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(54) **IMPACT DISSIPATING BALL**

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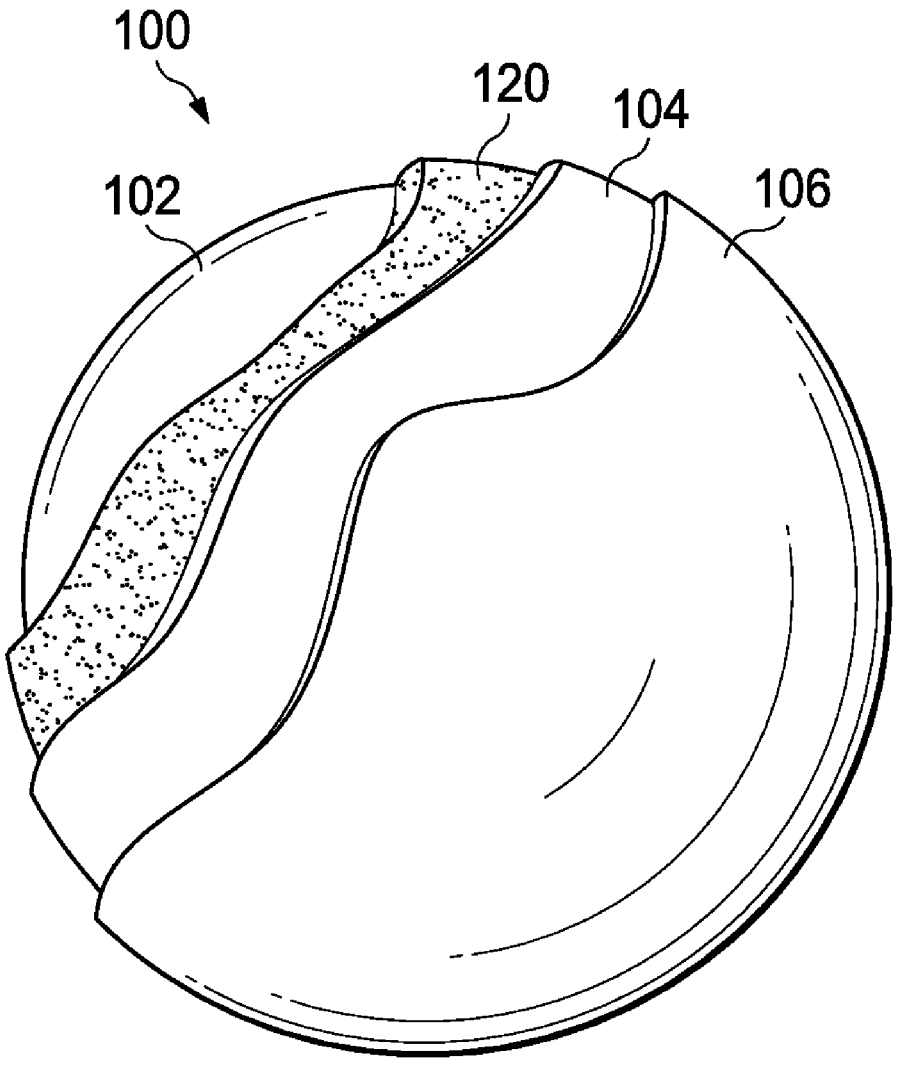
(52) **U.S. Cl.**

CPC ..... ***A63B 41/08*** (2013.01); ***A63B 41/02*** (2013.01)

(57) **ABSTRACT**

Impact dissipating balls are described. The impact dissipating balls, such as soccer balls, are constructed with one or more layers, sections, or portions of impact absorbing, impact dissipating materials, and/or impact dissipating structures/geometries. The particular type and/or arrangement or placement of padding can vary based on a variety of factors, such as style of impact dissipating ball, size of the impact dissipating ball, the manufacturing process of the impact dissipating ball, expected levels of impact, quality of the impact dissipating ball, and regulations with which the impact dissipating ball is intended to comply.



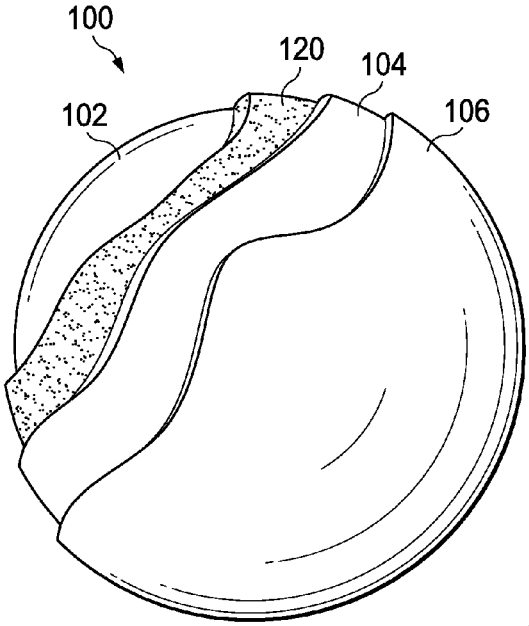



FIG. 1

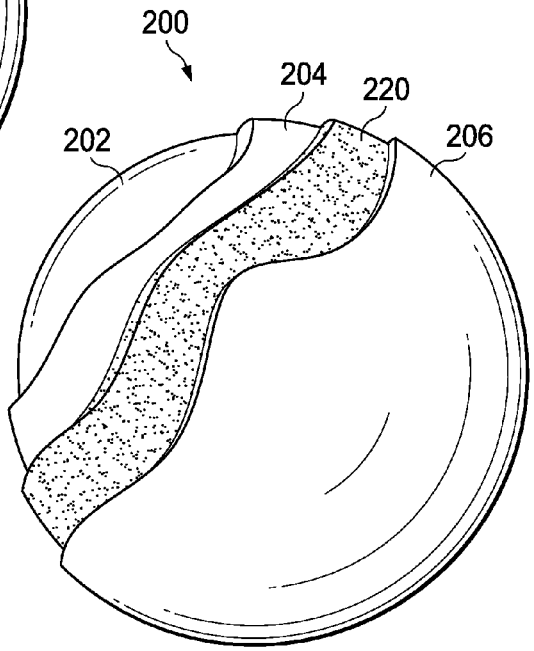



FIG. 2

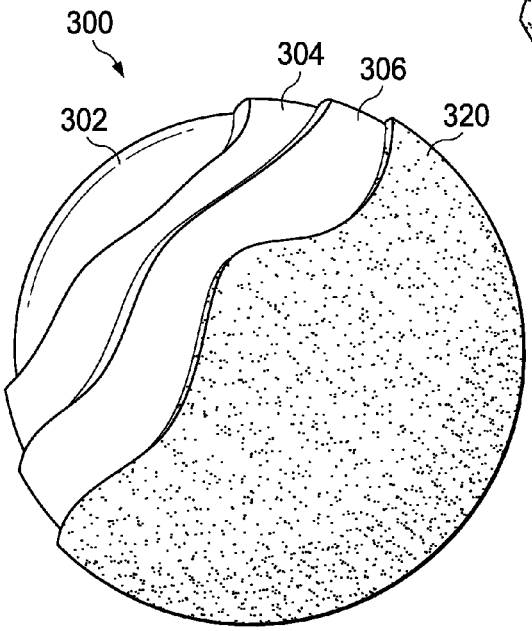



FIG. 3

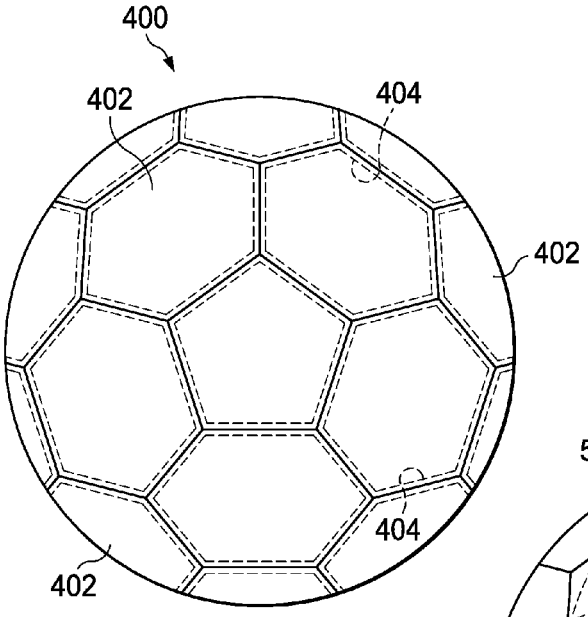



FIG. 4

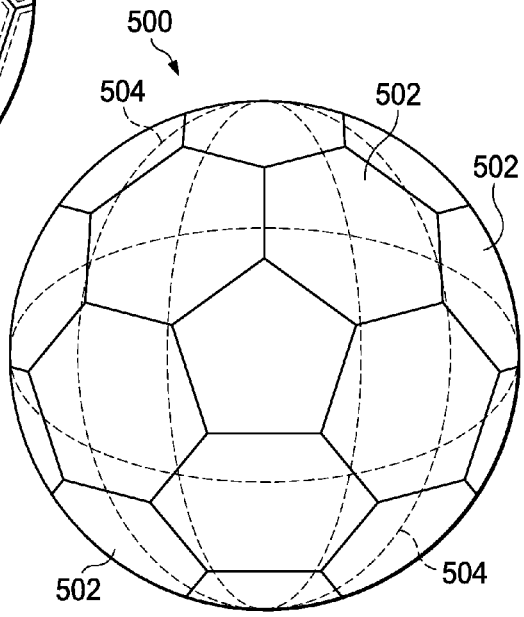



FIG. 5

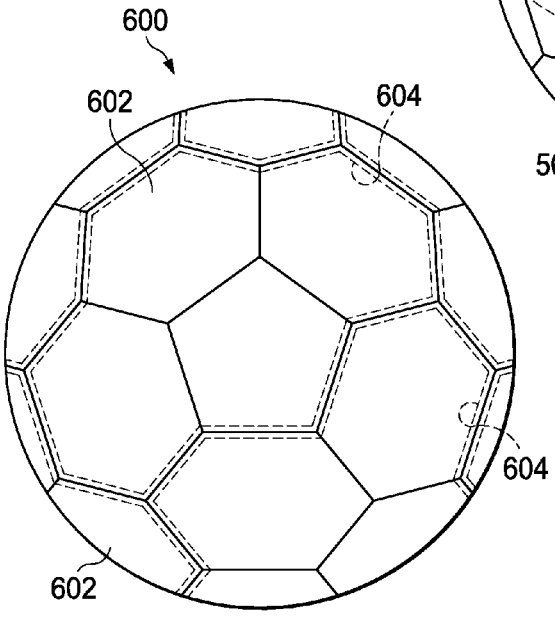



FIG. 6

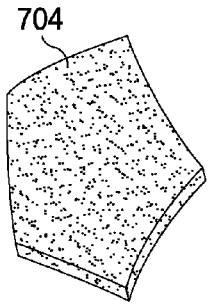



FIG. 7

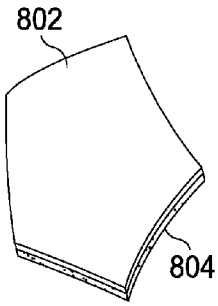



FIG. 8

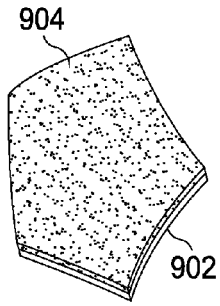



FIG. 9

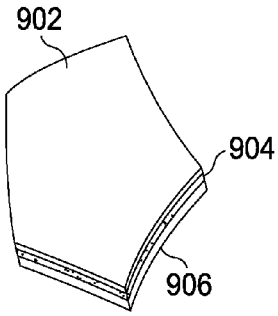



FIG. 10

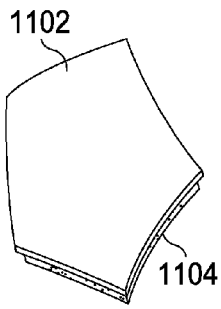



FIG. 11

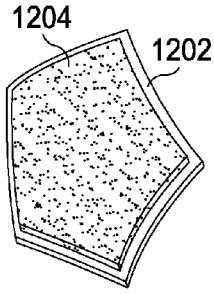



FIG. 12

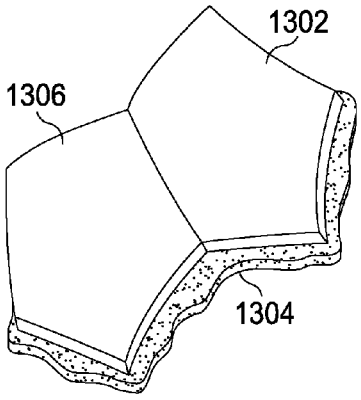



FIG. 13

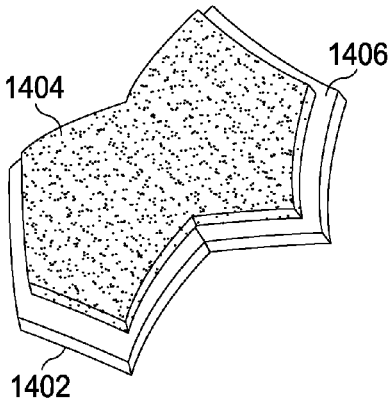



FIG. 14

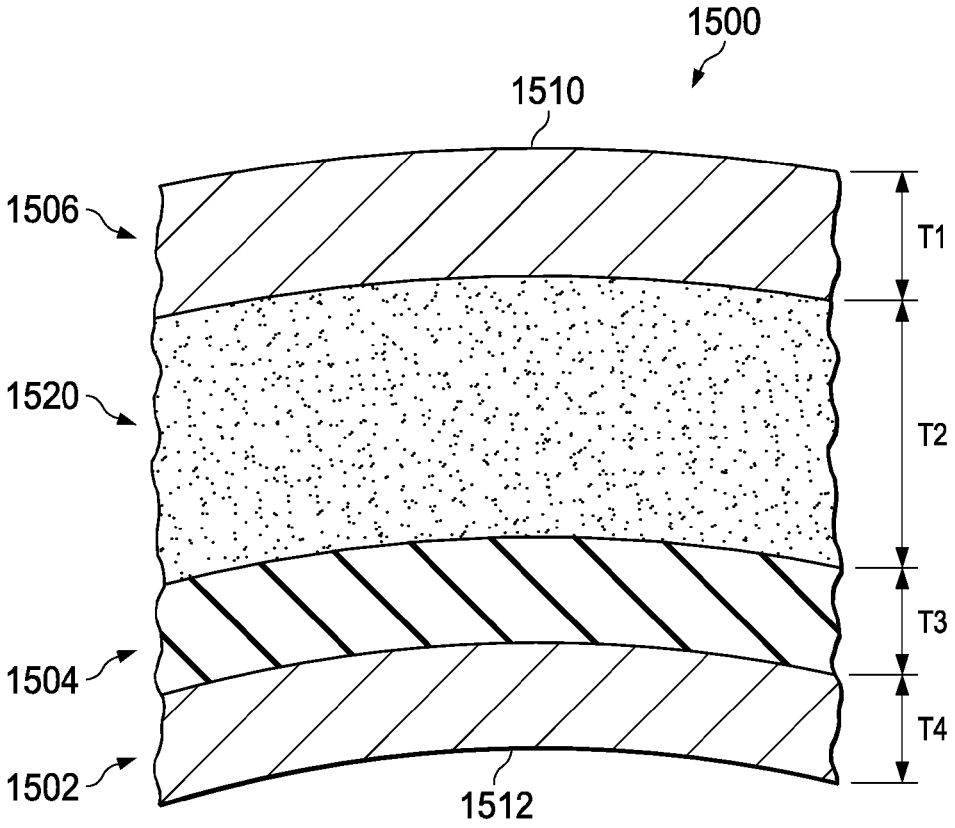



FIG. 15

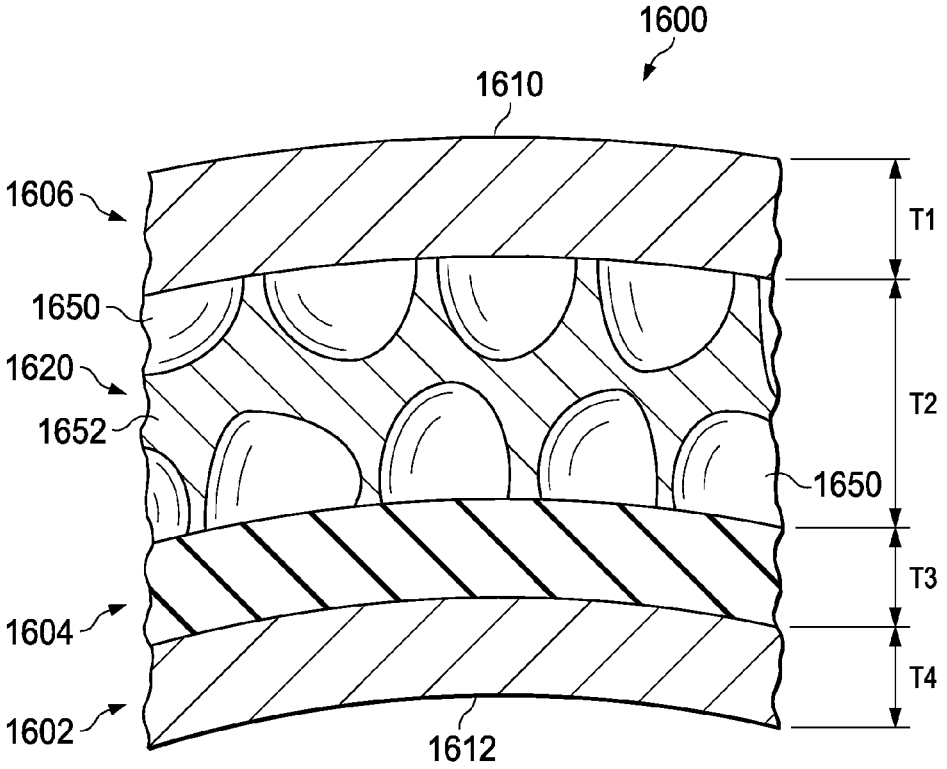



FIG. 16A

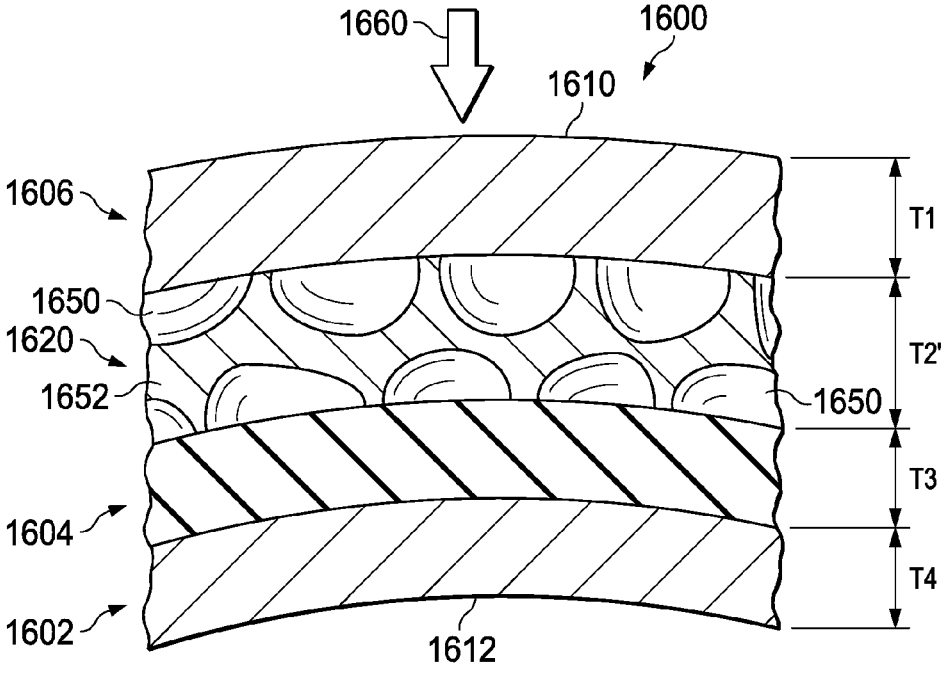



FIG. 16B

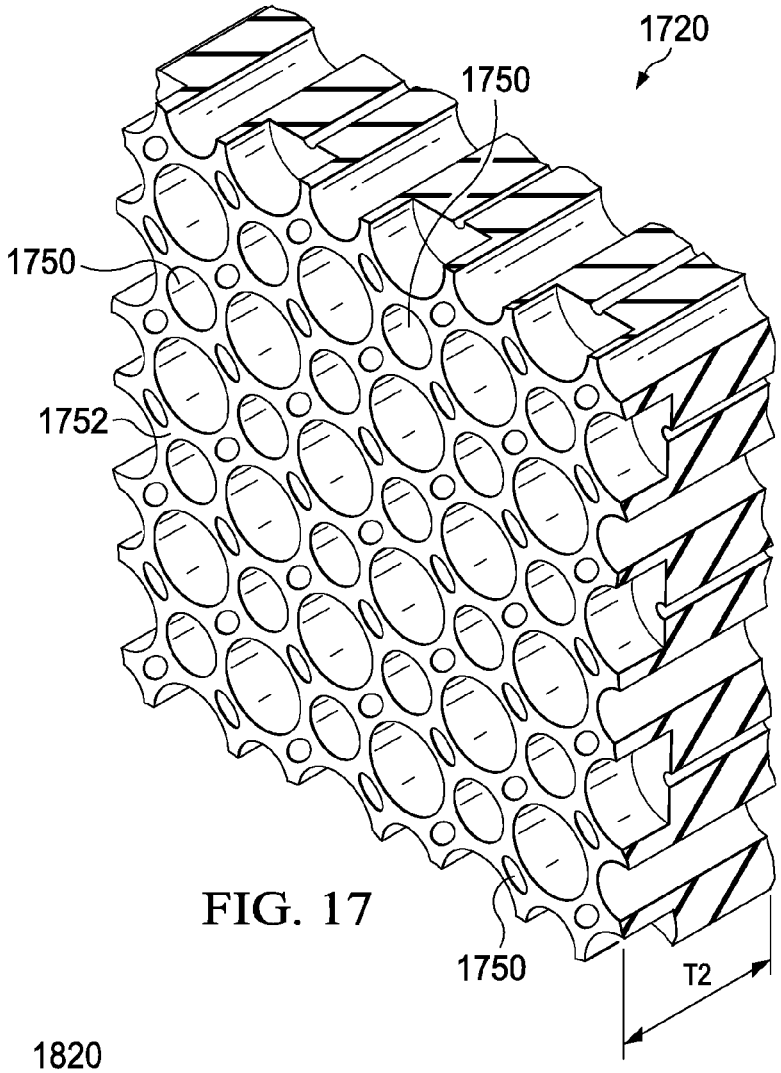



FIG. 17

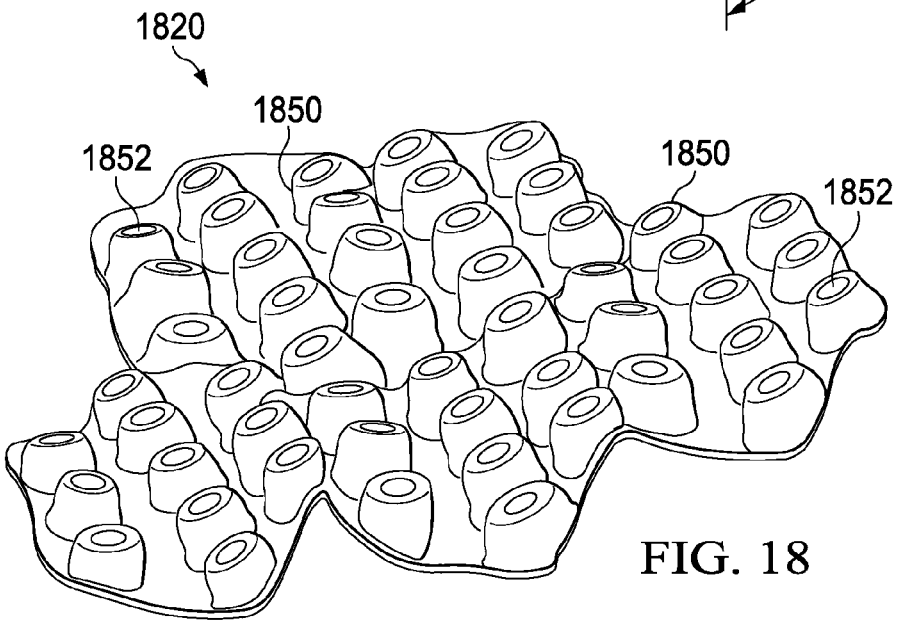



FIG. 18

# IMPACT DISSIPATING BALL

## CROSS-REFERENCE TO RELATED APPLICATION

**[0001]** This application claims priority to the disclosure of U.S. Provisional Patent Application Ser. No. 62/205,830, entitled "IMPACT DISSIPATING BALL," filed Aug. 17, 2015, the disclosure of which is herein by incorporated by reference in its entirety.

## BACKGROUND

**[0002]** Soccer is the world's most popular sport and the soccer ball is the most important piece of equipment used in the game. Although the color and designs on the outside of a soccer ball may be different, the shape, size, and weight of regulation balls are defined by international rules. During soccer games, a player can impact the ball with their head, either intentionally or inadvertently.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0003]** The present disclosure will be more readily understood from a detailed description of some example embodiments taken in conjunction with the following figures:

**[0004]** FIGS. **1-3** depict example partial cutaway views of soccer balls to show various internal layers thereof.

**[0005]** FIGS. **4-6** depict example soccer balls having internally positioned padding layers, which are shown in phantom for the purposes of illustration.

**[0006]** FIGS. **7-14** depict non-limiting example arrangements of cover panels and padding panels.

**[0007]** FIG. **15** depicts a cutaway view of an example soccer ball illustrating an example arrangement of layers.

**[0008]** FIG. **16**A depicts a cutaway view of another example soccer ball illustrating an example arrangement of layers.

**[0009]** FIG. **16**B depicts the soccer ball of FIG. **16**A during the application of an external force.

**[0010]** FIGS. **17-18** depict example padding layers having deformable voids.

## DETAILED DESCRIPTION

**[0011]** Various non-limiting embodiments of the present disclosure will now be described to provide an overall understanding of the principles of the structure, function, and use of impact dissipating balls disclosed herein. One or more examples of these non-limiting embodiments are illustrated in the accompanying drawings. Those of ordinary skill in the art will understand that the balls and methods specifically described herein and illustrated in the accompanying drawings are non-limiting embodiments. The features illustrated or described in connection with one non-limiting embodiment may be combined with the features of other non-limiting embodiments. Such modifications and variations are intended to be included within the scope of the present disclosure.

**[0012]** The presently disclosed embodiments are generally directed to impact dissipating balls, methods of using impact dissipating balls, and methods of manufacturing impact dissipating balls. More specifically, the presently disclosed embodiments are generally directed to soccer balls that can be constructed with one or more layers, sections, or portions of impact absorbing, impact dissipating materials, or impact dissipating structures/geometries, referred to generally herein as padding or a padding layer. The particular type and/or arrangement or placement of padding can vary based on a variety of factors, such as style of soccer ball, size of soccer ball, the manufacturing process of the soccer ball, expected levels of impact, quality of the soccer ball, regulations with which the ball is intended to comply, and so forth. As described in more detail below, in some embodiments, a soccer ball can be manufactured from multiple layers wrapped or otherwise formed around an airtight bladder or other type of core. In accordance with the present disclosure, padding can be disposed on the outer surface and/or in between various layers during the manufacturing process. This padding can generally serve to dissipate impact to a player when the player strikes the ball, such as using their head. The padding can also serve to dissipate impact when a player is inadvertently hit with the ball, such as in the face or other parts of the head.

**[0013]** In some embodiments, soccer balls incorporating padding satisfy appropriate regulations such as those promulgated by Fédération Internationale de Football Association (FIFA). As such, in some embodiments, soccer balls incorporating padding can be spherical, made of leather or other suitable material, of a circumference of not more than 70 cm and not less than 68 cm, not more than 450 g in weight and not less than 410 g at the start of the match, and a of a pressure equal to 0.6-1.1 atmosphere (600-1100 g/cm$^2$) at sea level. Soccer balls for youth games can have smaller dimensions and weights. As is to be appreciated, impact dissipating balls in accordance with the present disclosure can be utilized for other sporting endeavors, such as sports in which players typically impact the ball with their head. For such sports, such as futsal, the impact dissipating balls can be manufactured with padding while retaining relevant competition ball requirements. With regard to futsal balls incorporating padding during the manufacturing process, for example, the futsal ball can be spherical, made of leather or other suitable material, of a circumference of not less than 62 cm and not more than 64 cm, not less than 400 grams nor more than 440 grams in weight at the start of the match, and of a pressure equal to 0.4-0.6 atmosphere (400-600 g/cm$^2$) at sea level. To the extent that FIFA regulations may vary, or the ball will be used for sports having different requirements, impact dissipating balls can be manufactured in accordance with the present disclosure to comply with those regulations and/or requirements.

**[0014]** Reference throughout the specification to "various embodiments," "some embodiments," "one embodiment," "some example embodiments," "one example embodiment," or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. Thus, appearances of the phrases "in various embodiments," "in some embodiments," "in one embodiment," "some example embodiments," "one example embodiment, or "in an embodiment" in places throughout the specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner in one or more embodiments.

**[0015]** Referring now to FIGS. **1-3**, example partial cutaway views of simplified soccer balls **100**, **200**, and **300** are depicted showing various internal layers thereof. As is to be appreciated, soccer balls **100**, **200**, and **300** can schematically represent relatively inexpensive soccer balls, as may be

designed for recreational or some lower levels of competitive play. Soccer balls **100**, **200**, and **300** depicted in FIGS. **1-3** can also schematically represent high quality, relatively expensive soccer balls designed for high levels of competitive play. Highest quality soccer balls, for example, are typically hand stitched with a 5-ply twisted polyester cord, mid-priced balls are typically machine-stitched, and low end balls are typically glued together. Nevertheless, soccer balls manufactured in accordance with the present disclosure can incorporate one or more impact dissipating padding layers.

**[0016]** Referring first to FIG. **1**, a soccer ball **100** is shown having a core **102**. In some embodiments, the core **102** is an airtight bladder which is filled with air to appropriately pressurize the soccer ball **100** for gameplay. A padding layer **120** is in contact with the core **102** and either partially or entirely surrounds the core **102**. As schematically depicted by lining layer **104**, one or more layers of lining can be placed between the padding layer **120** and the cover **106**. The composition and number of lining layers **104** can vary. As compared to conventional balls, the number of layers **104** and/or the size of the core **102** can be reduced to accommodate the thickness of the padding layer **120**, as to maintain the total outer dimension of the soccer ball **100** at the desired size. In some embodiments, lining layer(s) **104** are polyester and/or cotton bonded (laminated) together to give the ball strength, structure and bounce. In some embodiments, the lining layer(s) **104** is a fiber-reinforced composite. Professional soccer balls or other higher end balls usually have four or more layers of lining. Promotional or practice balls may be constructed with less layers of lining.

**[0017]** The cover **106** can be made from, for example, synthetic leather made from PU (polyurethane) and PVC (poly vinyl chloride). As is to be appreciated, there are many variations of synthetic leather that can be used for cover **106**, such as AI-2000, Japanese Teijin Cordley, Microfiber, English Porvair, Korean Ducksung, Leather Art Pakistan Synthetic Leather, and PVC (poly vinyl chloride). The highest quality soccer balls used in competition and by professionals are typically produced by using AI-2000, Cordley, Ducksung, Mircofiber or other types of PU synthetic leather. Promotional soccer balls or practice balls are usually constructed with Polyvinyl Chloride(PVC) or rubber (molded or stitched) covers. For indoor soccer balls, the cover **106** can be made with a felt material similar to what is used on a tennis ball.

**[0018]** The cover **106** can comprise of a plurality of panels, the different segments that make up the outside covering of the ball, having similar or different shapes. The number of panels can vary for each design. A 32-panel ball is an example type of soccer ball, which is essentially a Buckminster Ball consisting of 20 hexagonal (six sided) and 12 pentagonal (five sided) surfaces. Panels of cover **106** can be stitched, glued, or thermally molded, such that when the soccer ball **100** is inflated, it is nearly a perfect sphere. Other traditional designs are 18 and 26-panel constructions, used in various professional leagues, including Major League Soccer, Scottish and English leagues. Some designs use less panels, such as 6 paneled soccer balls that are thermally bonded and do not utilized stitching.

**[0019]** While FIG. **1**, depicts the padding layer positioned between a liner layer **104** and the core **102**, other arrangements can be utilized, some examples of which are depicted in FIG. **2** and FIG. **3**. FIG. **2** depicts a soccer ball **200** having a cover **206**, lining layer **204** and an inner core **202**. These components can be similar, for example, to the similar components in FIG. **1**. In this embodiment, a padding layer **220** is positioned between the cover **206** and the lining layer **204**. In other configurations, multiple padding layers can utilized, such as a first padding layer positioned between the cover **206** and the lining layer **204** and a second padding layer (not shown) positioned between the lining layer **204** and the inner core **202**. In some embodiments, the padding layer **220** can serve as one or more of the lining layers **204**, thereby eliminating the need for the lining layer **204** or at least reducing the number of layers included in the lining layer **204**. FIG. **3** depicts a soccer ball **300** having similar components to the soccer balls **100**, **200** of FIGS. **1-2**. In this embodiment, however, the padding layer **320** is the outermost layer of the soccer ball **300**, such that the padding layer **320** will be directly impacted by players during gameplay. The padding layer **320** can be separate from the cover **306** or laminated therewith. In some configurations, the padding layer **320** is stitched, glued, or thermally bonded to the cover **306** (which may serve as a part of the lining layer). Additionally or alternatively, the soccer ball **300** can include the lining layer **304** and the padding layer **320** is applied directly to the lining layer **304**. As with other embodiments, the inner core **302** can be positioned at the center of the soccer ball **300**. The padding layer **320** can be comprised of multiple panels, as described above with regard to the cover **106**.

**[0020]** While FIGS. **1-3** schematically depict soccer balls for the purposes of illustration, it is to be appreciated other types of multi-layer sports balls can be manufactured using similar techniques to provide impact dissipating functionality. Such functionality may be desirable for sports using balls that are particularly hard (i.e., baseballs) and/or balls that travel at high rates of speed (i.e., Jai alai). All such impact dissipating sports balls are intended to be covered by the present disclosure.

**[0021]** The padding layer utilized by soccer balls in accordance with the present disclosure, such as padding layers **120**, **220**, and **320**, and described in more detail below, can be comprised of any suitable material that provides the desirable characteristics and response to impact. For example, the padding layer can comprise one or more of the following materials: thermoplastic polyurethane (available, for example, from Skydex Technologies), military-grade materials, impact absorbing silicone, D30® impact absorbing material, impact gel, wovens, non-wovens, cotton, elastomers, IMPAXX® energy-absorbing foam (available from Dow Automotive), DEFLEXION shock absorbing material (available from Dow Corning), styrofoam, polymer gels, general shock absorbing elastometers, visco-elastic polymers, PORON® XRD impact protection (available from Rogers Corporation), Sorbothane® (available from Sorbothane Inc.), Neoprene (available from DuPont), Ethyl Vinyl Acetate, impact-dispersing gels, foams, rubbers, and so forth. In some embodiments, the padding material can be auxetic, such as Armourgel S2® (available from Armourgel Limited). As such, the padding material can include geometries that structurally define a plurality of deformable voids between two layers of the soccer ball. During impact, the padding material (and the voids defined thereby) can deform proximate to the area of impact to dissipate the impact. The deformable voids can be visually concealed from an observer of the ball, such that the ball visually emulates a conventional soccer ball. In some embodiments, the padding material can also locally densify as the load rises.

**[0022]** The padding layer can be attached to one or more layers (such as the core **202**, the cover **206** and/or lining layer **204** of FIG. **2**, for example). In some embodiments, the padding layer **340** can be generally disconnected and "floating" between the layers. In some embodiments, the padding layer is coupled (i.e., glued, laminated, stitched, etc.) to one more components of the soccer ball. In some embodiments, padding layers in accordance with the present systems and methods can comprise a rate dependent material, such as a rate dependent low density foam material. Examples of suitable low density foams include polyester and polyether polyurethane foams. In some embodiments, such foams to have a density ranging from about 5 pounds per cubic foot (pcf) to about 35 pcf), more particularly from about 10 pcf to about 30 pcf, and more particularly still from about 15 pcf to about 25 pcf. PORON® and PORON XRD® are available from Rogers Corporation, which are open cell, microcellular polyurethane foams, is an example of one suitable rate dependent foam. However, in order to provide impact resistance, the padding layer can be any suitable energy absorbing or rate dependent materials. As such, other rate dependent foams or other types of materials can be used without departing from the scope of the present disclosure.

**[0023]** FIGS. **4-6** depict soccer balls having internally positioned padding layers, which are shown in phantom for the purposes of illustration. Referring first to FIG. **4**, soccer ball **400** comprises a plurality of cover panels **402** that are joined to collectively form the outer cover. While FIG. **4** depicts a soccer ball having hexagonal and pentagonal cover panels **402**, it is to be readily appreciated that the particular style of panels can vary without departing from the scope of the present disclosure. In this embodiment, the padding layer is comprised of a plurality of padding panels **404** that are generally shaped commensurately with the cover panels **402**. FIG. **5** depicts an example soccer ball **500** having a plurality of cover panels **502**. The padding panels **504** are generally triangularly shaped and attached together to form a sphere. FIG. **6** depicts an example soccer ball **600** having a plurality of cover panels **602**. In this embodiment, the various padding panels **604** collective form a sphere, with each padding panel **604** spanning a plurality of cover panels **602**.

**[0024]** Referring now to FIGS. **7-14**, various non-limiting example cover panel and padding panel arrangements are depicted. While the cover panels and/or padding panels are pentagonal in the illustrated embodiments, it is to be readily appreciated that a variety of different shaped cover panels and/or padding panels can be utilized without departing from the scope of the present disclosure. FIG. **7** depicts an embodiment in which a padding panel **704** serves as the cover panel. A plurality of padding panels **704** can be joined to form the outer surface of a soccer ball, such as the soccer ball **300** illustrated in FIG. **3**. FIG. **8** depicts a cover panel **802** that is coupled to a padding panel **804** that is substantially the same shape (i.e., coextensive). Such arrangement can be manufactured using a variety of suitable processes. For example, a sheet of the material for the cover panel can be joined to a sheet of padding material and then cut into the component as shown in FIG. **8**. Alternatively, the cover panel **802** can be formed separately from the padding panel **804** and then subsequently coupled using a suitable process, such as gluing, stitching, and so forth. In FIG. **8**, the cover panel **802** is positioned on the exterior of the padding panel **804**, such that the cover panel **802** forms the exterior surface of a soccer ball. FIG. **9** depicts a similar arrangement as FIG. **8**, with the padding panel layer **904** being coextensive with the cover panel layer **902**. In this embodiment, however, the padding panel **904** forms the exterior surface of a soccer ball. Referring now to FIG. **10**, a multi-layered arrangement is depicted. In this embodiment, a padding panel **904** is positioned between a first cover panel **902** and a second cover panel **906**. In some embodiments, the three layers are laminated to form a unitary panel that can be used to form the outer covering of a soccer ball.

**[0025]** While FIGS. **7-10** depict padding panels as being generally coextensive with cover panels, this disclosure is not so limited. Referring to FIG. **11**, for example, a padding panel **1104** is coupled to a cover panel **1102** and the overall dimension of the padding panel **1104** is less than the dimensions of the cover panel **1102**. An overhang is formed around the periphery of the cover panel **1102**, which can be utilized, for example, during the manufacturing process. In one embodiment, the overhang is utilized when attaching adjacent cover panels **1102** (i.e., to receive stitching and/or glue). FIG. **12** is similar to FIG. **11** in that an overhang is formed on the cover panel **1202** due to the smaller size of the padding panel **1204**. In this embodiment, however, the padding panel **1204** is positioned on the exterior side of the cover panel **1202**.

**[0026]** FIGS. **13-14** depict example arrangements in which a padding panel is coupled to multiple cover panels. Referring first to FIG. **13**, a first cover panel **1302** and an adjacent cover pane **1306** are both coupled to a surface of a padding layer **1304**. FIG. **14** depicts an embodiment in which the padding layer **1404** spans multiple cover panels, shown as cover panels **1402**, **1406**.

**[0027]** FIG. **15** depicts a cutaway view of an example soccer ball **1500** illustrating an example arrangement of layers. The soccer ball **1500** has a cover **1506**, a padding layer **1520**, a lining layer **1504**, and a core wall **1502**. The cover **1506** has an outer surface **1510** defining the outer surface of the soccer ball **1500** and the core wall **1502** has an inner surface **1512** that defines an airtight chamber. Outer surface **1510** can be textured to aid in the aerodynamics of the soccer ball to provide consistent performance. While FIG. **15** depicts the padding layer **1520** positioned between the cover **1506** and the lining layer **1504**, the padding layer **1520** can be positioned in a variety of different locations within the soccer ball **1500**. In some embodiments, the padding layer **1520** can be the core wall (when the core all forms a bladder) or can be the core itself (when the soccer ball has a solid core). Further, while one padding layer **1520** is illustrated, a plurality of padding layers can be utilized. Each separate padding layer can be manufactured from the same or different type of padding materials. For example, the padding layer positioned closer to the exterior of the soccer ball **1500** may be closed foam to reduce moisture absorption and retention.

**[0028]** As depicted in FIG. **15**, each layer can have a thickness, with the thickness of the core wall **1506** shown as T**1**, the thickness of the padding layer **1520** shown as T**2**, the thickness of the lining layer **1504** shown as T**3**, and the thickness of the core wall **1502** shown as T**4**. In some embodiments, the thickness T**1** is in the range of about 1 mm to about 10 mm, the thickness T**2** is in the range of about 1 mm to about 50 mm, the thickness T**3** is in the range of about 1 mm to about 10 mm, and the thickness T**4** is in the range of about 1 mm to about 10 mm. In some embodiments, the

thickness of the padding layer (or total thickness of a plurality of padding layers) comprises at least 10% of the overall thickness of the composite layers (e.g., T2/(T1+T2+T3+T4)*100). In some embodiments, the thickness of the padding layer (or total thickness of a plurality of padding layers) comprises at least 25% of the overall thickness of the composite layers. In some embodiments, the thickness of the padding layer (or total thickness of a plurality of padding layers) comprises at least 50% of the overall thickness of the composite layers. In some embodiments, the thickness of the padding layer (or total thickness of a plurality of padding layers) comprises at least 50% of the overall thickness of the composite layers. In some embodiments, the thickness of the padding layer (or total thickness of a plurality of padding layers) comprises at least 75% of the overall thickness of the composite layers. In some embodiments, the thickness of the padding layer comprises at least 90% of the overall thickness of the composite layers.

**[0029]** As mentioned above, in some embodiments, a padding layer of a soccer ball in accordance with the present disclosure can in include structures that define a plurality of deformable voids. FIGS. **16**A-**16**B depict a cutaway view of an example soccer ball **1600** illustrating an example arrangement of layers that includes a layer defining a plurality of deformable voids. The soccer ball **1600** has a cover **1606**, a padding layer **1620**, a lining layer **1604**, and a core wall **1602**. The cover **1606** has an outer surface **1610** defining the outer surface of the soccer ball **1600** and the core wall **1602** has an inner surface **1612** that defines a pressurizable airtight chamber. The outer surface **1610** can be textured to aid in the aerodynamics of the soccer ball to provide consistent performance. While FIG. **16** depicts the padding layer **1620** positioned between the cover **1606** and the lining layer **1604**, the padding layer **1620** can be positioned in a variety of different locations within the soccer ball **1600**. In some embodiments, the padding layer **1620** can be the core wall (when the core all forms a bladder) or can be the core itself (when the soccer ball has a solid core). Further, while one padding layer **1620** is illustrated, a plurality of padding layers can be utilized. Each separate padding layer can be manufactured from the same or different type of padding materials. For example, the padding layer positioned closer to the exterior of the soccer ball **1600** may be closed foam to reduce moisture absorption and retention and the inwardly positioned padding layers can include the structures defining the deformable voids.

**[0030]** The padding layer **1620** is shown to include a webbing **1652** that defines a plurality of deformable voids **1650**. In this embodiment, the deformable voids **1650** are positioned between the cover **1606** and the lining layer **1604**, but this disclosure is not so limited. In some embodiments, the webbing **1652** may define more than 1 deformable voids per square inch. In some embodiments, the webbing **1652** may define more than 4 deformable voids per square inch. In some embodiments, the webbing **1652** may define more than 8 deformable voids per square inch. In some embodiments, the webbing **1652** may define more than 15 deformable voids per square inch. Further, while the deformable voids **1650** are shown as being generally hemispherically shaped, any suitable shape can be used without departing from the scope of the current disclosure. For instance, in some embodiments, the deformable voids **1650** are spherical and positioned completely internal to the padding layer **1620**. In some embodiments, the deformable voids **1650** are cylindrical/tubular and extend either partially or completely through the padding layer **1620**. As is to be appreciated, a wide variety of deformable void shapes can be utilized. In any event, the webbing **1652** can provide sufficient structural rigidity to maintain the shape of the deformable voids **1650** while in a relaxed state (shown in FIG. **16**A) and allow deformation of the deformable voids **1650** while an external force is applied to the outer surface **1610** of the soccer ball **1600**.

**[0031]** As depicted in FIG. **16**A, and similar to FIG. **15**, each layer can have a thickness, with the thickness of the core wall **1606** shown as T**1**, the thickness of the padding layer **1620** shown as T**2**, the thickness of the lining layer **1604** shown as T**3**, and the thickness of the core wall **1602** shown as T**4**. In some embodiments, the thickness T**1** is in the range of about 1 mm to about 10 mm, the thickness T**2** is in the range of about 1 mm to about 50 mm, the thickness T**3** is in the range of about 1 mm to about 10 mm, and the thickness T**4** is in the range of about 1 mm to about 10 mm. In some embodiments, the thickness of the padding layer (or total thickness of a plurality of padding layers) comprises at least 10% of the overall thickness of the composite layers. In some embodiments, the thickness of the padding layer (or total thickness of a plurality of padding layers) comprises at least 25% of the overall thickness of the composite layers. In some embodiments, the thickness of the padding layer (or total thickness of a plurality of padding layers) comprises at least 50% of the overall thickness of the composite layers. In some embodiments, the thickness of the padding layer (or total thickness of a plurality of padding layers) comprises at least 50% of the overall thickness of the composite layers. In some embodiments, the thickness of the padding layer (or total thickness of a plurality of padding layers) comprises at least 75% of the overall thickness of the composite layers. In some embodiments, the thickness of the padding layer comprises at least 90% of the overall thickness of the composite layers.

**[0032]** FIG. **16**B depicts the soccer ball **1600** with a force being applied to the outer surface **1610**, as indicated by arrow **1660**. Such force can be from a player's head, for instance. The thickness of some of the layers of the soccer ball **1660** do not change, or do not substantially change, under the application force. The thickness of the padding layer **1620**, however, reduces to a thickness of T**2'** at the area of the soccer ball **1600** proximate to the application of force **1660**. The thickness of the padding payer **1620** can be changed from T**2** (FIG. **16**A) to T**2'** (FIG. **16**B) through the deformation of the deformable voids **1650** as the webbing **1652** contorts based on the force. In some embodiments, the thickness T**2'** proximate to the area of the soccer ball **1600** to which the force is applied can be less than about 80% of the thickness of T**2**. In some embodiments, the thickness T**2'** proximate to the area of the soccer ball **1600** to which the force is applied can be less than about 60% of the thickness of T**2**. In some embodiments, the thickness T**2'** proximate to the area of the soccer ball **1600** to which the force is applied can be less than about 40% of the thickness of T**2**. In some embodiments, the thickness T**2'** proximate to the area of the soccer ball **1600** to which the force is applied can be less than about 25% of the thickness of T**2**. The thickness of T**2'** can also depend on the level of force applied to the outer surface **1610**. Upon the removal of the force **1660**, the shape of the deformable voids **1650** can return to the shape illustrated in FIG. **16**A.

**[0033]** While the padding layer **1620** depicts one example arrangement of deformable voids **1650** defined by the webbing **1620**, a variety of different types of padding layers can be utilized, some non-limiting examples of which are depicted in FIGS. **17-18**. Referring first to FIG. **17**, a padding layer **1720**, shown in a planar form for clarity, depicts one example type of padding layer that can be incorporated in a soccer ball, or other type of ball. The padding layer **1720** has a webbing **1752** that structurally defines a plurality of deformable voids **1750**. As shown, the deformable voids **1750** vary in size, shape, and depth. The thickness T2 of the padding layer **1720** can be in the range of about 1 mm to about 50 mm. Referring now to FIG. **18**, a padding layer **1820**, which is also shown in a planar form for clarity, depicts another example type of padding layer that can be incorporated in a soccer ball, or other type of sports ball. The padding layer **1820** has a webbing **1852** that structurally defines a plurality of deformable voids **1850**. As shown, the deformable voids **1850** are generally uniform in shape, having a tubular structure. Similar to the embodiments described above, the padding layers **1720** and **1820** can each comprise a plurality of padding panels.

**[0034]** In various embodiments disclosed herein, a single component may be replaced by multiple components and multiple components may be replaced by a single component to perform a given function or functions. Except where such substitution would not be operative, such substitution is within the intended scope of the embodiments. While various embodiments have been described herein, it should be apparent that various modifications, alterations, and adaptations to those embodiments may occur to persons skilled in the art with attainment of at least some of the advantages. The disclosed embodiments are therefore intended to include all such modifications, alterations, and adaptations without departing from the scope of the embodiments as set forth herein.

What is claimed is:

**1**. A soccer ball, comprising:
- a pressurizable airtight bladder;
- a lining layer surrounding the pressurizable airtight bladder;
- a padding layer surrounding the pressurizable airtight bladder, wherein the padding layer comprises a low density foam having a density within the range of about 5 pounds per cubic foot to about 35 pounds per cubic foot; and
- a cover surrounding the padding layer, wherein the cover comprises a plurality of cover panels.

**2**. The soccer ball of claim **1**, wherein the low density foam has a density within the range of about 10 pounds per cubic foot to about 30 pounds per cubic foot.

**3**. The soccer ball of claim **2**, wherein the low density foam has a density within the range of about 15 pounds per cubic foot to about 25 pounds per cubic foot.

**4**. The soccer ball of claim **1**, wherein the padding layer is immediately adjacent to the cover.

**5**. The soccer ball of claim **4**, wherein at least a portion of the padding layer is coupled to the adjacent to the cover.

**6**. The soccer ball of claim **1**, wherein the padding layer is immediately adjacent to the pressurizable airtight bladder.

**7**. The soccer ball of claim **6**, wherein at least a portion of the padding layer is coupled to the adjacent to the pressurizable airtight bladder.

**8**. The soccer ball of claim **1**, wherein the padding layer comprises a plurality of padding panels.

**9**. The soccer ball of claim **8**, wherein each of the plurality of padding panels is generally aligned with a corresponding cover panel of the cover.

**10**. The soccer ball of claim **8**, wherein the total number of padding panels is less than the total number of cover panels.

**11**. The soccer ball of claim **8**, wherein the total number of padding panels is equal to the total number of cover panels.

**12**. The soccer ball of claim **8**, wherein the total number of padding panels is greater than to the total number of cover panels.

**13**. The soccer ball of claim **1**, wherein the padding layer defines a plurality of deformable voids.

**14**. A soccer ball, comprising:
- a pressurizable airtight bladder;
- a lining layer surrounding the pressurizable airtight bladder;
- a padding layer surrounding the pressurizable airtight bladder, wherein the padding layer defines a plurality of deformable voids; and
- a cover surrounding the padding layer, wherein the cover comprises a plurality of cover panels.

**15**. The soccer ball of claim **14**, wherein the padding layer is immediately adjacent to the cover.

**16**. The soccer ball of claim **15**, wherein at least a portion of the padding layer is coupled to the adjacent to the cover.

**17**. The soccer ball of claim **14**, wherein the padding layer is immediately adjacent to the pressurizable airtight bladder.

**18**. The soccer ball of claim **17**, wherein at least a portion of the padding layer is coupled to the adjacent to the pressurizable airtight bladder.

**19**. The soccer ball of claim **14**, wherein at least some of the plurality of deformable voids are hemispherically-shaped.

**20**. The soccer ball of claim **14**, wherein at least some of the plurality of deformable voids are tubular-shaped.

**21**. The soccer ball of claim **14**, wherein the padding layer is visually concealed by the cover.

**22**. A soccer ball, comprising:
- a pressurizable airtight bladder;
- a lining layer surrounding the pressurizable airtight bladder;
- a padding layer surrounding the pressurizable airtight bladder, wherein the padding layer comprises a plurality of padding panels; and
- a cover surrounding the pressurizable airtight bladder, wherein the cover comprises a plurality of cover panels.

**23**. The soccer ball of claim **22**, wherein the total number of padding panels is less than the total number of cover panels.

**24**. The soccer ball of claim **22**, wherein the total number of padding panels is equal to the total number of cover panels.

**25**. The soccer ball of claim **22**, wherein the total number of padding panels is greater than the total number of cover panels.

**26**. The soccer ball of claim **22**, wherein each of the plurality of padding panels is coupled to a respective one of the plurality of cover panels.

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