort layer 71a solely controls the amount of air entering the comfort layer 71a when a user gets off the bedding or seating product, thus allowing the springs 28 in the pockets 84a to expand and air to flow into the comfort layer 71a. Similarly, when a user gets onto a bedding or seating product, the springs 28 compress and cause air to exit the pockets 84a of the comfort layer 71a and exit the comfort layer. The amount of air exiting the comfort layer 71a affects the feel/compression of the individually pocketed mini coil springs 28 when a user lays on the product incorporating the comfort layer 71a.

[00070] Fig. 7A illustrates one corner of an alternative embodiment of comfort layer 30a, which may be used in any bedding or seating product. The comfort layer 30a comprises aligned rows 104 and columns 106 of pockets 90a, each pocket 90a comprising intersecting weld seams 98a joining upper and lower plies of fabric 91, 93a as described above. However, each of the intersecting weld seams 98a is a continuous seam, as opposed to a seam having weld segments with gaps therebetween to allow airflow through the seam. These intersecting weld seams 98a of pockets 90a allow no airflow through the weld seams 98a. Therefore, the fabric material of the first and second plies 91, 93 of pockets 90a of comfort layer 30a must

be made of semi-impermeable material to allow some airflow into and out of the pockets 90a of comfort layer 30a. The type of material used for comfort layer 30a solely controls the amount of air entering the comfort layer 30a when a user gets off the bedding or seating product, thus allowing the springs 28 in the pockets 90a to expand and air to flow into the comfort layer 30a. Similarly, when a user gets onto a bedding or seating product, the springs 28 compress and cause air to exit the pockets 90a of the comfort layer 30a and exit the comfort layer. The amount of air exiting the comfort layer 30a affects the feel/compression of the individually pocketed mini coil springs 28 when a user lays on the product incorporating the comfort layer 56a.

[00071] It is within the contemplation of the present invention that only some of the strings of a pocketed spring assembly be made in accordance with the present invention. For example, every other string may be made of conventional fabric. It is further within the scope of the present invention that the different strings shown and described herein may be used together.

[00072] The various embodiments of the invention shown and described are merely for illustrative purposes only, as the drawings and the description are not intended to restrict or limit in any way the scope of the claims. Those skilled in the art will appreciate various changes, modifications, and improvements which can be made to the invention without departing from the spirit or scope thereof. The invention in its broader aspects is therefore not limited to the specific details and representative apparatus and methods shown and described. Departures may therefore be made from such details without departing from the spirit or scope of the general inventive concept. The invention resides in each individual feature described herein, alone, and in all combinations of those features. Accordingly, the

scope of the invention shall be limited only by the following claims and their equivalents.

WHAT IS CLAIMED IS:

1. A bedding or seating product comprising:

a pocketed spring assembly comprising a plurality of parallel strings of springs joined together, each of the strings of springs comprising a plurality of individually pocketed springs, each of the strings of springs comprising an ultrasonically weldable fabric, the ultrasonically weldable fabric being ultrasonically welded to itself along a longitudinal seam, having first and second opposed sides covering opposite surfaces of the springs, a plurality of pockets being formed along a length of the string of springs by transverse seams joining the first and second sides, at least one spring being positioned in each said pocket, wherein the ultrasonically weldable fabric is made at least partially with recycled fibers;

cushioning materials; and

a covering encasing the pocketed spring assembly and cushioning materials.

2. A pocketed spring assembly for use in a bedding or seating product, the pocketed spring assembly comprising:

a pocketed spring assembly comprising a plurality of parallel strings of springs joined together, each of the strings of springs comprising a plurality of individually pocketed springs, each of the strings of springs comprising an ultrasonically weldable fabric, the ultrasonically weldable fabric being ultrasonically welded to itself along a longitudinal seam, having first and second opposed sides covering opposite surfaces of the springs, a plurality of pockets being formed along a length of the string of springs by transverse seams joining the first and second sides, at least one spring being positioned in each said pocket, wherein the ultrasonically weldable fabric is made at least partially with recycled fibers.

3. The pocketed spring assembly of claim 2 wherein the ultrasonically weldable fabric is stitchbond fabric.

4. The pocketed spring assembly of claim 2 wherein the ultrasonically weldable fabric is spunlaced fabric.

5. The pocketed spring assembly of claim 2 wherein the ultrasonically weldable fabric is needle-punched fabric.

6. The pocketed spring assembly of claim 2 wherein the recycled polymer fibers are made of polyethylene terephthalate.

7. The pocketed spring assembly of claim 2 wherein the ultrasonically weldable fabric has a weight of 1.0 to 4.0 ounces per square yard.

8. The pocketed spring assembly of claim 2 wherein the ultrasonically weldable fabric is made of one hundred percent recycled fibers.

9. The pocketed spring assembly of claim 2 wherein the ultrasonically weldable fabric is made of at least fifty percent recycled fibers.

10. The pocketed spring assembly of claim 2 wherein at least some of the recycled fibers are polymer fibers.

11. The pocketed spring assembly of claim 2 wherein the parallel strings of springs are joined together with adhesive having at least some bio-based material.

12. The pocketed spring assembly of claim 2 wherein the parallel strings of springs are joined together with adhesive having at least some recycled material.

13. A pocketed spring assembly for use in a bedding or seating product, the pocketed spring assembly comprising:

a plurality of parallel strings of springs joined together, each of said strings comprising a plurality of individually pocketed springs, each of the strings being formed from a piece of ultrasonically weldable fabric, said ultrasonically weldable of fabric being joined to itself along a longitudinal seam and having first and second opposed sides of fabric covering opposite surfaces of the springs, a plurality of pockets being formed along a length of the string by transverse seams joining the first and second sides of the fabric, at least one spring being positioned in each of the pockets, wherein the longitudinal seam and each of the transverse seams joins the piece of ultrasonically weldable fabric to itself, wherein the ultrasonically weldable fabric is made with at least some recycled polymer fibers.

14. The pocketed spring assembly of claim 13 wherein the ultrasonically weldable fabric has a weight of 1.0 to 4.0 ounces per square yard.

15. The pocketed spring assembly of claim 13 wherein the recycled polymer fibers are made of polyethylene terephthalate.

16. The pocketed spring assembly of claim 13 wherein the parallel strings of springs are joined together with adhesive having at least some bio-based material.

17. The pocketed spring assembly of claim 13 wherein the parallel strings of springs are joined together with adhesive having at least some recycled material.

18. A fabric for use in a string of springs, said fabric comprising:

at least one layer of non-woven stitchbond ultrasonically weldable fabric made at least partially from recycled fibers.

19. The fabric of claim 18 wherein the recycled fibers are made of polyethylene terephthalate.

20. The fabric of claim 18 wherein at least some of the recycled fibers are polymer fibers.

21. A fabric for use in a string of springs, said fabric comprising:

at least one layer made of a mixture of non-woven stitchbond ultrasonically weldable recycled synthetic fibers and non-ultrasonically weldable fibers.

22. The fabric of claim 21 wherein the ultrasonically weldable recycled synthetic fibers comprise at least thirty percent of the fibers.

23. A string of springs for use in a pocketed spring assembly, the string of springs comprising:

a plurality of individually pocketed springs, said string of springs comprising a ultrasonically weldable fabric joined to itself along a longitudinal seam, first and second opposed plies of the ultrasonically weldable fabric being on opposite sides of the springs, a plurality of pockets being formed along a length of the string by transverse seams joining the first and second plies of the ultrasonically weldable fabric, at least one spring being positioned in each of the pockets, wherein the ultrasonically weldable fabric comprises non-woven stitchbond fabric made with at least some recycled synthetic fibers.

24. The string of springs of claim 23 wherein the non-woven stitchbond fabric is made entirely of recycled synthetic fibers.

25. The string of springs of claim 23 wherein the recycled synthetic fibers are made of polyethylene terephthalate.

26. A comfort layer for a bedding or seating cushion product, said comfort layer comprising:

a matrix of interconnected pocketed springs, each spring of which is contained within a pocket between top and bottom plies of ultrasonically weldable non-woven fabric, the ultrasonically weldable top and bottom plies being joined by a seam around the pocket, wherein the ultrasonically weldable fabric is made at least partially with recycled fibers.

27. The comfort layer of claim 26 wherein at least one of the plies comprises non-woven stitchbond fabric.

28. The comfort layer of claim 26 wherein the seams of the pockets are circular.

29. The comfort layer of claim 26 wherein the seams of the pockets are straight.

30. The comfort layer of claim 26 wherein at least some of the recycled fibers are polymer fibers.

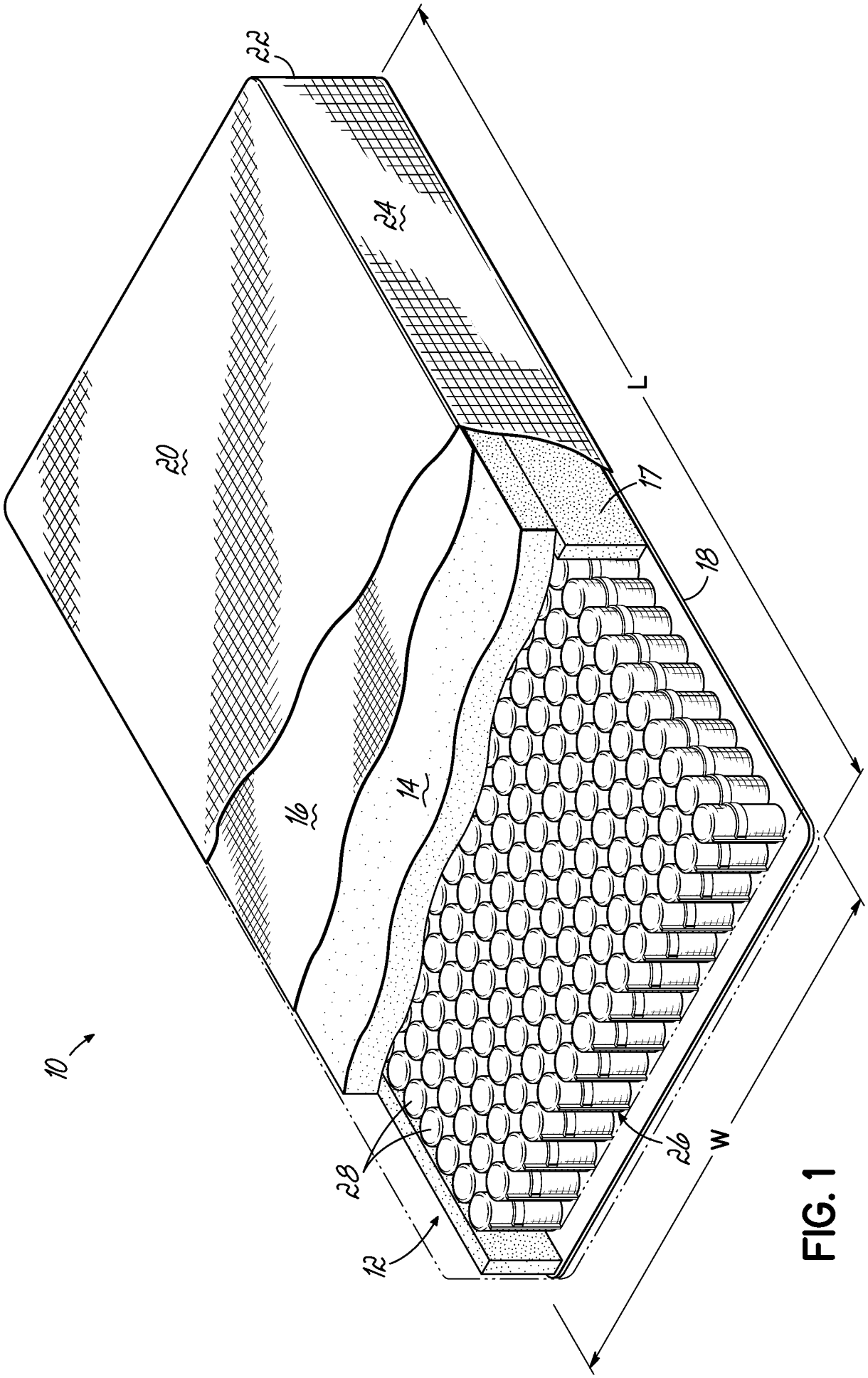


FIG. 1

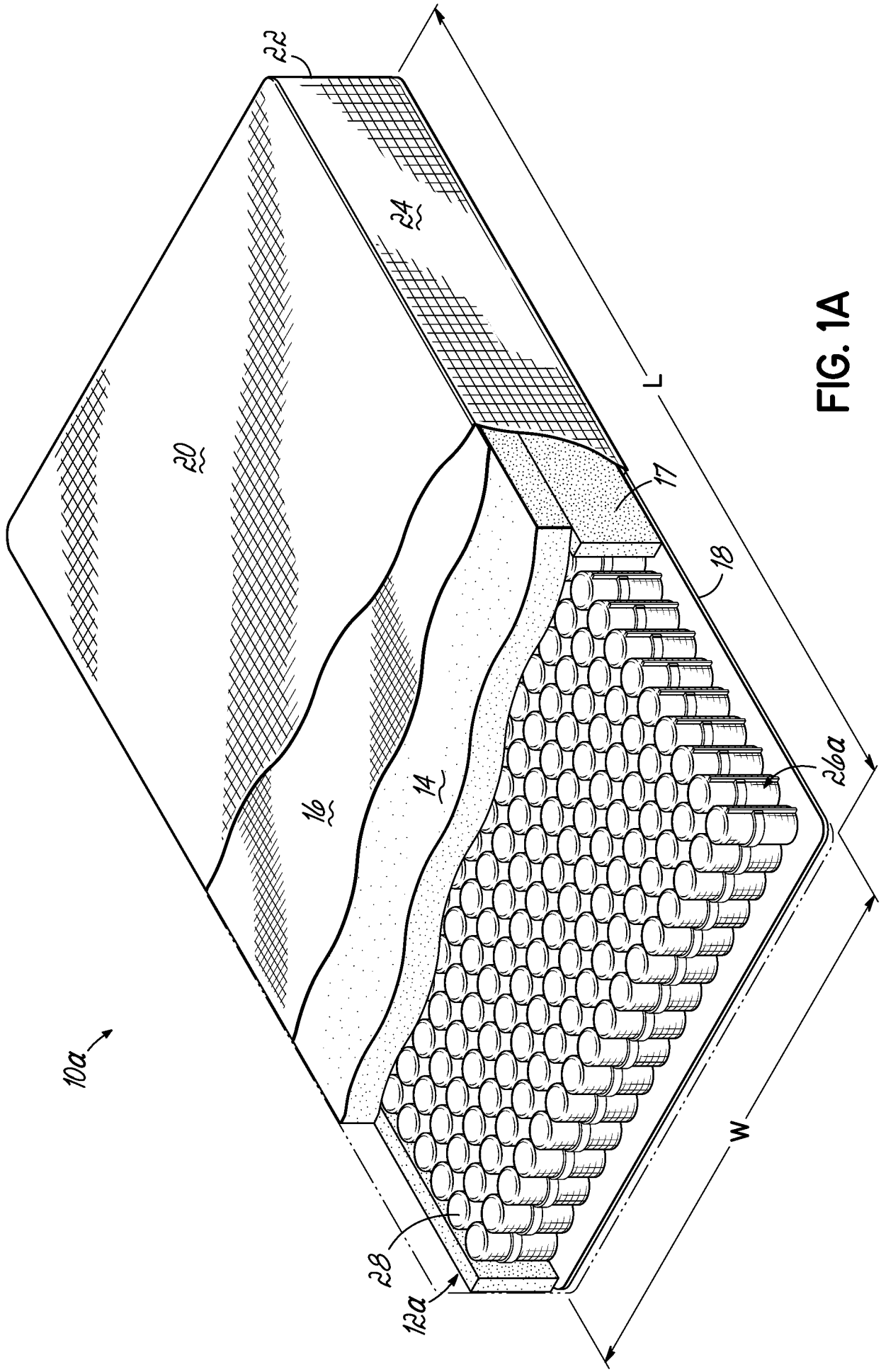


FIG. 1A

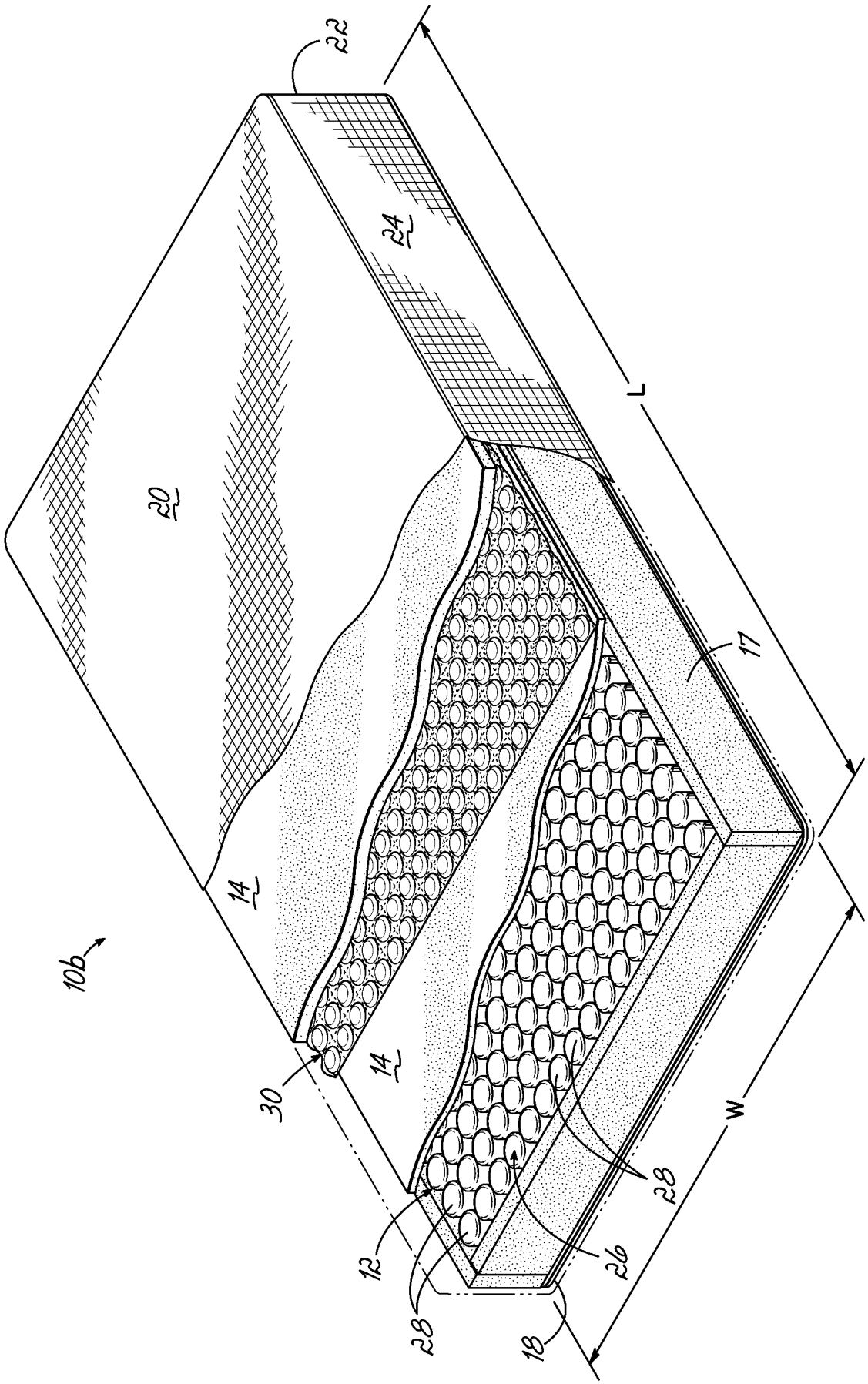


FIG. 1B

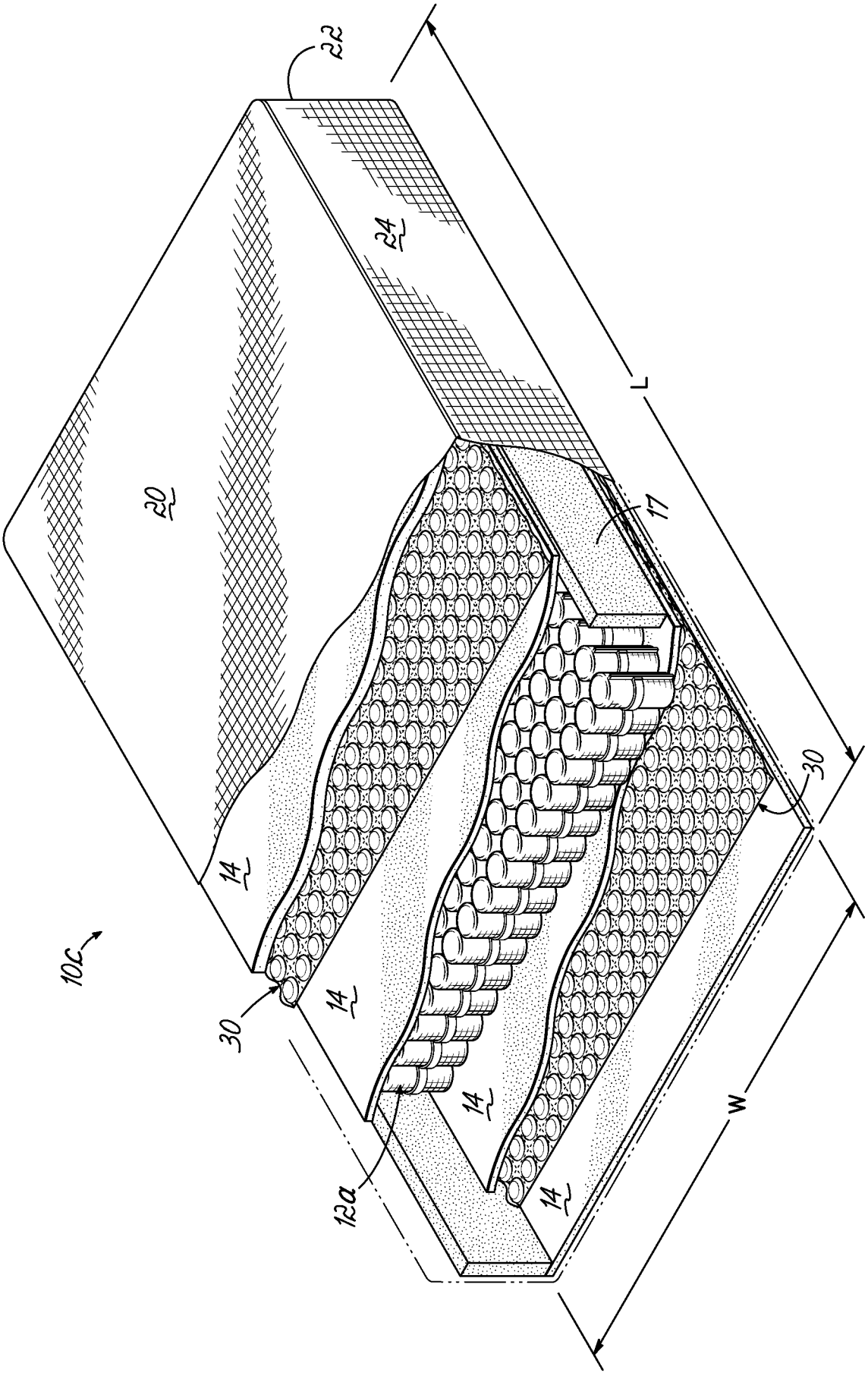


FIG. 1C

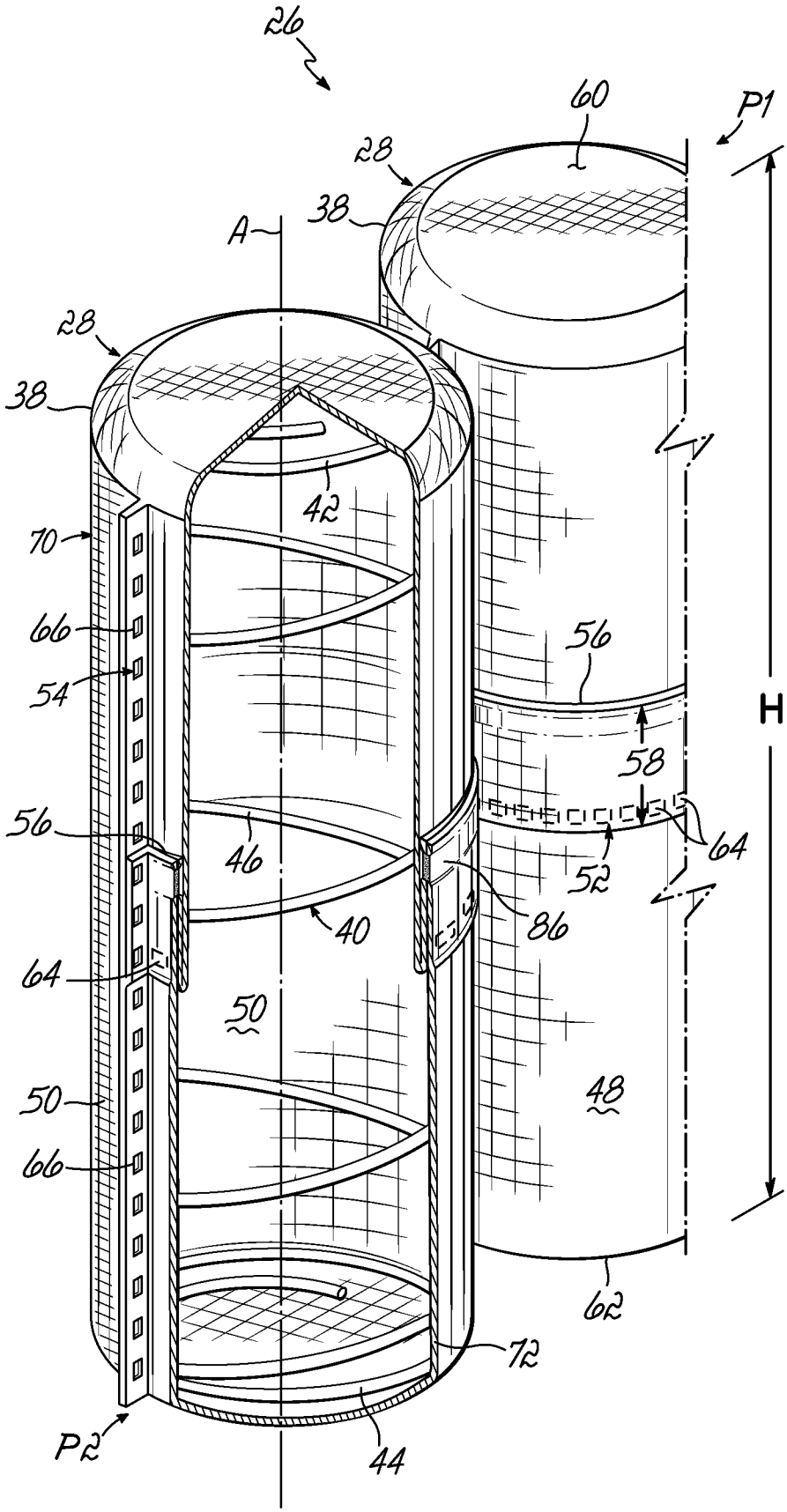

26
60
P1
28
38
A
28
38
42
70
66
54
56
58
H
56
46
64
52
40
86
64
50
50
48
66
62
72
P2
44

FIG. 2

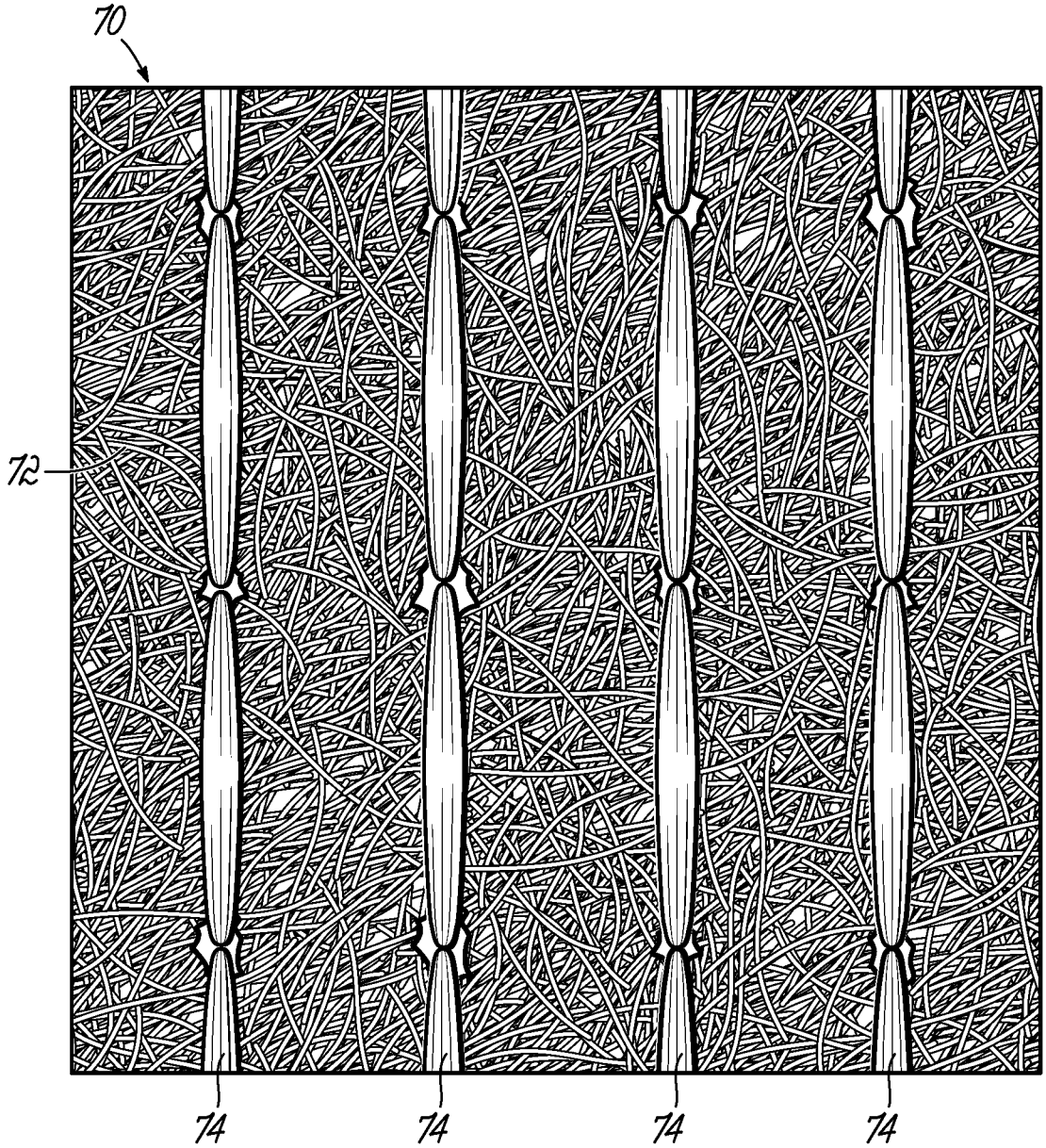


FIG. 2A

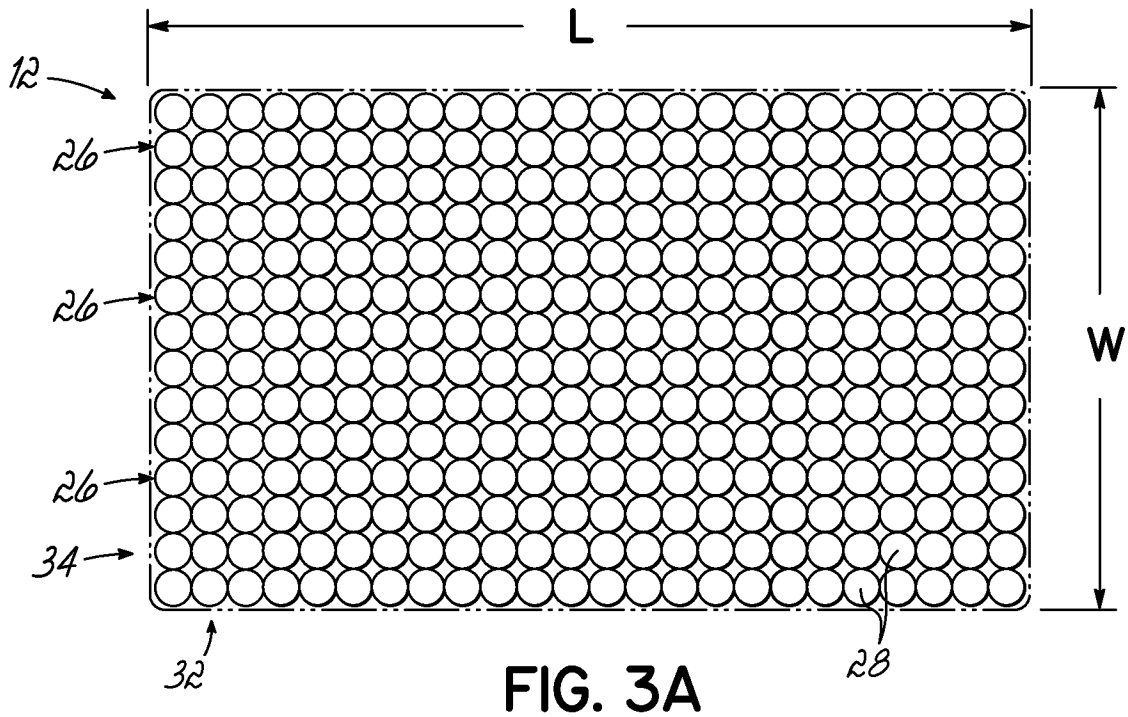


FIG. 3A

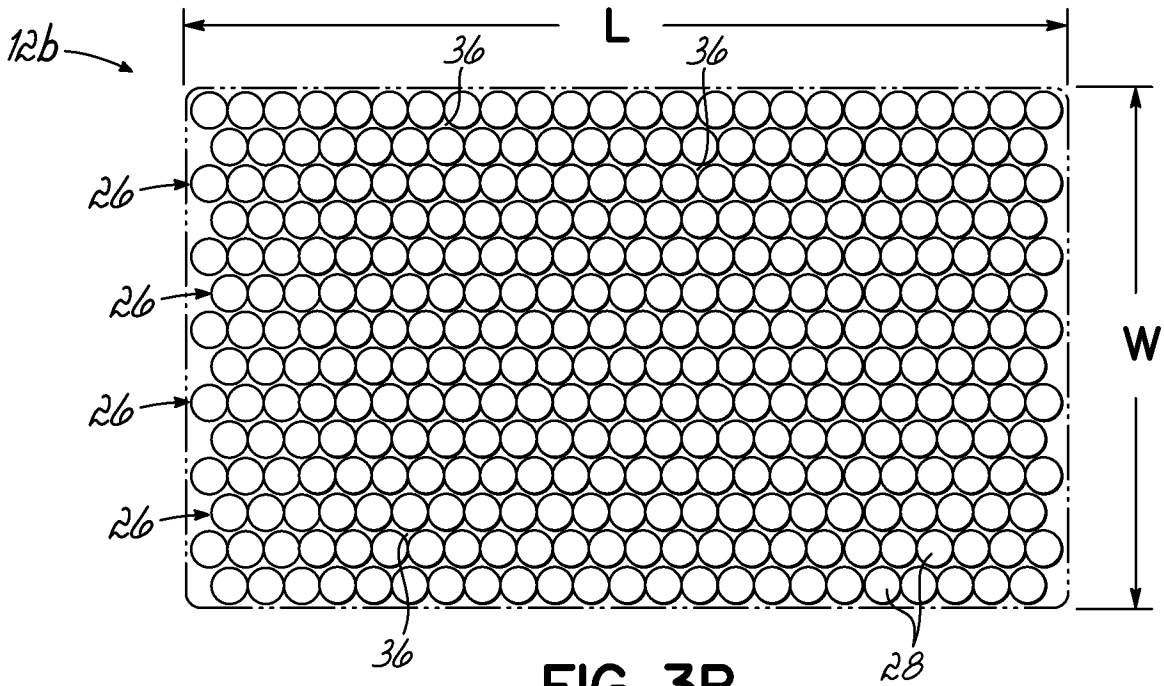


FIG. 3B

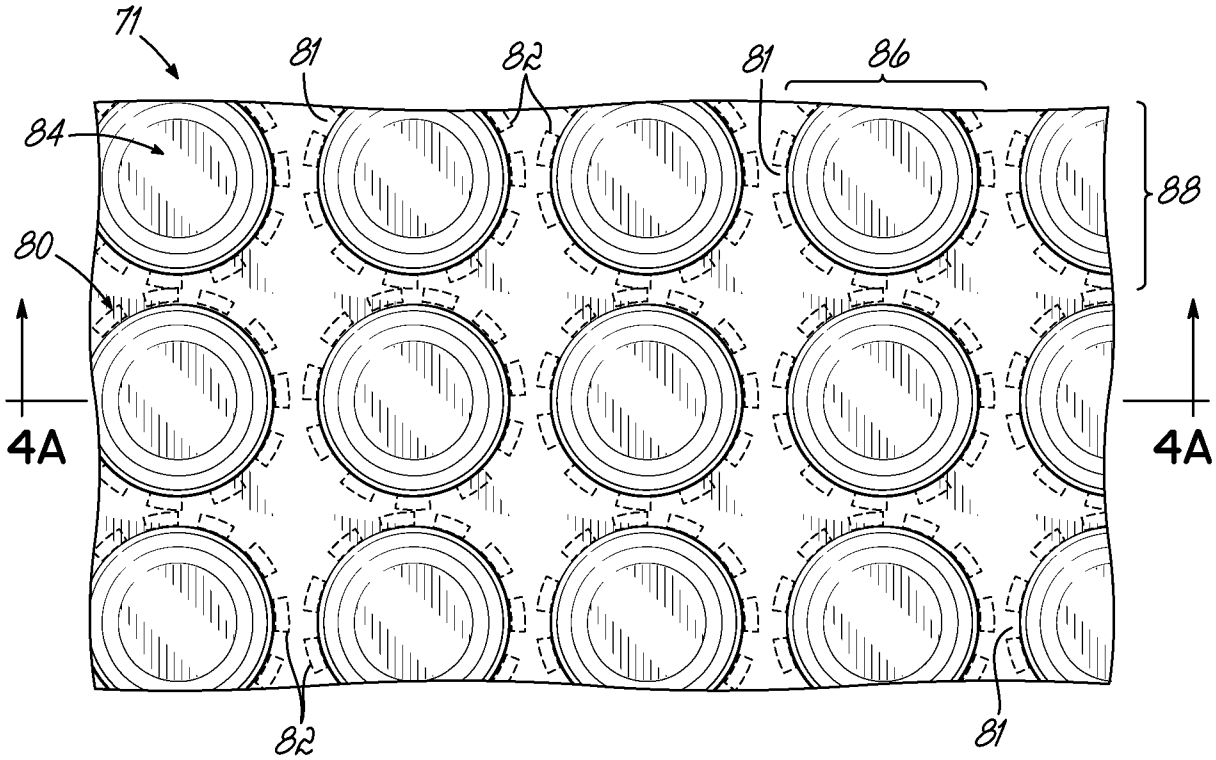


FIG. 4

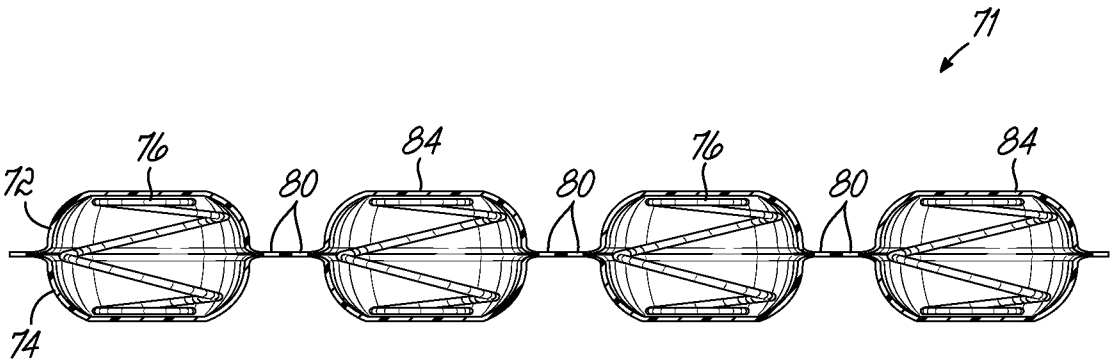


FIG. 4A

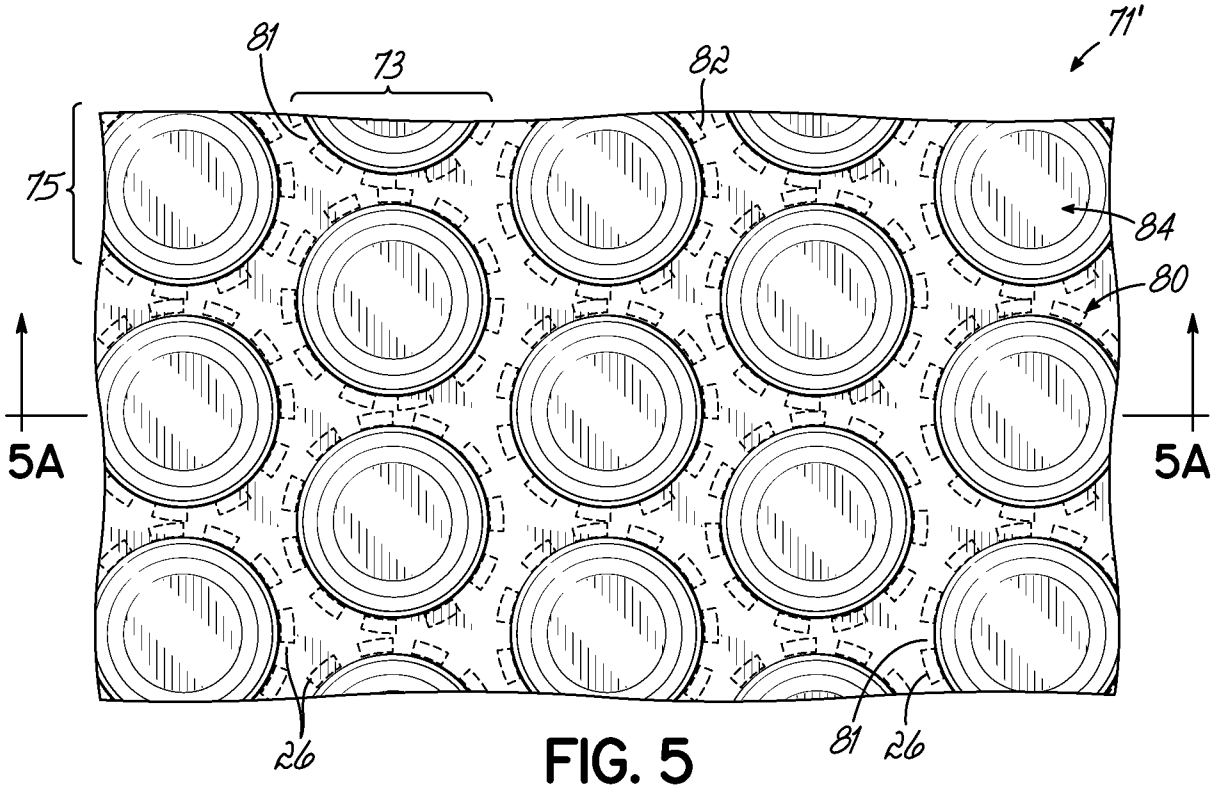


FIG. 5

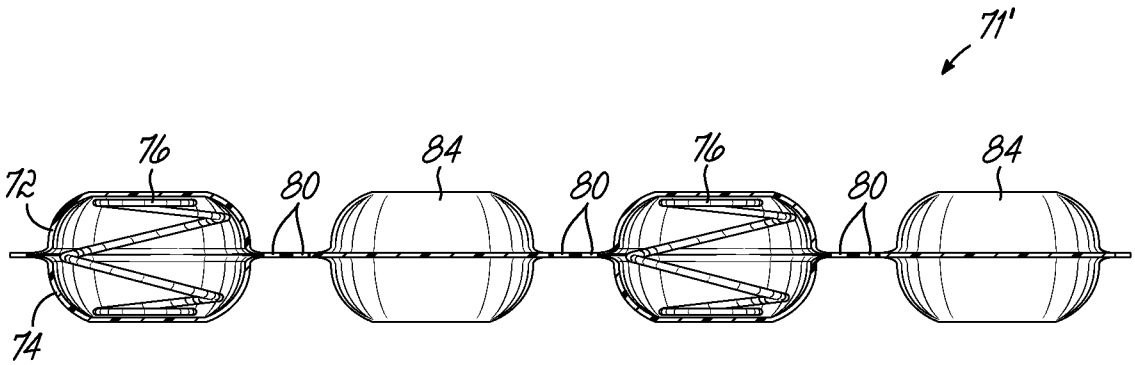


FIG. 5A

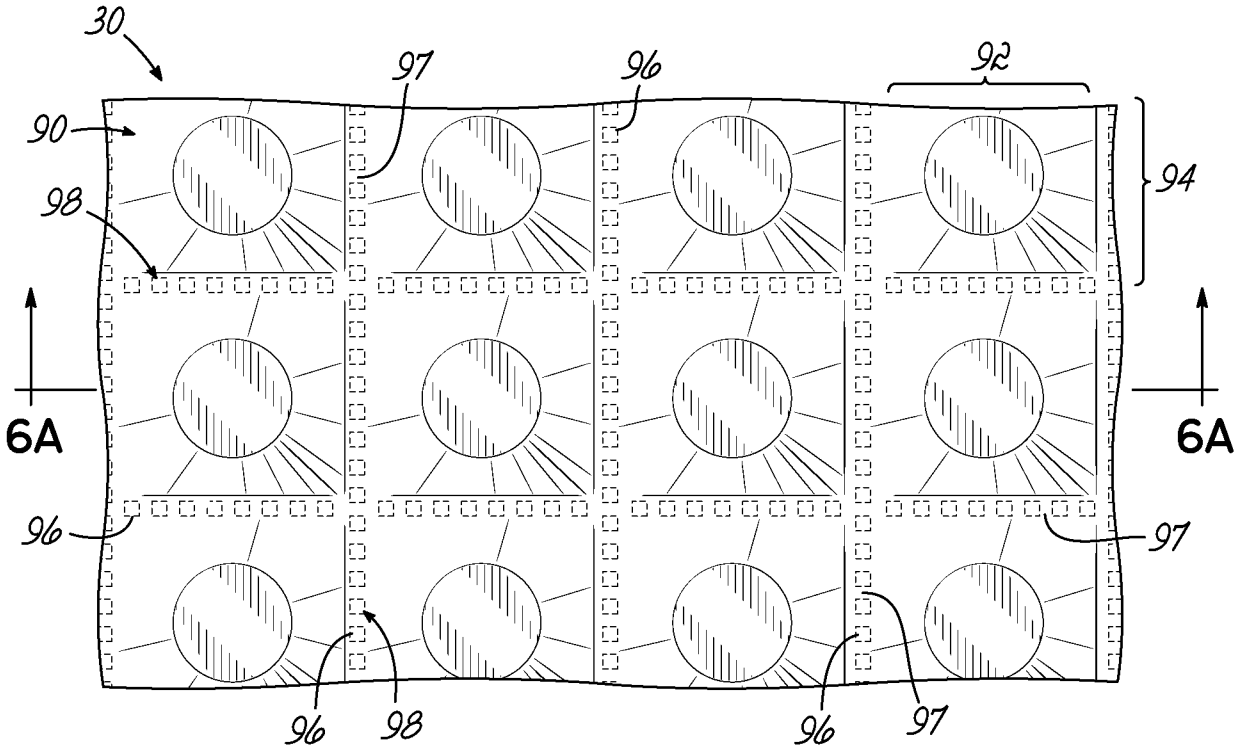

30
97
96
92
90
94
98
6A
6A
96
97
96
98
96
97

FIG. 6

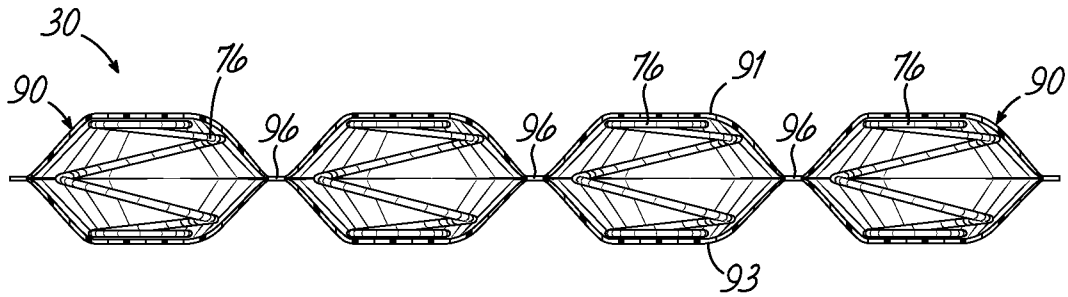

30
90
76
96
96
76
91
96
76
90
93

FIG. 6A

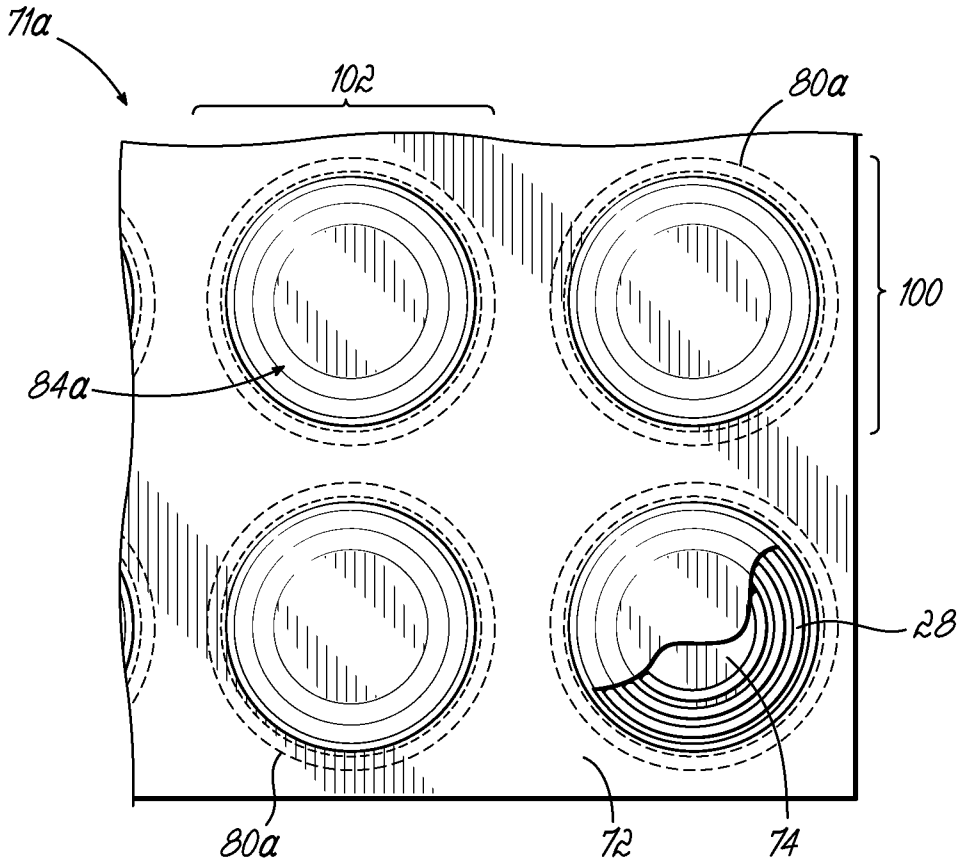


FIG. 7

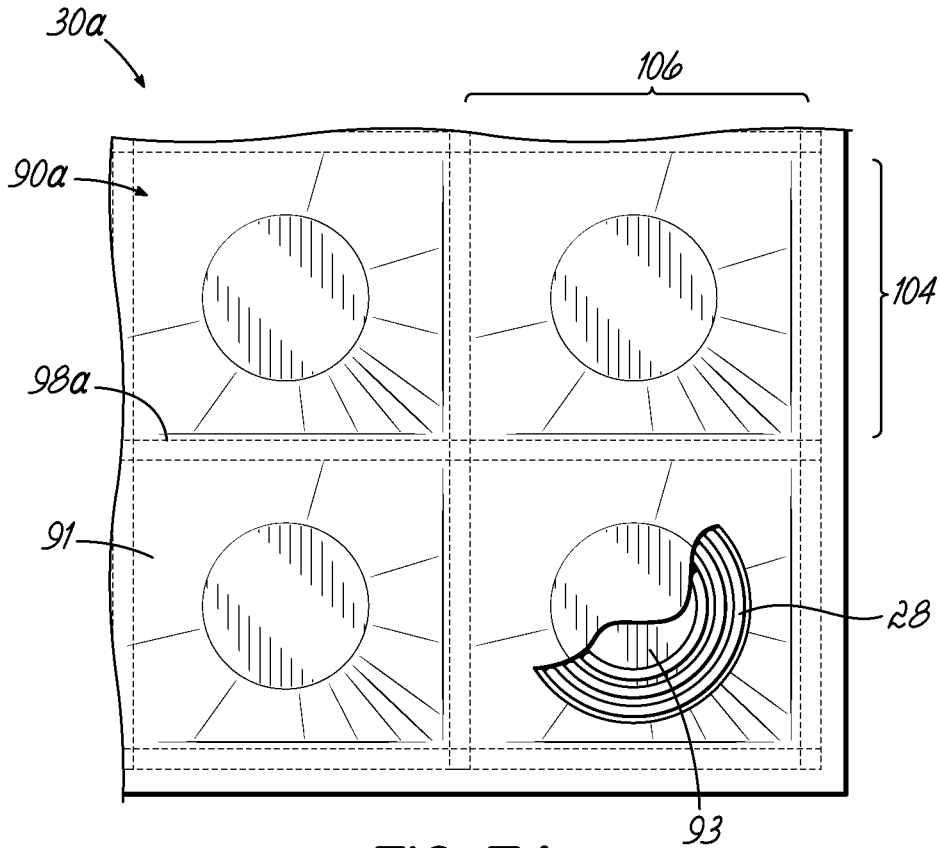


FIG. 7A

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2021/023807

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A47C 23/043; A47C 27/00; A47C 27/06 (2021.01)
CPC - A47C 23/043; A47C 27/00; A47C 27/06 (2021.05)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
see Search History document

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2019/0309441 A1 (EASTMAN) 10 October 2019 (10.10.2019) entire document	18-22 --- 3, 23-25, 27
Y	US 2018/0303246 A1 (L&P PROPERTY MANAGEMENT COMPANY) 25 October 2018 (25.10.2018) entire document	1-17
Y	JP 2001-190317 A (MISUMO KAKO:KK) 17 July 2001 (17.07.2001) machine translation	1-17, 24-30
Y	WO 2008/005936 A2 (BUCKEYE TECHNOLOGIES INC. et al) 10 January 2008 (10.01.2008) entire document	4
Y	JP 2018-24957 A (TAKAGI CHEMICALS INC) 15 February 2018 (15.02.2018) machine translation	5
Y	US 2016/0032156 A1 (TESA SE) 04 February 2016 (04.02.2016) entire document	11, 16
Y	US 2012/0196956 A1 (LEE et al) 02 August 2012 (02.08.2012) entire document	12, 17
Y	US 2019/0269251 A1 (L&P PROPERTY MANAGEMENT COMPANY) 05 September 2019 (05.09.2019) entire document	23-30
A	US 2018/0344045 A1 (L&P PROPERTY MANAGEMENT COMPANY) 06 December 2018 (06.12.2018) entire document	1-30

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 May 2021	JUN 28 2021
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Harry Kim Telephone No. PCT Helpdesk: 571-272-4300

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2021/023807

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2018/0325276 A1 (L&P PROPERTY MANAGEMENT COMPANY) 15 November 2018 (15.11.2018) entire document	1-30