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(54) **IMPACT ABSORBING PAD FOR GARMENT, AND GARMENT INCLUDING SAME**

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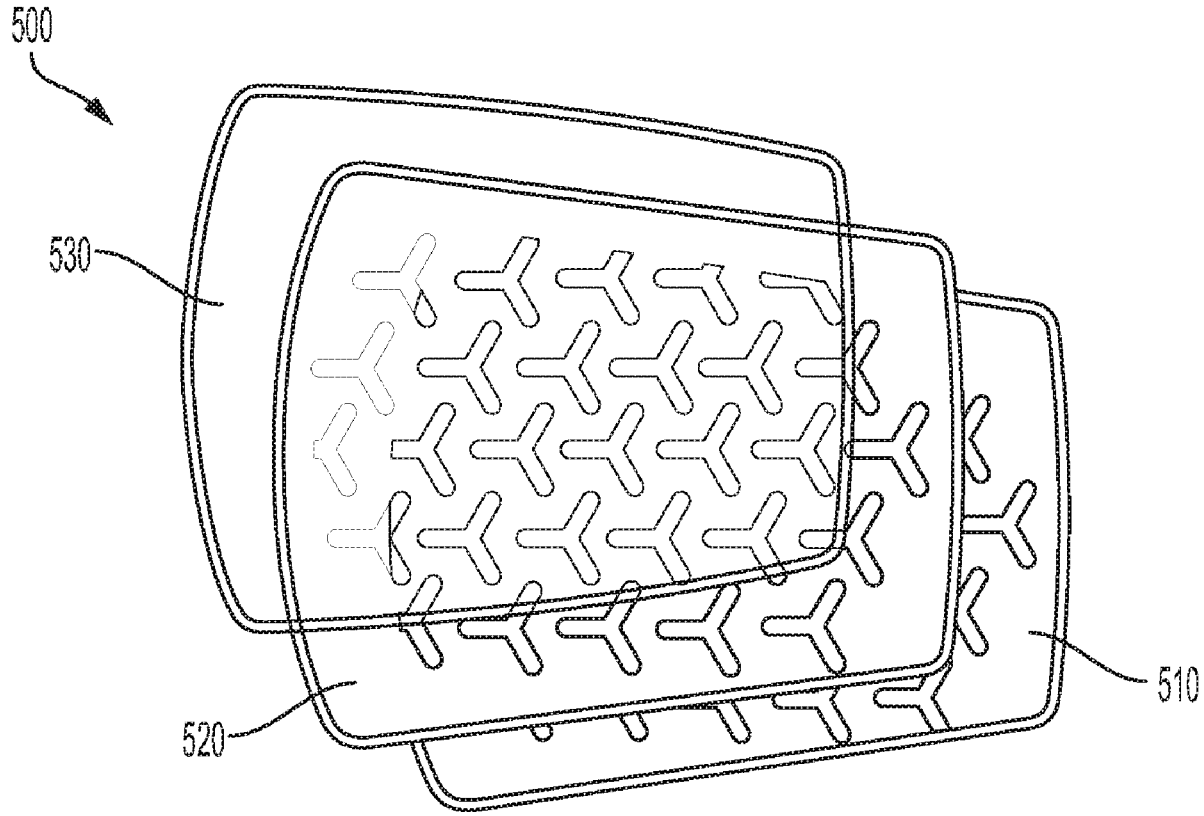
(57) **ABSTRACT**

A garment includes an impact absorbing pad having a layer of foam material with a body-facing surface, an outer surface that is opposite the body-facing surface, and a set of voids that extend through the layer in a multiple locations. The voids have a repeating pattern of shapes. Each shape includes three void arms having equal lengths that extend from a central vertex point. The impact absorbing pad may also include a second layer overlapping the first layer. The density of the first and second layer may be the same or may be different. The second layer may also have a set of voids overlapping the first set of voids. A covering covers the outer surface of the impact absorbing pad. The impact absorbing pad has a Shore durometer value of about 25 to about 50.



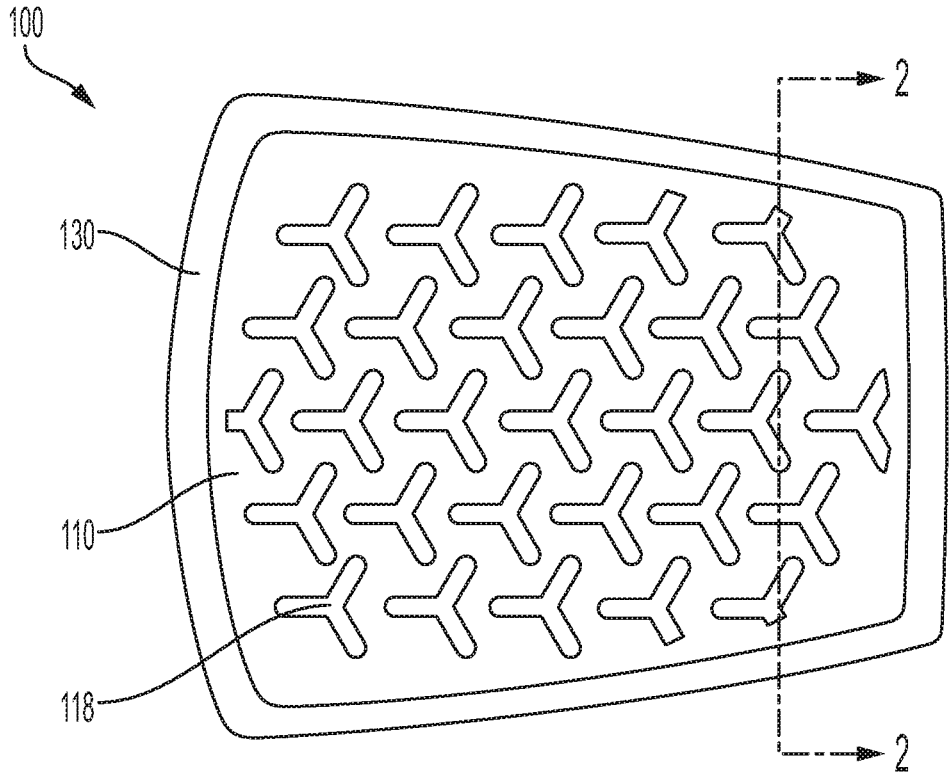

100
2
130
110
118
2

FIG. 1

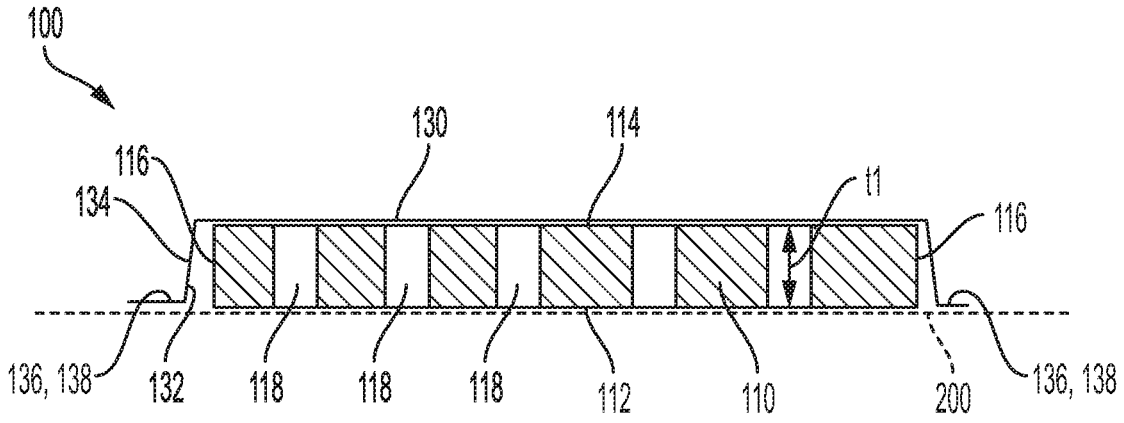

100
130
114
116
134
t1
116
136, 138
132
118
118
118
112
110
200
136, 138

FIG. 2

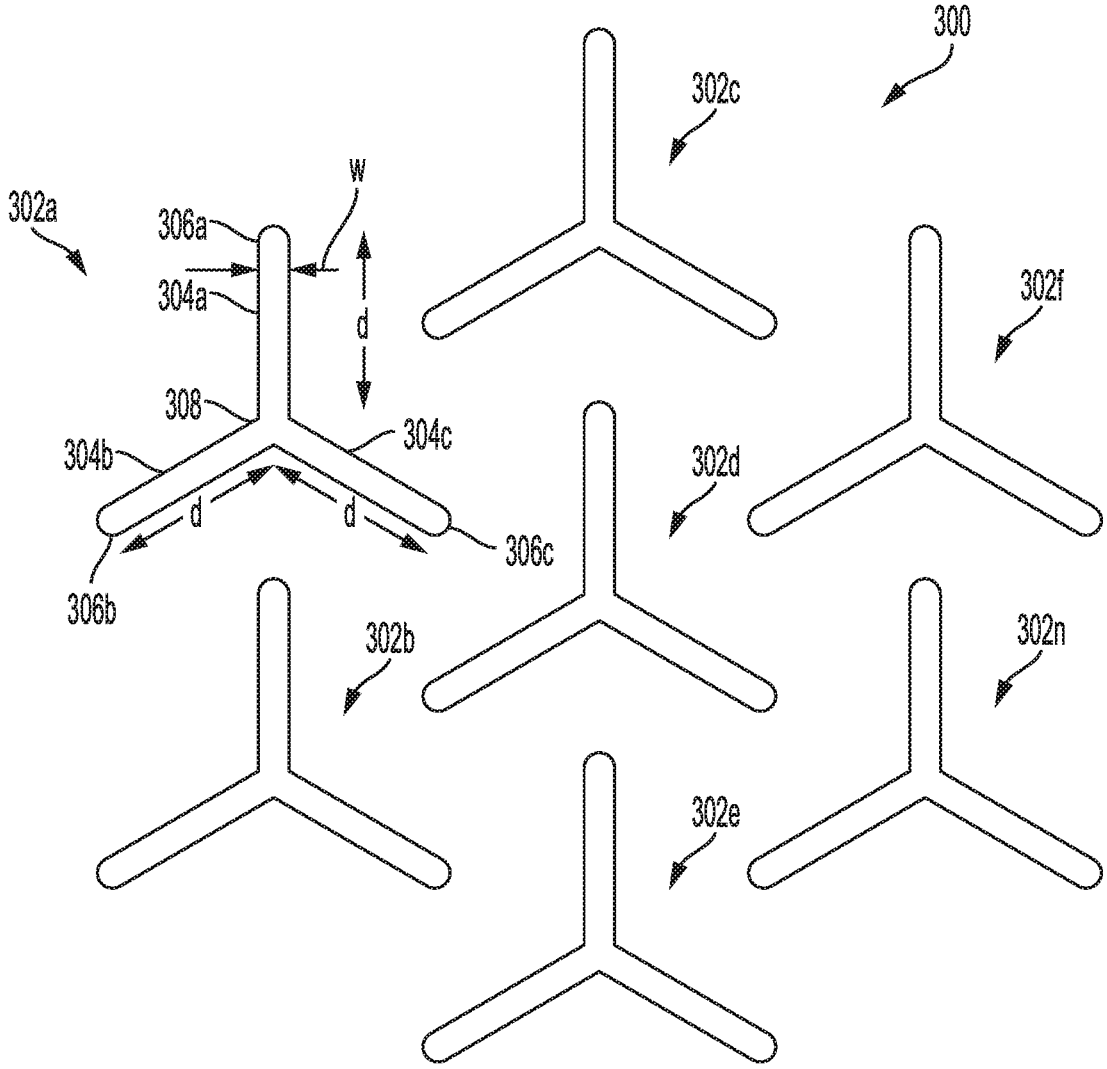

300
302a
302b
302c
302d
302e
302f
302n
306a
306b
306c
304a
304b
304c
308
w
d
d
d

FIG. 3

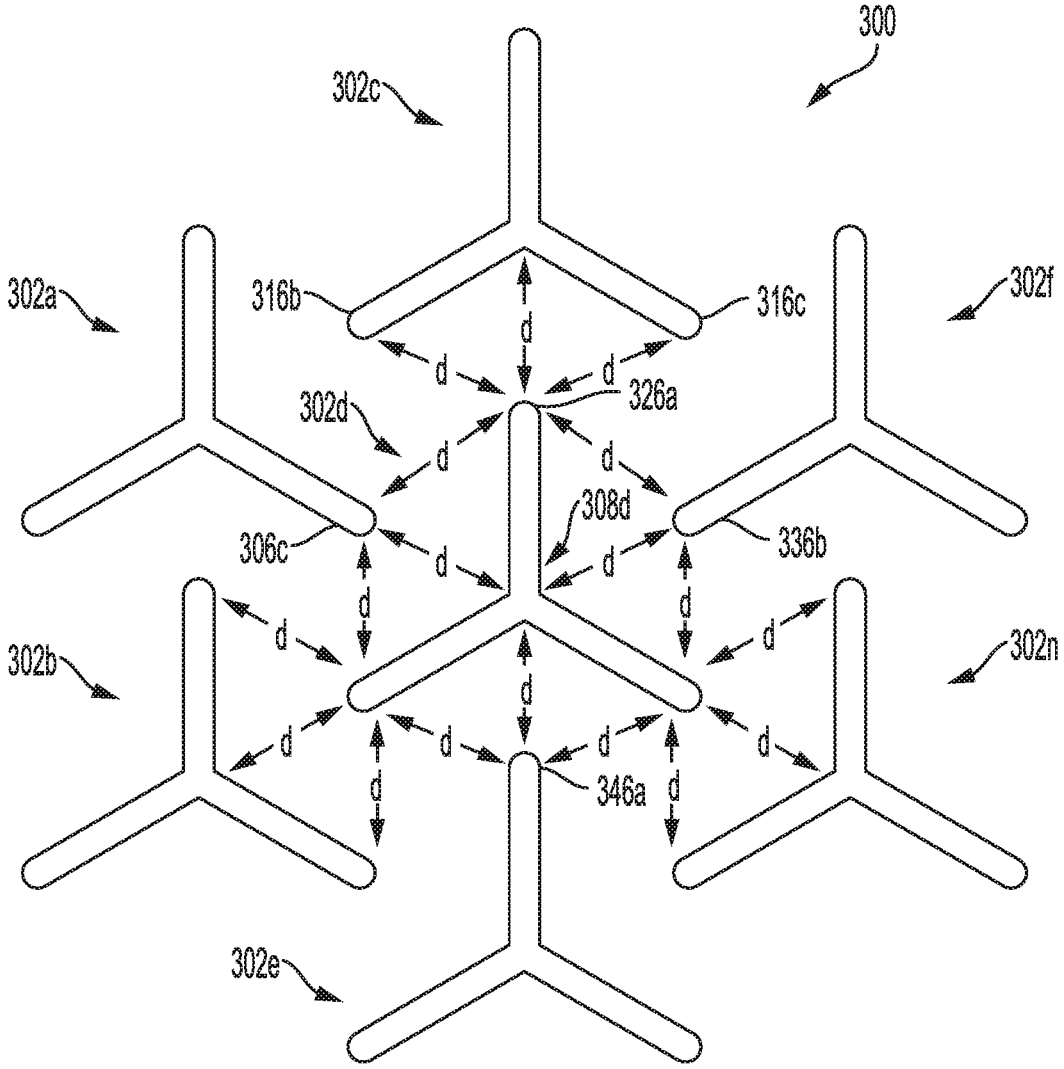

300
302c
302a
316b
316c
302f
d
326a
302d
308d
306c
336b
302b
302n
346a
302e

FIG. 4

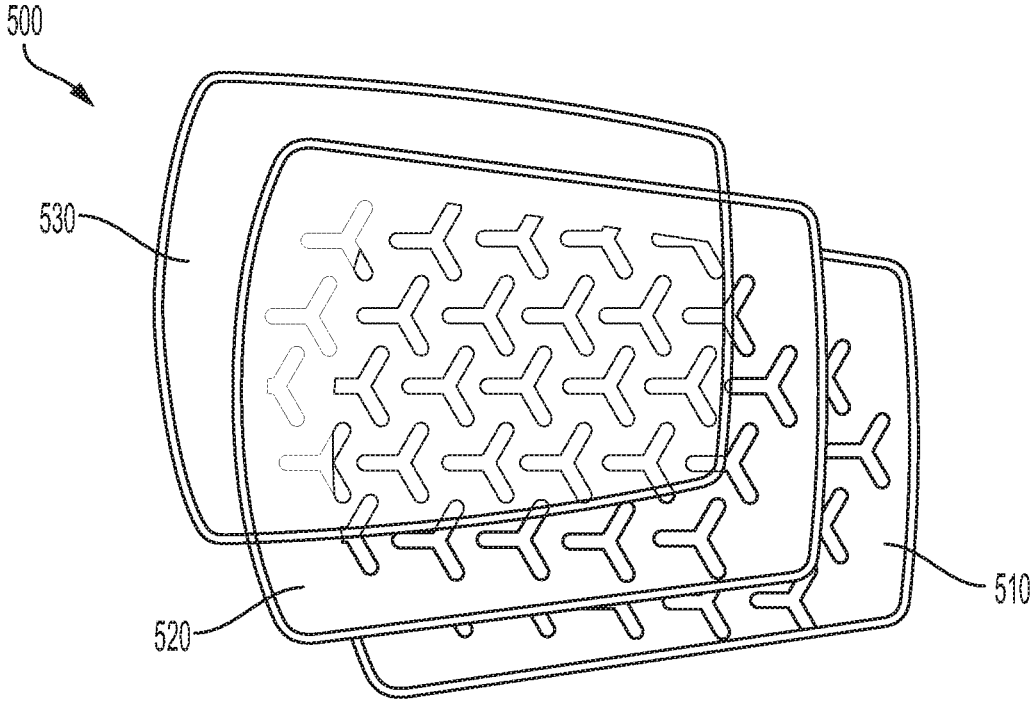

500
530
520
510

FIG. 5

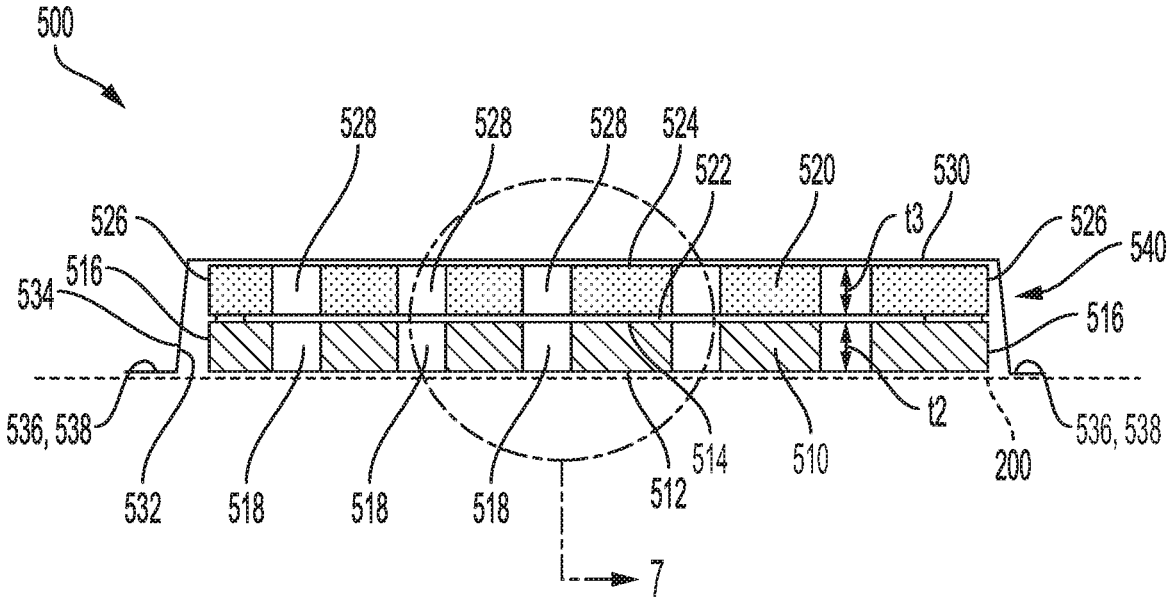

500
528
528
528
524
522
520
530
526
t3
526
540
516
534
516
536, 538
t2
536, 538
532
518
518
518
512
514
510
200
7

FIG. 6A

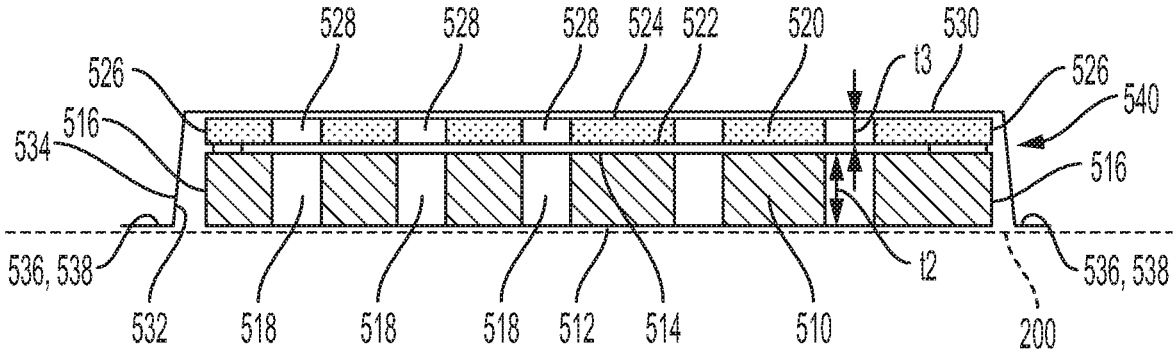

528
528
528
524
522
520
530
526
526
t3
540
516
534
516
536, 538
t2
536, 538
532
518
518
518
512
514
510
200

FIG. 6B

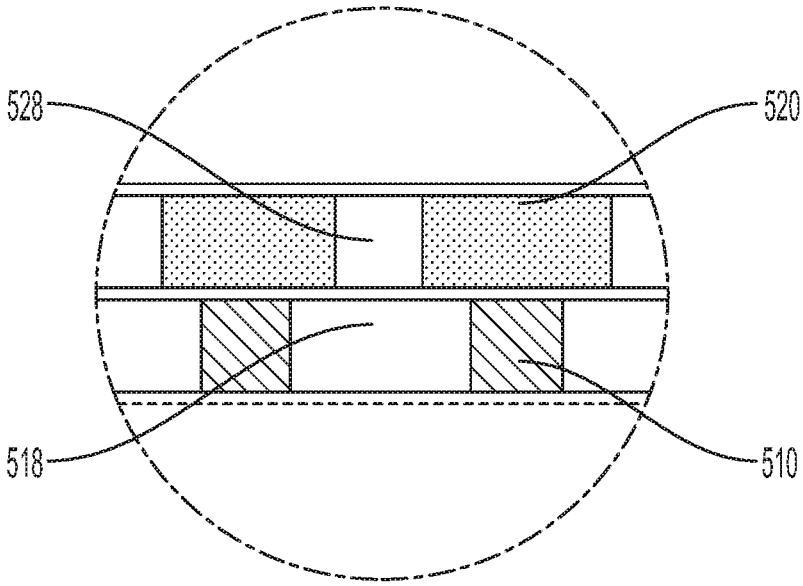

528
520
518
510

FIG. 7A

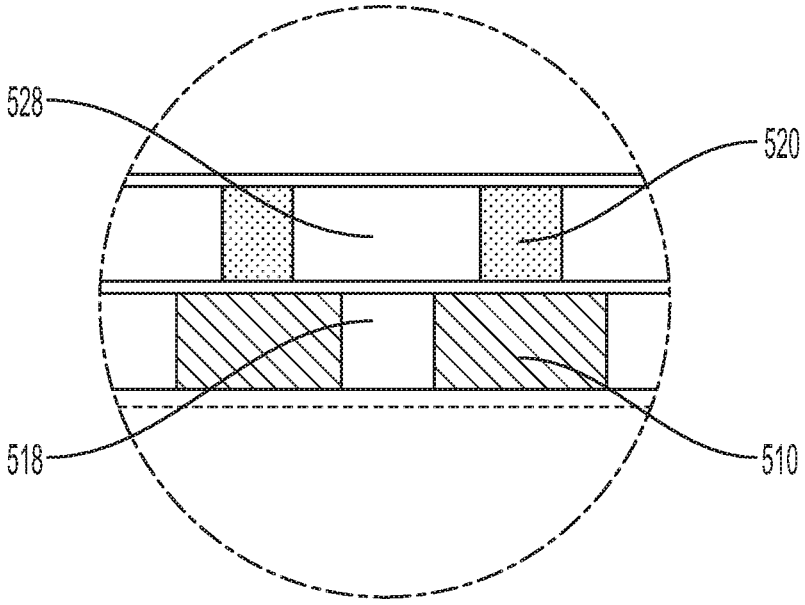


FIG. 7B

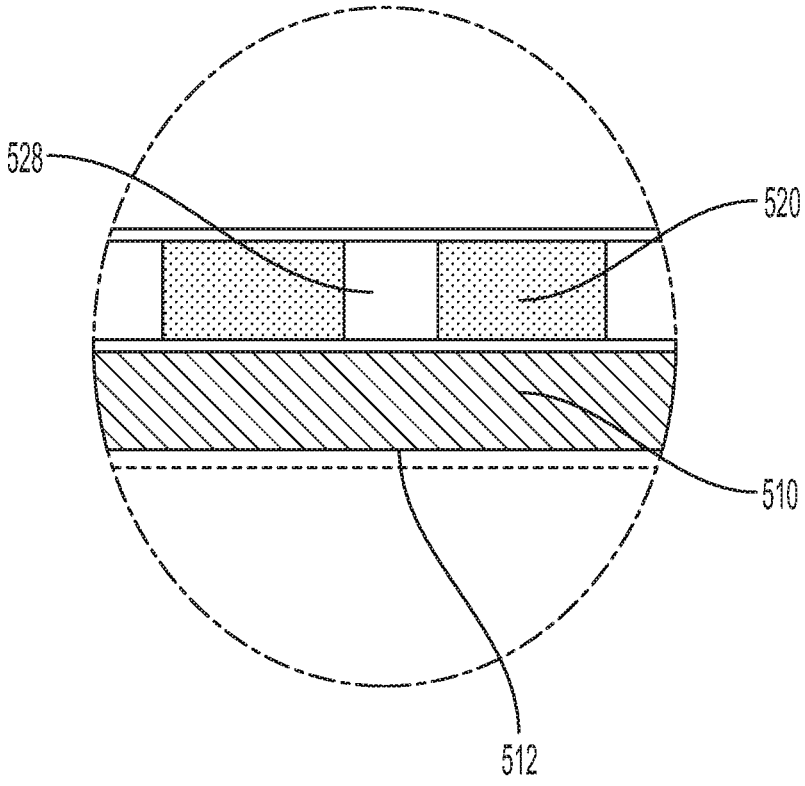


FIG. 7C

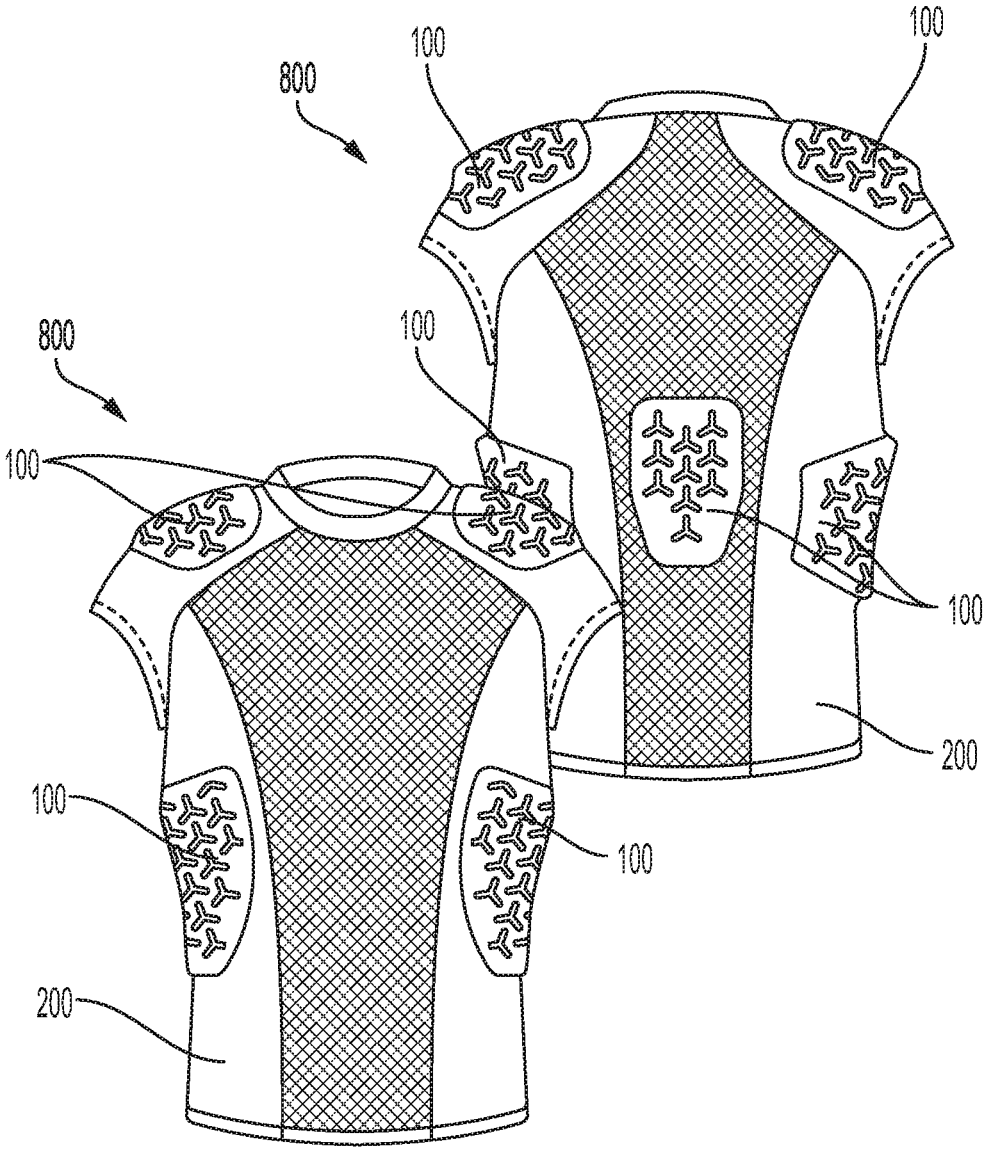


FIG. 8

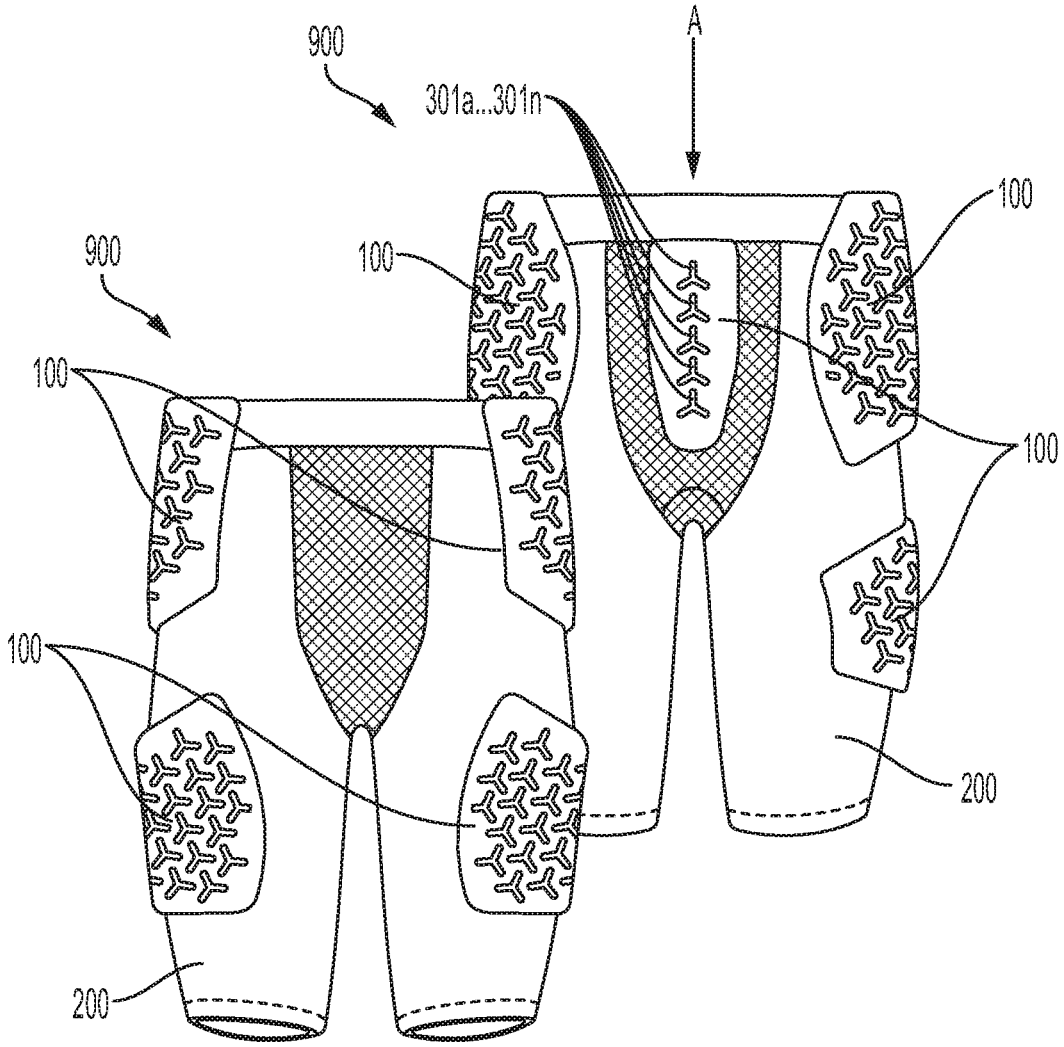


FIG. 9

IMPACT ABSORBING PAD FOR GARMENT, AND GARMENT INCLUDING SAME

BACKGROUND

[0001] Protective clothing can help a wearer (e.g., athlete, soldier, bicyclist, tradesperson, etc.) reduce or prevent impact-related injuries. However, the clothing's structural features that provide this protection often adds bulk and reduces flexibility, which can reduce the wearer's performance during the activity. For example, bulky padding can interfere with an athlete's performance during a sporting event.

[0002] This document describes a novel impact absorbing pad, garments containing such pads, and methods of manufacturing such pads that may help address the issues described above.

SUMMARY

[0003] In an embodiment, an impact absorbing pad includes a first layer of foam material having a plurality of voids that extend through the layer in a plurality of positions. As an example, in one embodiment, the first layer includes a body-facing surface and an outer surface that is opposite the body-facing surface. A covering covers the outer surface of the first layer, extends beyond at least a portion of the outer surface, and forms a frame around at least a portion of the outer surface. Alternatively, the covering may be attached to the outer surface of the first layer. Optionally, the first layer may exhibit a Shore durometer value between 25 and 50. In another embodiment, the impact absorbing pad may be included in a garment.

[0004] Optionally, the voids may include a pattern of shapes, each shape having three void arms of equal lengths and that extend from a central vertex point. As an example, in one embodiment, each void arm may have a distal end and each distal end of each void arm may be equidistant from the distal ends of each closest adjacent void arm in the pattern in which the void is positioned. Alternatively, the distance between the distal end of each void arm may be equidistant from the central vertex point of each adjacent void. In an embodiment, the voids may exhibit equal widths no greater than 10 mm.

[0005] Optionally, a second layer of foam material having a plurality of voids that extend through the layer in a plurality of positions may be included adjacent the first layer. As an example, in one embodiment, the second layer includes a body-facing surface and an outer surface that is opposite the body-facing surface. As an example, in an embodiment, the foam material of the first layer may have a first density, the foam material of the second layer may have a second density, and the first density may be different than the second density.

[0006] In an alternate embodiment, an impact absorbing pad includes a first layer of foam material having a plurality of voids that extend through the first layer in a plurality of positions and a second layer of foam material having a plurality of voids that extend through the second layer in a plurality of positions. As an example, in one embodiment, the first layer includes a body-facing surface and an outer surface that is opposite the body-facing surface and the second layer includes a body-facing surface that is adjacent to the outer surface of the first layer and an outer surface that is opposite the body-facing surface of the second layer. A covering covers the outer surface of the first layer, extends beyond at least a portion of the outer surface, and forms a frame around at least a portion of the outer surface. As an example, in an embodiment, the foam material of the first layer may have a first density, the foam material of the second layer may have a second density, and the first density may be different than the second density. Optionally, the first foam of the first layer may have a Shore durometer value between 20 and 30, while the second foam of the second layer may have a Shore durometer value between 35 and 45. In another embodiment, the impact absorbing pad may be included in a garment.

[0007] Optionally, the voids of the first layer and the voids of the second layer may have a pattern of shapes, each shape having three void arms that extend from a central vertex point. As an example, in one embodiment, each void arm has a distal end and each distal end of each void arm may be equidistant from the distal ends of each closest adjacent void arm in the pattern in which the void is positioned. Alternatively, the distance between the distal end of any void arm in each pattern may be equidistant from the central vertex point of each adjacent void.

[0008] Optionally, the positions of voids of the first layer may correspond to the positions of the voids of the second layer. As an example, in one embodiment, the voids of the first layer may exhibit a first size, and the voids of the second layer may exhibit a second size that is larger than the first size so that portions of the outer surface of the first layer are visible through the voids of the second layer. Alternatively, the second size may be smaller than the first size.

[0009] Optionally, the outer surface of the first layer may attached to the body-facing surface of the second layer. As an example, in one embodiment, an adhesive may attach the outer surface of the first layer to the body-facing surface of the second layer.

[0010] In another alternate embodiment, a garment includes an impact absorbing pad made from a foam material and having a plurality of voids that extend through the impact absorbing pad in a plurality of positions. As an example, in one embodiment, the impact absorbing pad includes a body-facing surface and an outer surface that is opposite the body-facing surface. Optionally, the voids may have a pattern of shapes, each shape having three void arms of equal lengths and that extend from a central vertex point. As an example, in one embodiment, each void arm has a distal end and each distal end of each void arm may be equidistant from the distal ends of each closest adjacent void arm in the pattern in which the void is positioned. Alternatively, the distance between the distal end of any void arm in each pattern may be equidistant from the central vertex point of each adjacent void.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. **1** illustrates a front view of an example pad.

[0012] FIG. **2** illustrates a sectional view of the pad of FIG. **1**.

[0013] FIG. **3** illustrates an example geometric pattern of voids formed in a pad.

[0014] FIG. **4** illustrates a spatial relationship between the voids of FIG. **3**.

[0015] FIG. **5** illustrates an expanded view of another example pad.

[0016] FIG. **6**A illustrates a sectional view of an alternate pad, such as that of FIG. **5**.

[0017] FIG. **6**B illustrates a sectional view of a variation of the pad of FIG. **6**A.

[0018] FIGS. **7**A-**7**C illustrate a detailed view of a pad similar to that of FIG. **6**A having variations of pad layers with voids.

[0019] FIG. **8** illustrates a front and back view of an example shirt garment employing one or more pads.

[0020] FIG. **9** illustrates a front and back view of an example pants garment employing one or more pads.

DETAILED DESCRIPTION

[0021] As used in this document, the singular forms "a," "an," and "the" include plural references unless the context clearly dictates otherwise. Unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art. As used in this document, the term "comprising" (or "comprises") means "including (or includes), but not limited to." When used in this document, the term "exemplary" is intended to mean "by way of example" and is not intended to indicate that a particular exemplary item is preferred or required.

[0022] In this document, when terms such "first" and "second" are used to modify a noun, such use is simply intended to distinguish one item from another, and is not intended to require a sequential order unless specifically stated. The terms "approximately" and "about" when used in connection with a numeric value, is intended to include values that are close to, but not exactly, the number. For example, in some embodiments, the term "approximately" may include values that are within +/−10 percent of the value.

[0023] When used in this document, terms such as "top" and "bottom," "upper" and "lower", or "outer" and "inner," are not intended to have absolute orientations but are instead intended to describe relative positions of various components with respect to each other. For example, a first component may be an "upper" component and a second component may be a "lower" component when a device of which the components are a part is oriented in a first direction. The relative orientations of the components may be reversed, or the components may be on the same plane, if the orientation of the structure that contains the components is changed. The claims are intended to include all orientations of a device containing such components.

[0024] FIG. **1** illustrates a front view of an example impact absorbing pad **100**. One or more pads **100** may be placed adjacent a wearer's body to protect the wearer from impacts and prevent impact-related injuries from occurring. For example, a pad **100** may be connected to the interior of protective equipment such as the interior of a helmet, football shoulder pads, or baseball catcher's chest protector. Likewise, the pad **100**, for example, may be connected to the exterior of a garment worn by the user, as will be described in more detail below. The connection of the pad **100** to a piece of protective equipment or to a garment may be removable or permanently fixed. For example, one or more pads **100** may be placed in pockets having matching shapes for each pad **100**. Likewise, the connection of the pad **100** to the garment may be permanent, such as, for example, by sewing, gluing, heat welding, or the like. A garment having one or more pads **100** (i.e., a padded garment) may be worn by athletes, bicyclists, soldiers, tradespersons, or other users of protective equipment. Examples of padded garments are compression shirts, loose shirts, compression shorts/pants, loose shorts/pants, or the like. Likewise, examples of protective equipment are knee pads, elbow pads, helmets, chest protectors, back protectors, military body armor, or the like.

[0025] The impact absorbing pad **100** may have a planar or curved form having one or more layers of impact absorbing material. The pad **100**, as shown in FIG. **1**, may have a single layer or multiple layers of impact absorbing material (e.g. a first pad layer) **110** and an oversized mesh panel **130** for covering the first pad layer **110** and for attaching to a fabric portion of a garment.

[0026] As shown in FIGS. **1** and **2**, the first pad layer **110** has an inner surface **112**, an outer surface **114**, a perimeter edge **116**, and a thickness t**1**. (In this context, the term "inner" refers to the body-facing surface that would face the body of the person who is wearing the pad in use, and the term "outer" refers to the surface that would face away from the wearer's body during use.) The first pad layer **110** may be made of an elastomeric material such as, for example, ethylene-vinyl acetate (e.g., EVA) foam, vinyl nitrile foam, vinyl sponge, neoprene sponge, sponge rubber, solid viscoelastic polymers, or the like. The first pad layer **110** may have a Shore durometer (e.g., hardness) value of about 50, about 35, about 30, about 25, or other values to prevent impacts from injuring the wearer. As described below, the first pad layer **110** may have one or more voids **118**.

[0027] The mesh panel **130** has an inner surface **132**, an outer surface **134**, and a perimeter edge **136**. The mesh panel **130** may be made of a fabric material such as, for example, Spandex (e.g., LYCRA), nylon, polyester, cotton, or the like and/or a combination of these materials. The perimeter edge **136** of the mesh panel **130** may create a surface area having a width that is greater than the width of the surface area created by the perimeter edge **116** of the first pad layer **116**. The mesh panel **130** may be sewn to the garment fabric adjacent all perimeter edges **136** thus permanently enclosing the first pad layer **110** adjacent to the garment fabric. Alternatively, the mesh panel **130** may be sewn along all but one perimeter edge **136** forming a pocket matching the shape of the first pad layer **110**. The mesh panel **130** serves as a cover that extends beyond and forms a frame **138** along one or more perimeter edges **136** of the pad **110** for fixing the mesh panel **130** to the garment fabric, for example, by sewing.

[0028] The impact absorbing pad **100** may a multi-part component formed by a mesh panel **130** separated from a first pad layer **110** or may be an integral component formed by a mesh panel **130** joined to a first pad layer **110**. For example, a portion of the inner surface **132** of the mesh panel **130** may be fixed to a portion of the outer surface **114** of the first pad layer **110**. Examples of fixing the two parts together are sewing, gluing (e.g., adhesives), hot welding, or the like. Other methods of forming an integral pad component may be placing a portion of the oversized mesh panel **130** in the bottom of a mold form prior to injecting foam material for the first pad layer **110** thus forming the foam into, through, and around a portion of the mesh holes of the mesh panel **130**.

[0029] FIG. **2** illustrates a sectional view along cutline **2**-**2** of the pad **100** of FIG. **1**. The first pad layer **110** may be covered by the mesh panel **130**. The thickness t**1** may be within the range of approximately 8 mm to approximately 13 mm, such as about 10 mm, to provide sufficient protection for the wearer without adding cumbersome weight or

volume to the wearer's garment, for example. The voids **118** provide a pathway for moisture to escape and for flexibility in the pad **100**.

[0030] The first pad layer **110** and mesh panel **130** may have the same color or may have different colors from each other and/or the garment to be attached to. For example, a garment having a first color may have a mesh panel **130** with the same color and a first pad layer **110** with a second color so as to contrast below the mesh panel **130**.

[0031] FIG. **3** illustrates an example geometric pattern **300** of voids **302***a* . . . **302***n* (hereinafter **302** unless distinctly one or the other). The voids **302** may be formed by laser cutting, die cutting, extrusion, molding, or the like. Each void **302** has a thickness equal to the thickness of the pad layer in which it is formed and a width w. The width w may be in the range of approximately 2 mm to approximately 5 mm, such as about 3 mm. The pattern **300** may be such that the voids **302** are arranged in aligned columns. For example, as shown in FIG. **3**, a first column may have voids **302***a* and **302***b*; a second column may have voids **302***c*, **302***d*, and **302***e*; and a third column may have voids **302***f* and **302***n*. Each column may include more or fewer voids **302**, and any pad may have more or fewer columns. Each void **302** may have varying shapes or identical shapes. For example, each void **302** may have a pattern of shapes having three arms **304***a*, **304***b*, **304***c* (e.g., void arms, hereinafter **304** unless distinctly one or the other) each having a distal end **306***a*, **306***b*, **306***c* (hereinafter **306** unless distinctly one or the other) that extends from a central vertex point **308**. The three arms **304** may form a tri-arm shape (e.g., Y-shaped). The arms **304** of each void **302** may be equal in length d and may be angled 120 degrees apart. The intersection of the arms **304** of each void **302** occurs at its central vertex **308**.

[0032] FIG. **4** illustrates a spatial relationship between the voids **302** of FIG. **3**.

[0033] The distal ends **306** of each void **302** may be spaced equidistant d from the adjacent distal ends **306** of the closest adjacent void **302**. The equidistant spacing d is equal in length to the length d of the arms **304**. Referring by way of example to void **302***d* in FIG. **4**, the distal end **326***a* of void **302***d* is spaced d from distal end **306***c* of void **302***a*. Distal end **326***a* of void **302***d* also is spaced d from distal ends **316***b* and **316***c* of void **302***c*. This pattern continues for all closest adjacent distal ends **306** in the pattern.

[0034] The vertex **308** of each void **302** may be spaced equidistant d from the distal end **306** of the closest adjacent void **302**. The equidistant spacing d is also equal in length to the length d of the arms **304** and the equidistant spacing d between adjacent distal ends **306**. Referring by way of example to void **302***d* in FIG. **4**, the vertex **308***d* of void **302***d* is spaced d from the distal end **306***c* of void **302***a*. Vertex **308***d* of void **302***d* is also spaced d from the distal end **336***b* of void **302***f*, and from the distal end **346***a* of void **302***e*.

[0035] Likewise, the vertex **308** of each void **302** may be spaced equidistant d+d from the vertex **308** of each adjacent void **302**. The equidistant spacing d+d is equal in length to twice the length d of the arms **304**, twice the equidistant spacing d between adjacent distal ends **306**; and twice the equidistant spacing d between adjacent distal ends **306** and vertices **308**. Referring by way of example to void **302***d* in FIG. **4**, the vertex **308***d* of the void **302***d* is spaced d+d from the vertices of all adjacent voids **302***a*, **302***b*, **302***c*, **302***e*, **302***f* and **302***n*.

[0036] The distance d may be in the range of approximately 8 mm to approximately 12 mm, such as about 8 mm. All voids **302** may follow this repeating geometric pattern **300** to provide an impact absorbing pad having a flexible form capable of conforming to the wearer's body. The tri-arm shape of the voids **302** provide improved flexure in multiple directions such that a pad may flex in multiple directions more than a pad having no voids or a pad having other shaped voids.

[0037] FIG. **5** illustrates an expanded view of another example impact absorbing pad **500**. The impact absorbing pad **500**, as shown in FIG. **5**, may be a dual-layer device having a first inner layer of impact absorbing material (e.g. a first pad layer) **510**, a second outer layer of impact absorbing material (e.g. a second pad layer) **520**, and an oversized mesh panel **530** for covering the first and second pad layers **510**, **520** and for attaching to a fabric portion of a garment.

[0038] As shown in FIGS. **6**A and **6**B, the first pad layer **510** has an inner surface **512**, an outer surface **514**, a perimeter edge **516**, and a thickness t**2**. The first pad layer **510**, when in use, is placed adjacent the wearer's body (e.g., the inner pad layer). The first pad layer **510** may also be made of an elastomeric material as described above in the single-layer embodiment of FIG. **1**. For example, the first pad layer **510** may have a foam material having a first density. The first pad layer **510** may have a Shore durometer (e.g., hardness) value of about 35, about 30, about 25, about 20, or other values to prevent impacts from injuring the wearer. As described below, the first pad layer **510** may have one or more voids **518**.

[0039] The second pad layer **520** has an inner surface **522**, an outer surface **524**, a perimeter edge **526**, and a thickness t**3**. The second pad layer **520**, when in use, is placed on the outer region of the pad **500** (e.g., the outer pad layer). The second pad layer **520** may also be made of an elastomeric material as described above. For example, the second pad layer **520** may have a foam material having a second density different from the first density of the first pad layer **510** foam material (i.e., a pad **500** having a dual-density foam material). The second pad layer **520** may have a Shore durometer (e.g., hardness) value of about 45, about 40, about 35, or other values to further prevent impacts from injuring the wearer. The Shore durometer value of the second pad layer **520** may be the same as the Shore durometer value of the first pad **510**, or it may be different. For example, the Shore durometer value of the second pad layer **520** may be about two times (2×) greater, about one and three quarter times (1.75×) greater, about one and half times (1.5×) greater, or other multiples of times greater than the Shore durometer value of the first pad **510** so as to provide a more rigid outer layer (i.e., the second pad layer **520**) to provide more shock absorption and/or reduce deformation caused by objects that may impact the user and to provide a softer inner panel (i.e., the first pad layer **510**) for a more conforming deformation against the user's body. As described below, the second pad layer **520** may also have one or more voids **528**.

[0040] The mesh panel **530** has an inner surface **532**, an outer surface **534**, and a perimeter edge **536**. The mesh panel **530** may also be made of a fabric material as described above. The perimeter edge **536** of the mesh panel **530** may create a surface area greater than the surface area created by the perimeter edges **516**, **526** of the first pad layer **510** and second pad layer **520**. The mesh panel **530** may also be sewn

to the garment fabric as described above. The mesh panel **530** may also include a frame **538** along one or more perimeter edges **536** for fixing the mesh panel **530** to the garment fabric, for example, by sewing.

[0041] The impact absorbing pad **500** may be a multi-part component formed by a mesh panel **530** separated from a second pad layer **520** and a first pad layer **510** or may be an integral component formed by a mesh panel **530** joined to a second pad layer **520** which is likewise joined to a first pad layer **510** in a stacked layer design. For example, a portion of the inner surface **532** of the mesh panel **530** may be fixed to a portion of the outer surface **524** of the second pad layer **520** as described above. Likewise, a portion of the inner surface **522** of the second pad layer **520** may be fixed to a portion of the outer surface **514** of the first pad layer **510**. For example, an adhesive layer **540** may be applied between a portion of the inner surface **522** of the second pad layer **520** and a portion of the outer surface **514** of the first pad layer **510**.

[0042] The first pad layer **510**, second pad layer **520**, and mesh panel **530** may have the same color or may have different colors from each other and/or the garment to be attached to. For example, a garment having a first color may have a second pad layer **520** and mesh panel **530** with the same color and a first pad layer **510** with a second color so as to provide a color contrast. This variability would provide a selection of pads **500** having various colors to match the user's team colors.

[0043] Thus, FIG. **6**A illustrates a sectional view of a dual-layer pad **500**. The first pad layer **510** and second pad layer **520** may be covered by the mesh panel **530**. An adhesive layer **540** may fix the first pad layer **510** and second pad layer **520** together as described above. The thicknesses t**2** and t**3**, for example, may be equal and within the range of 4 mm to 7 mm, such as 5.5 mm, to provide sufficient rigidity to the outer pad layer (second pad layer **520**) and softness to the inner pad layer (first pad layer **510**). The voids **518**, **528** provide a pathway for moisture to escape and for flexibility in the pad **500**.

[0044] As shown in FIGS. **5**, **6**A, and **6**B, the voids of each pad layer may be positioned to have shapes that match, and they also may be positioned such that when the pad layers are positioned against each other, the corresponding voids of each pad layer will be positioned over each other and form a larger void that extends through both layers. The surface area of each void may be the same, or the voids of one pad layer (such as the outer pad layer) may have a greater surface area than the voids of the other pad layer.

[0045] FIG. **6**B illustrates a sectional view of an alternate dual-layer pad **500'** similar to FIG. **6**A. The relative thicknesses t**2** and t**3** of the first pad layer **510** and second pad layer **520** may be the same, as shown in FIG. **6**A or they may have varying thicknesses t**2** and t**3** as shown in FIG. **6**B. The thickness t**2** of the first pad layer **510**, for example, may be within the range of 5 mm to 9 mm, such as 8 mm, and the thickness t**3** of the second pad layer **520**, for example, may be within the range of 3 mm to 6 mm, such as 3 mm, to provide sufficient rigidity to the outer pad layer (second pad layer **520**) and softness to the inner pad layer (first pad layer **510**). For example, as shown in FIG. **6**B, the thickness t**2** of the first pad layer **510** may be greater than the thickness t**3** of the second pad layer **520**. The varying thicknesses t**2** and t**3** of the pad layers **510**, **520** may be tuned for different needs, such as a thicker outer layer (i.e., the second pad layer **520**) having a higher Shore durometer value (i.e., more rigid) for sports having impact objects with sharp edges, such as when a hockey puck hits a hockey player, compared to a thicker inner layer (i.e., the first pad layer **510**) having a lower Shore durometer value (i.e., softer) for sports having impact objects without sharp edges but large impact forces, such as when a football player is tackled by another football player or is tackled to the ground.

[0046] For a dual-layer pad, the voids of the first pad layer and the voids of the second pad layer may have the same shape, size, placement, and orientation so as to create equal voids through the pad layers. Alternatively, the voids may have varying shapes, sizes, placements, and/or orientations. FIGS. **7**A-**7**C illustrate a detailed view of a pad similar to the pad **500** of FIG. **6**A having variations of pad layers with voids. For example, as shown in FIG. **7**A, the voids **518** on the first pad layer **510** may have the same shape, placement, and orientation as the voids **528** on the second pad layer **520** but with a larger size to allow more moisture to be wicked away during strenuous activities. The larger size may result from the voids of the first layer having a larger surface area than the voids of the second layer, which could occur for example if the arms of the tri-arm-shaped voids in the first have a wider width than those of the second layer. Likewise, as shown in FIG. **7**B, the voids **518** on the first pad layer **510** may have the same shape, placement, and orientation as the voids **528** on the second pad layer **520** but with a smaller size to provide a decorative color contrast between the voids **518**, **528** and or descriptive design to the pads **500**. Alternatively for a dual-layer pad **500**, the voids **518**, **528** may be on only one of the pad layers **510**, **520** such that, as shown in FIG. **7**C, for example, a first pad layer **510** having no voids **518** provides a flush inner surface **512** while the second pad layer **520** includes voids **528** to provide more flexure of the pad **500**.

[0047] FIG. **8** illustrates a front and back view of a padded garment, for example, a shirt garment **800** employing one or more pads **100**. FIG. **9** illustrates a front and back view of an example pants garment **900** employing one or more pads **100**. Pads **100** may be symmetrical or asymmetrical. Pads **100** may have a variety of shapes, such as round, triangular, square, rectangular, pentagon, hexagon, or the like. Pads **100** may also have curved edges. Pads **100** may have voids in a plurality of columns or a single column arranged in a pattern as described above. Alternatively, for example, as shown in FIG. **9**, for protection of a wearer's tailbone, a pad **100** may have a single column of voids.

[0048] The features and functions described above, as well as alternatives, may be combined into many other different systems or applications. Various alternatives, modifications, variations or improvements may be made by those skilled in the art, each of which is also intended to be encompassed by the disclosed embodiments.

1. An impact absorbing pad comprising:

a first layer that:

has a body-facing surface, and an outer surface that is opposite the body-facing surface,

comprises a foam material, and

includes a plurality of voids that extend through the layer in a plurality of positions; and

a covering that:

covers the outer surface of the first layer, and

extends beyond and forms a frame around at least a portion of the outer surface of the first layer.

2. The impact absorbing pad of claim 1, wherein the voids comprise a pattern of shapes, each shape comprising three void arms having equal lengths and that extend from a central vertex point.

3. The impact absorbing pad of claim 1, wherein:
each void comprises a distal end, and
each distal end of each void is equidistant from the distal end of its closest adjacent void.

4. The impact absorbing pad of claim 1, wherein:
each void arm comprises a distal end, and
the distance between the vertex of each void arm is equidistant from the vertex of each adjacent void.

5. The impact absorbing pad of claim 1, wherein the covering is attached to the outer surface of the first layer.

6. The impact absorbing pad of claim 1, wherein the voids exhibit equal widths.

7. The impact absorbing pad of claim 1, further comprising a second layer that:
has a body-facing surface, and an outer surface that is opposite the body-facing surface;
comprises a foam material; and
includes a plurality of voids that extend through the layer in a plurality of positions, wherein:
the foam material of the first layer has a first density,
the second layer has a foam material having a second density, and
the first density is different than the second density.

8. The impact absorbing pad of claim 1, wherein the first layer exhibits a Shore durometer value that is from about 25 to about 50.

9. A garment comprising the impact absorbing pad of claim 1.

10. An impact absorbing pad comprising:
a first layer that:
has a body-facing surface, and an outer surface that is opposite the body-facing surface,
comprises a first foam of a first density, and
includes a plurality of voids that extend through the first layer in a plurality of positions;
a second layer that:
has a body-facing surface that is adjacent to the outer surface of the first layer,
has an outer surface that is opposite the body-facing surface of the second layer,
comprises a second foam of a second density that is different than the first density, and
includes a plurality of voids that extend through the second layer in a plurality of positions; and
a covering that:
covers the outer surface of the second layer, and
extends beyond and forms a frame around at least a portion of the outer surface of the second layer;
wherein:
the first foam has a Shore durometer value of about 20 to about 30, and
the second foam has a Shore durometer value of about 35 to about 45.

11. The impact absorbing pad of claim 10, wherein the voids of the first layer and the voids of the second layer comprise a pattern of shapes, each shape comprising three void arms that extend from a central vertex point.

12. The impact absorbing pad of claim 10, wherein:
each void comprises a distal end, and
each distal end of each void is equidistant from the distal end of its closest adjacent void in the layer in which the void is positioned.

13. The impact absorbing pad of claim 10, wherein:
each void comprises a vertex, and
the vertex of each void in each layer is equidistant from the vertex of each adjacent void in the layer in which the void is positioned.

14. The impact absorbing pad of claim 10, wherein the positions of voids of the first layer correspond to the positions of the voids of the second layer.

15. The impact absorbing pad of claim 14, wherein:
the voids of the first layer exhibit a first size, and
the voids of the second layer exhibit a second size that is larger than the first size so that portions of the outer surface of the first layer are visible through the voids of the second layer.

16. The impact absorbing pad of claim 14, wherein:
the voids of the first layer exhibit a first size, and
the voids of the second layer exhibit a second size that is smaller than the first size.

17. The impact absorbing pad of claim 10, wherein the outer surface of the first layer is attached to the body-facing surface of the second layer.

18. The impact absorbing pad of claim 17, further comprising an adhesive that attaches the outer surface of the first layer to the body-facing surface of the second layer.

19. A garment comprising the impact absorbing pad of claim 10.

20. (canceled)

21. (canceled)

22. (canceled)

23. The impact absorbing pad of claim 1, wherein the voids comprise voids formed by die cutting.

24. The impact absorbing pad of claim 10, wherein the voids comprise voids formed by die cutting.

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