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(54) **PROTECTIVE PADDING ASSEMBLY FOR A SPORTS APPAREL ARTICLE**

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(71) Applicant: **Wilson Sporting Goods Co.**, Chicago, IL (US)

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(72) Inventors: **Allen G. Wagner**, Chicago, IL (US);
Rey C. Corpuz, Hinsdale, IL (US);
Bradley L. Gaff, Woodridge, IL (US);
Shaun P. Gilday, Chicago, IL (US);
Damon Clegg, Hood River, OR (US);
Don Reardon, Portland, OR (US); **Chris Hill**, Portland, OR (US)

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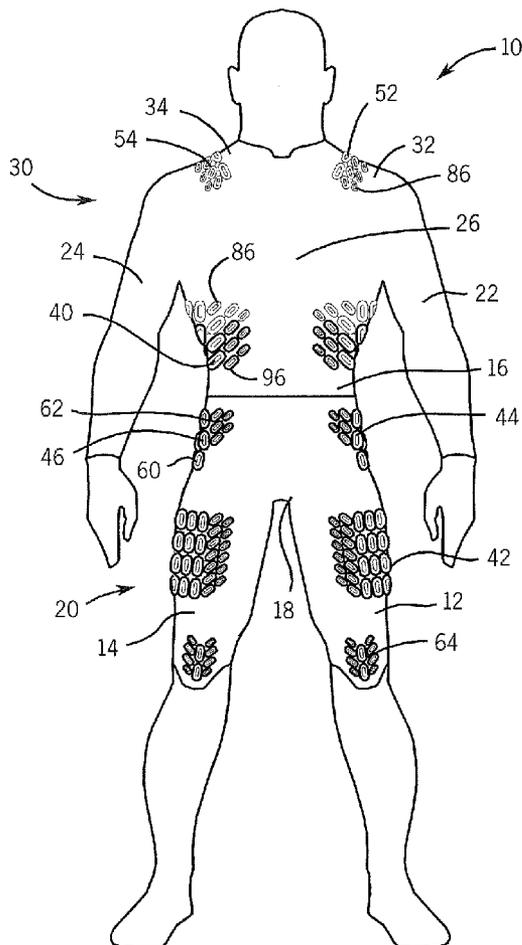
(73) Assignee: **Wilson Sporting Goods Co.**, Chicago, IL (US)

(57) **ABSTRACT**

A protective sports garment comprising including an article of clothing and at least a first pad assembly having an inner surface and an outer surface defining a pad area. The pad assembly includes a plurality of spaced apart cells coupled together by a plurality of linking members, and first and second regions. Each of the first and second regions extends over at least 25 percent of the pad area. The first region is formed of a first inner layer and a first outer layer, and the second region is formed of the first inner layer and does not include the first outer layer. The first inner and outer layers are formed of first and second materials having first and second durometer values measured on a hardness scale, respectively. The second durometer value is greater than the first durometer value. The inner surface of the pad assembly engages the article.

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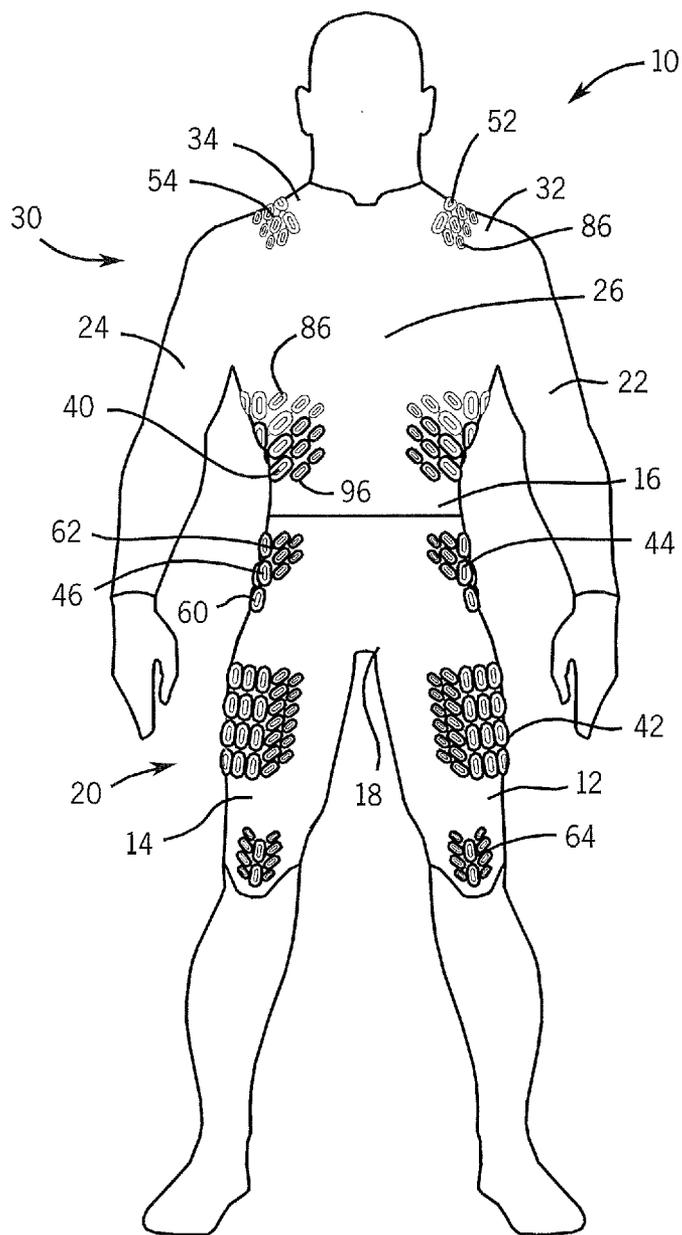


FIG. 1

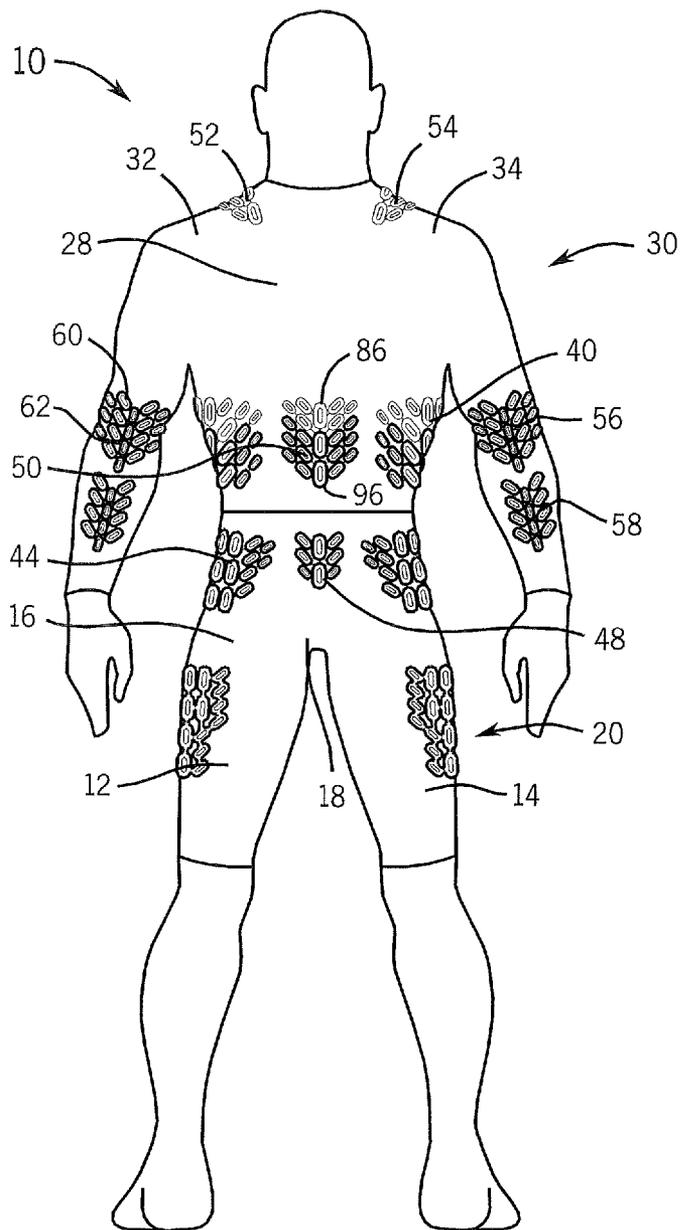


FIG. 2

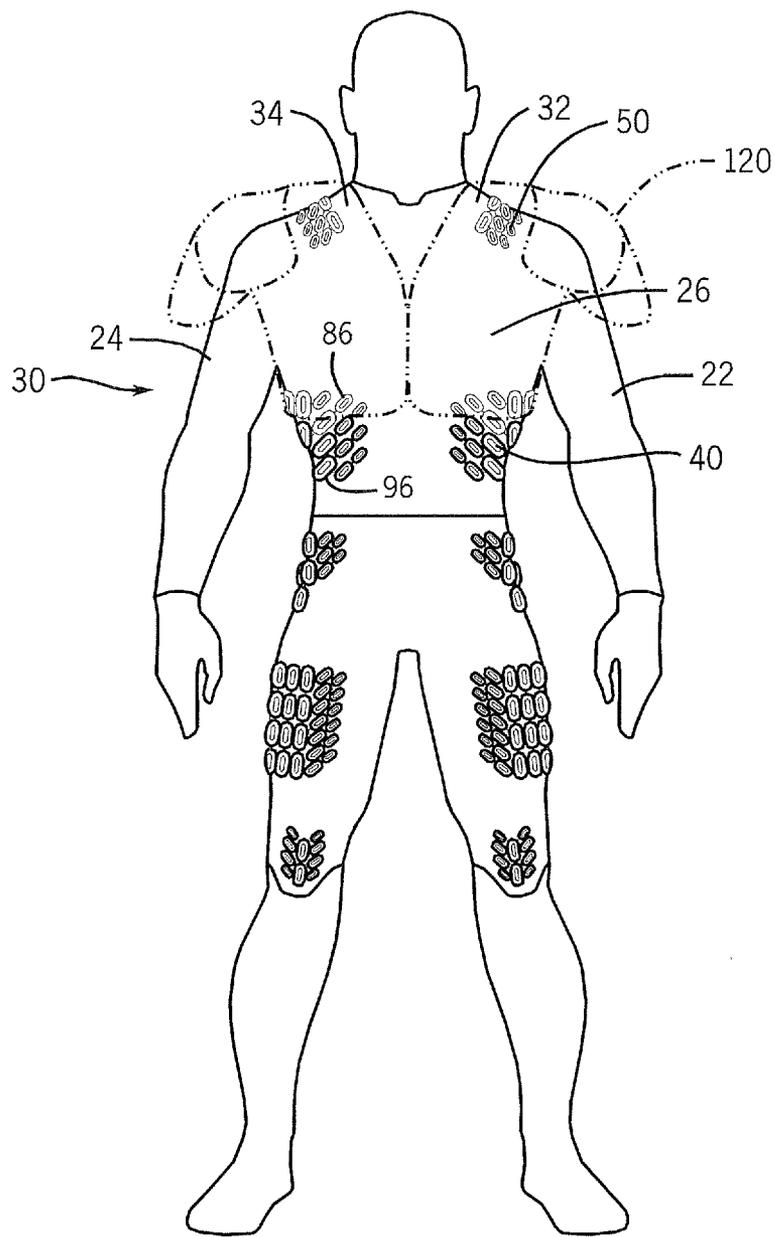


FIG. 3

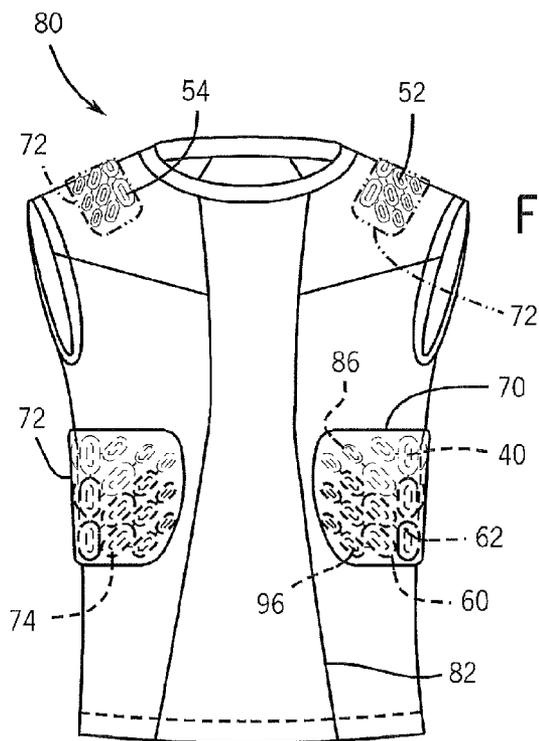


FIG. 5a

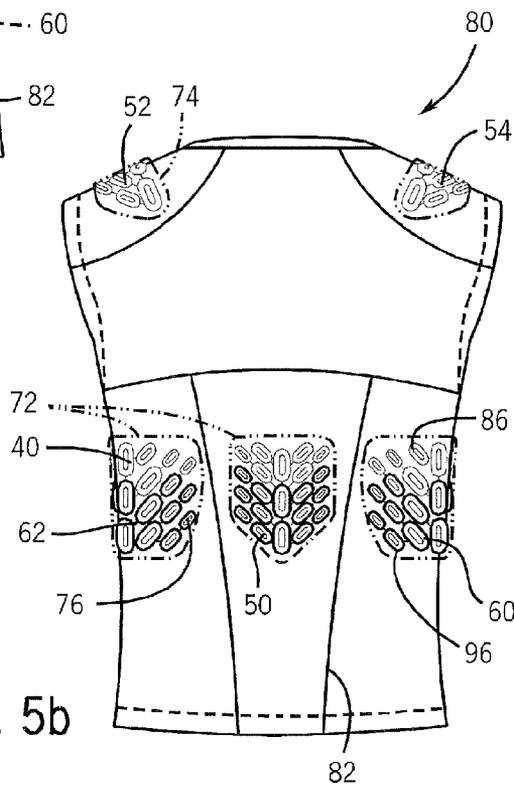


FIG. 5b

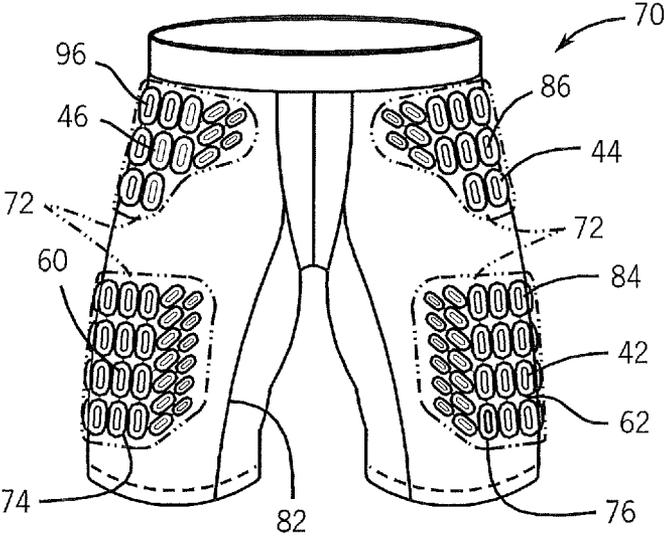


FIG. 4a

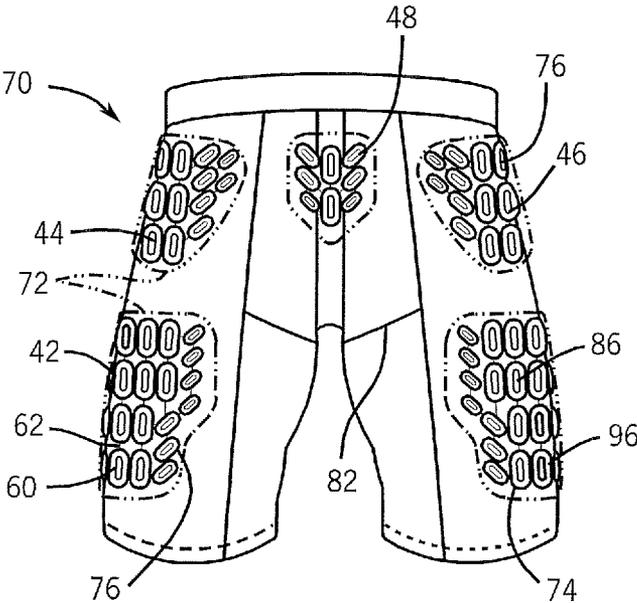


FIG. 4b

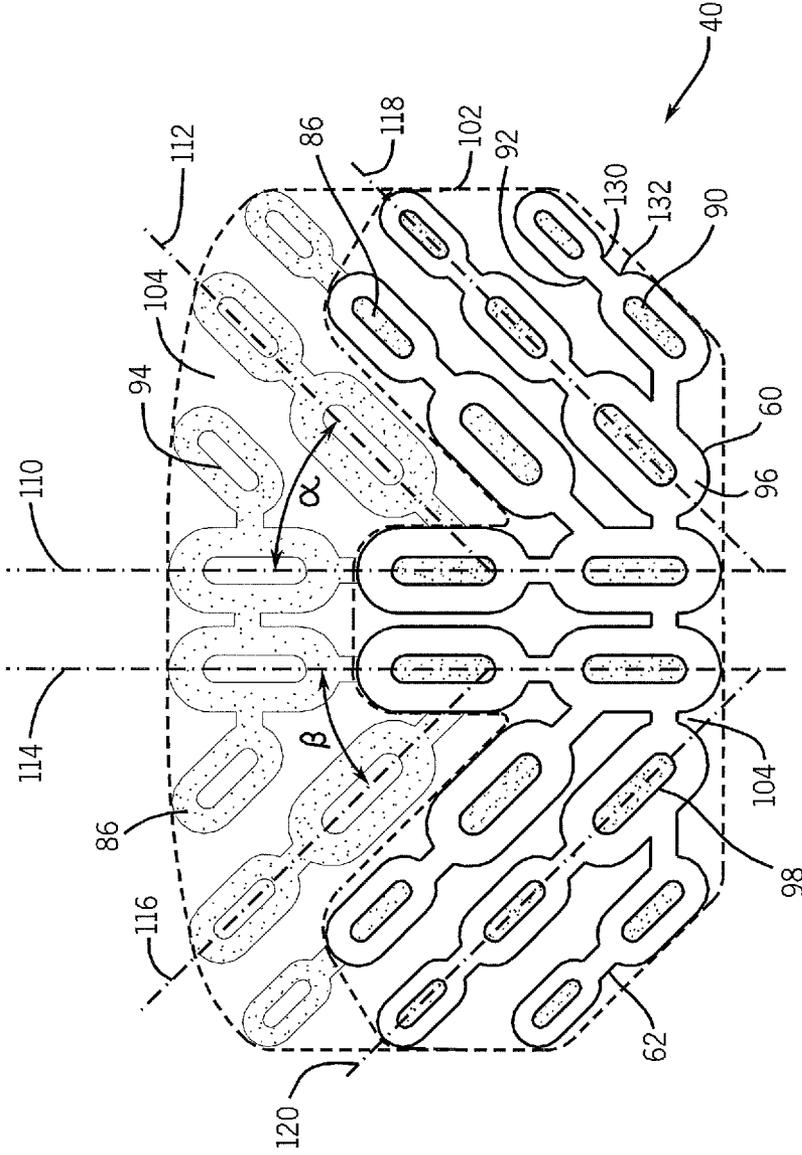


FIG. 6

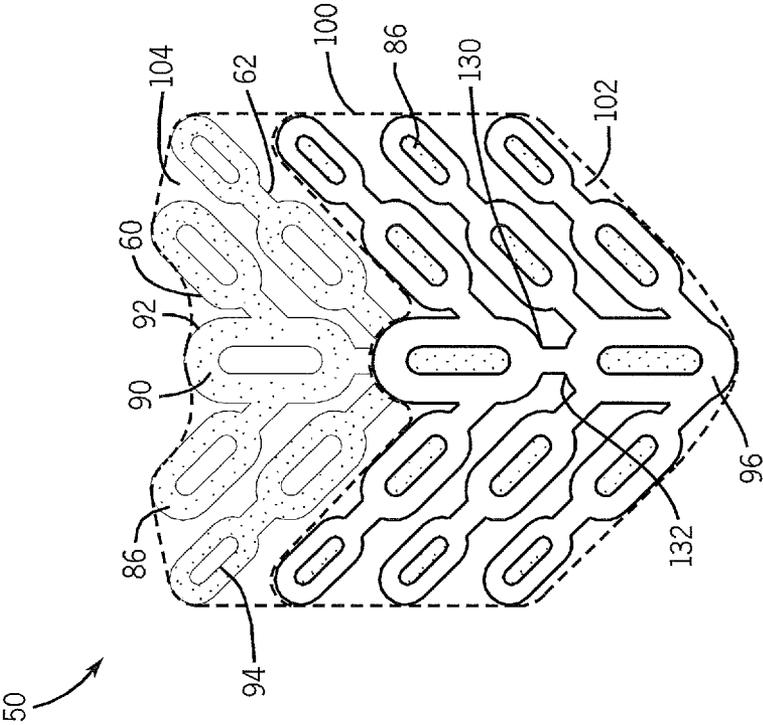


FIG. 7

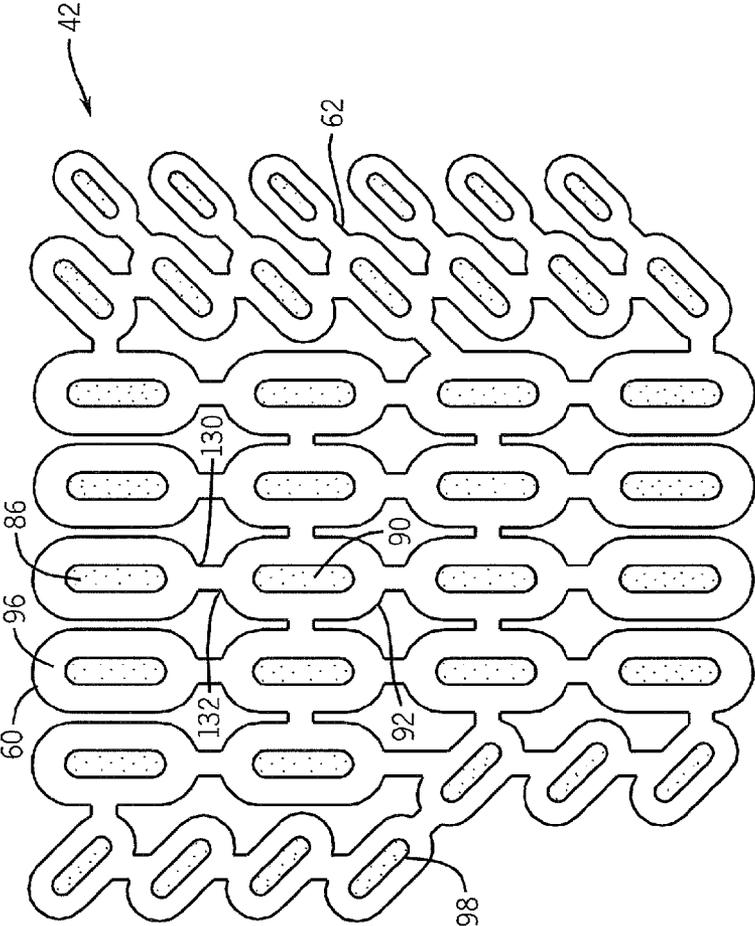


FIG. 8

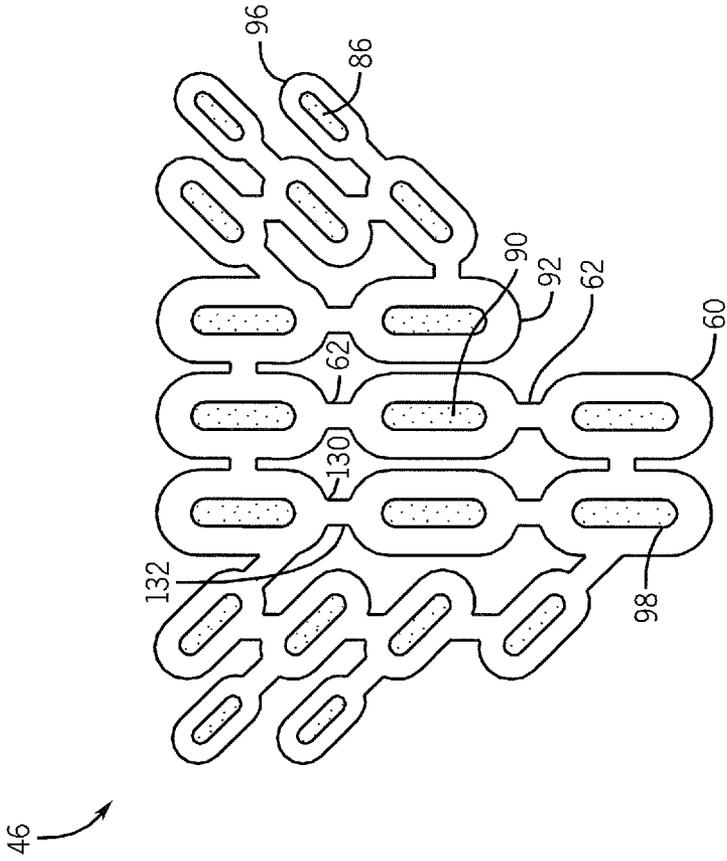


FIG. 9

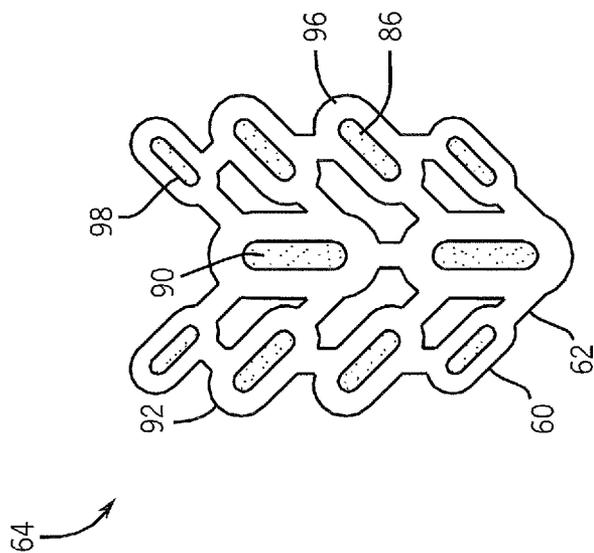


FIG. 10

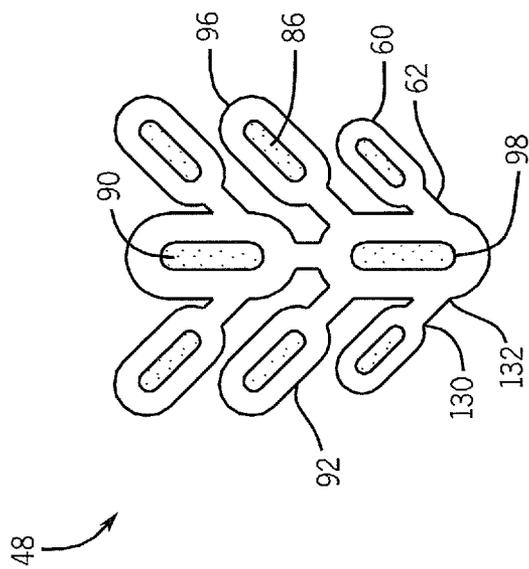


FIG. 11

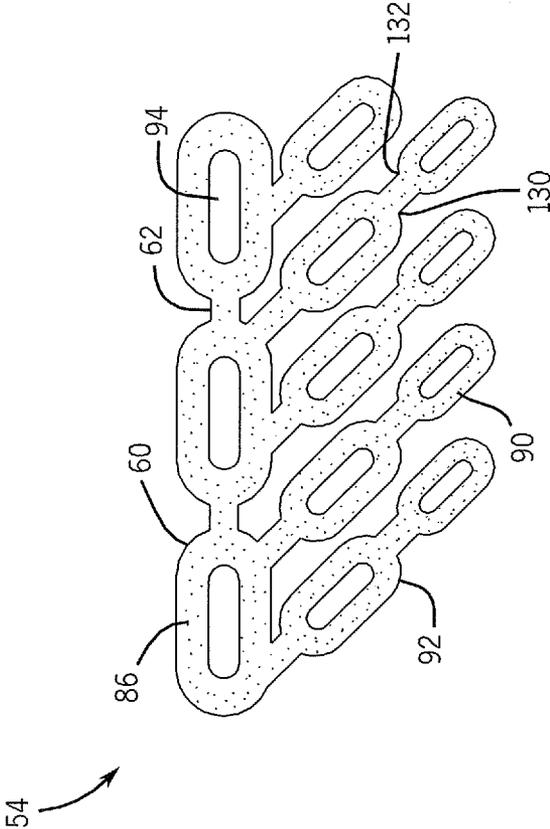


FIG. 12

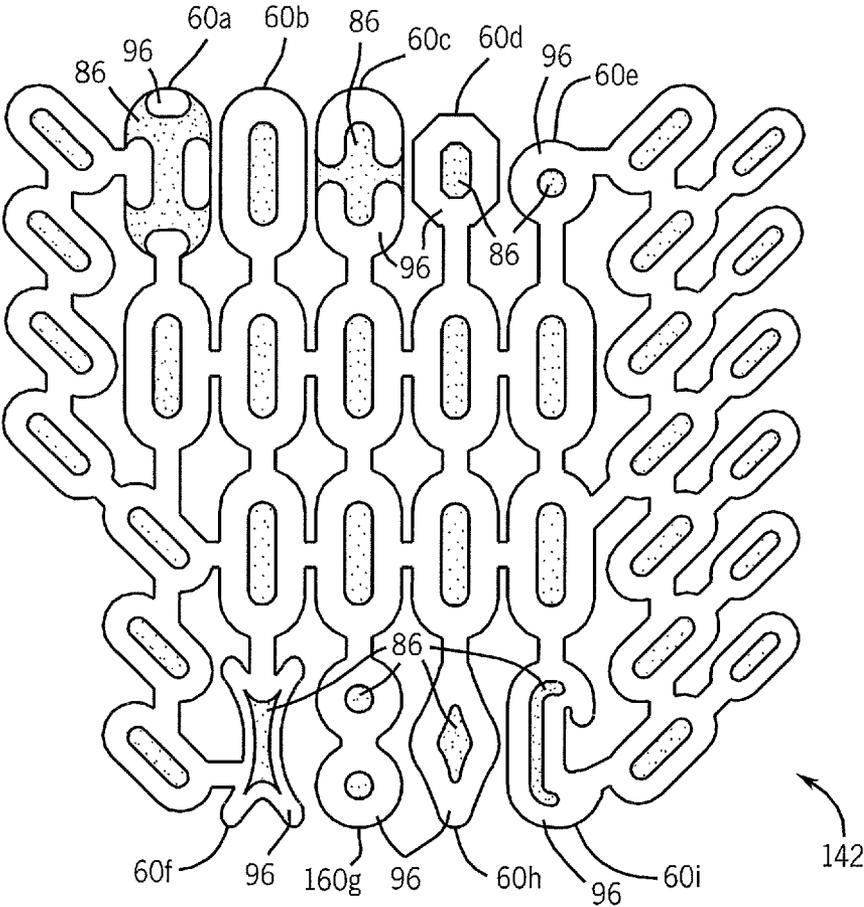
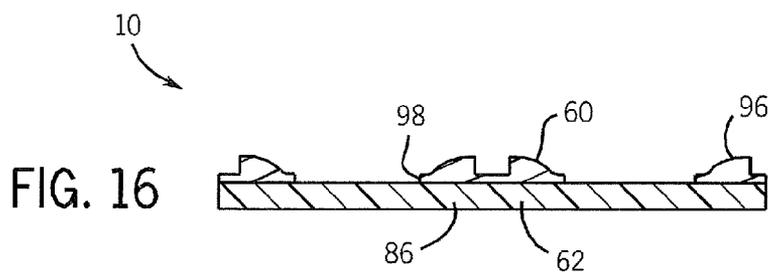
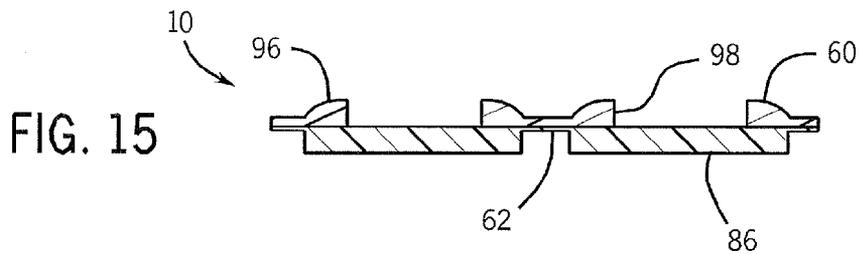
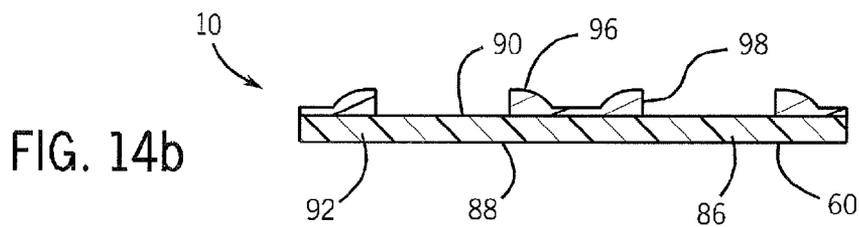
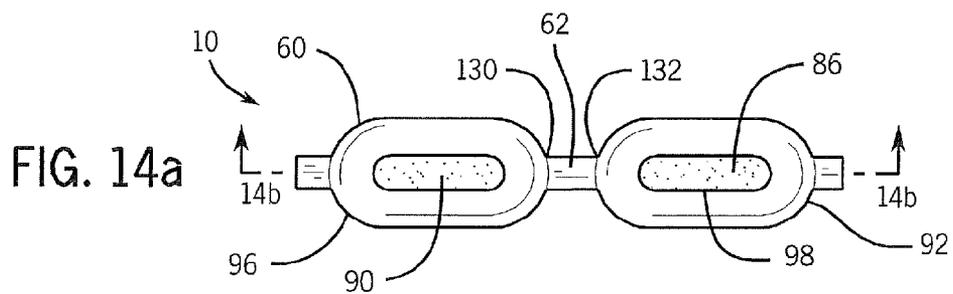


FIG. 13



PROTECTIVE PADDING ASSEMBLY FOR A SPORTS APPAREL ARTICLE

SUMMARY OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates generally to a sports apparel article including a padding assembly. In particular, the present invention relates to protective sports apparel incorporating one or more improved padding assemblies to enhance the protection, performance and comfort of the user.

BACKGROUND OF THE INVENTION

[0002] Many sports require protective equipment including padding assemblies to help protect players from impacts and injury. Protective equipment can include a variety of external pads applied over the players clothing and/or uniform. Protective equipment pads are worn by players in a number of contact sports, such as football, hockey, lacrosse, basketball and soccer. In recent years, sports apparel articles such as pants, shirts, shorts and sleeves have been configured to incorporate one or more protective pads. The padding can be attached directly to the inside or outside of the apparel article or placed within pockets on the apparel article. Such protective apparel items can be worn as the only protective equipment for the player or worn in conjunction with other external protective equipment, such as shoulder pads, hip pads, shin guards, thigh pads, rib pads, etc.

[0003] Although protective sports apparel has improved in recent years, some drawbacks remain. Many sports apparel articles incorporating protective pads can be bulky, heavy, provide only limited flexibility, and inhibit breathability of the apparel article. When such sport protective apparel articles are worn with external pads, the combination can be uncomfortable and unnecessarily inhibit the movement and flexibility of the user. Some existing pads incorporated into apparel items provide only limited articulation or flexibility. As a result, some movement can be restrained by the padding. Other existing pad assemblies include a group of separate smaller pads constrained within a pouch or pocket of the apparel article. Such pad assemblies can offer insufficient support and protection from sharp impacts. In some designs, the pouch or packet can be large enough to allow for bunching of some small pad and excessive separation of other pads leaving areas of the user's body unprotected and vulnerable to impacts.

[0004] Accordingly, a continuing need exists to a protective sports apparel article with one or more padding assemblies configured to protect the user without negatively affecting the user's performance. What is needed is a lightweight breathable padding assembly for a sports apparel article that enables the user to comfortably perform all the desired movements for a particular sport or activity without causing binding, obstruction or undesirable restriction. It is desirable to provide a protective sport apparel article with a protective padding assembly that is configured to be used, worn and perform with other external pad assemblies, such as, for example, shoulder pads. What is needed is a padding assembly that provides exceptional structural integrity, durability and reliability while conforming to the contour of the user's body and allowing for free uninhibited movement by the user. Additionally, there is a continuing need for a protective sports apparel item that provides a pleasing unique aesthetic.

[0005] The present invention provides a multi-layered pad assembly configured for use with an article of athletic apparel. The pad assembly includes a plurality of spaced apart cells and a plurality of linking members. The cells include an inner layer having an inner surface, an outer surface and a side surface. The cells are formed of a first material having a first durometer value measured on an Asker C hardness scale. The inner surface is coupled to the article of athletic apparel. At least two of the plurality of cells includes an outer layer formed of a second material. The second material has a second durometer value measured on an Asker C hardness scale. The second durometer value is greater than the first durometer value. Each of the linking members has first and second ends. The first end is connected to one of the cells and the second end is connected to another of the cells.

[0006] According to a principal aspect of a preferred form of the invention, a pad assembly configured for use with an article of athletic apparel includes a plurality of spaced apart cells and a plurality of linearly extending linking members connecting the cells together. The plurality of spaced apart cells includes an inner layer having an inner surface and an outer surface. The inner layer is formed of a first material. The inner surface is coupled to the article of athletic apparel. The plurality of linearly extending linking members includes at least first and second linking members defining at least first and second axes, respectively. The first and second axes define a first angle that is within the range of 20 degrees to 90 degrees. Each of the linking members has first and second ends. The first end is connected to one of the cells and the second end is connected to another of the cells.

[0007] According to another preferred aspect of the invention, a protective sports garment including an article of clothing and at least a first pad assembly. The first pad assembly has an inner surface and an outer surface. The pad assembly includes a plurality of spaced apart cells coupled together by a plurality of linking members, and first and second regions. The outer surface of the first pad assembly defines a pad area. Each of the first and second regions extends over at least 25 percent of the pad area. The first region is formed of a first inner layer and a first outer layer, and the second region being formed of the first inner layer and not including the first outer layer. The first inner and outer layers is formed of first and second materials having first and second durometer values measured on a hardness scale, respectively. The second durometer value is greater than the first durometer value. The inner surface of the pad assembly engages the article of clothing.

[0008] This invention will become more fully understood from the following detailed description, taken in conjunction with the accompanying drawings described herein below, and wherein like reference numerals refer to like parts.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a front view of a set of protective apparel articles incorporating protective padding assemblies in accordance with a preferred embodiment of the present invention

[0010] FIG. 2 is a rear view of the set of protective apparel articles of FIG. 1.

[0011] FIG. 3 is a front view of the protective shirt of FIG. 1 with a silhouette of shoulder pads positioned over the shirt.

[0012] FIG. 4a is a front view of a pair of protective shorts in accordance with a preferred embodiment of the present invention.

[0013] FIG. 4b is a rear view of the pair of protective shorts of FIG. 4a.

[0014] FIG. 5a is a front view of a shirt in accordance with a preferred embodiment of the present invention.

[0015] FIG. 5b is a rear view of the shirt of FIG. 5a.

[0016] FIG. 6 is a top view of a rib padding assembly of the protective shirt of FIG. 1.

[0017] FIG. 7 is a top view of a spine padding assembly of the protective shirt of FIG. 1.

[0018] FIG. 8 is a top view of a right thigh padding assembly of the protective pant of FIG. 1.

[0019] FIG. 9 is a top view of a right hip padding assembly of the protective pant of FIG. 1.

[0020] FIG. 10 is a top view of a tail bone padding assembly of the protective pant of FIG. 1.

[0021] FIG. 11 is a top view of a knee padding assembly of the protective pant of FIG. 1.

[0022] FIG. 12 is a top view of a right shoulder padding assembly of the protective shirt of FIG. 1.

[0023] FIG. 13 is a top view of a right thigh padding assembly in accordance with an alternative preferred embodiments of the present invention.

[0024] FIG. 14a is a top view of a pair of cells and linking members of a padding assembly in accordance with a preferred embodiment of the present invention.

[0025] FIG. 14b is a side view of the pair of cell and the linking members of

[0026] FIG. 12a.

[0027] FIG. 15 is a side view of a pair of cells and linking members of a padding assembly in accordance with an alternative preferred embodiment of the present invention.

[0028] FIG. 16 is a side view of a pair of cells and linking members of a padding assembly in accordance with an alternative preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0029] Referring to FIGS. 1 through 3, a protective sports apparel system is shown generally as 10. The sports apparel system 10 can include a pair of sports protective pants 20 and a sports protective shirt 30 in accordance with one implementation of the present invention is illustrated. The sports protective pants 20 and shirt 30 are configured for use in American football. The present application is directly applicable to other sports apparel items and padding assemblies, such as, for example, use in the following sports, baseball, softball, lacrosse, soccer, hockey, rugby, basketball, skiing, snowboarding, cycling and volleyball.

[0030] The pants 20 can include left and right leg sections 12 and 14, a waist section 16 and a crotch section 18. The shirt 30 can include left and right arm sections 22 and 24, front and rear torso sections 26 and 28, and left and right shoulder sections 32 and 34. The pants 20 and the shirt 30 can be formed of one or more woven or non-woven textile materials, such as nylon. In other implementations, the pants and/or shirt can be made of other materials, such as, for example, Lycra® (a registered trademark of Invista North America S.A.R.L.), rayon, polyester, elastane, polyacrylic, spandex, linen, wool, cotton, silk and combinations thereof. The textile materials used to form the pants and/or shirt can be highly resilient, breathable, and have moisture wicking properties. The textile

materials used to form the pants and/or shirt can include microfibers, knits, or coatings that form a breathable and/or water-resistant barrier or polymer sheet. The textile materials can be laminated or otherwise layered in two or more sheets of similar or different materials.

[0031] The protective sports apparel system 10 includes one or more padding assemblies. The padding assemblies can include one or more rib padding assemblies 40, thigh padding assemblies 42, left and right hip padding assemblies 44 and 46, a tail bone padding assembly 48, a spine padding assembly 50, left and right shoulder padding assemblies 52 and 54, elbow padding assemblies 56, forearm padding assemblies 58, knee padding assemblies 64 and other padding assemblies. The padding assemblies include a plurality of spaced apart cells 60 coupled together by a plurality of linking members 62. The cells 60 and/or the linking members 62 can be formed as a single layered structure or as a multi-layered structure having two or more layers of resilient padding material. The spaced apart cells 60 and linking members 62 can be arranged in a large variety of different sizes, shapes, and configurations. The spacing between the cells 62 and the arrangement and/or alignment of the linking members 62 can be varied to provide the optimum level of flexibility, comfort and structural integrity to meet a particular user's needs, or a particular application. The padding assemblies 40-58 and 64 can be directly coupled to the respective sports apparel articles such as the pants 20 or the shirt 30 through one or more adhesives, stitching, snap fit connections, hook, loop fastening mechanisms, thermal bonding, chemical bonding, rivets and combinations thereof.

[0032] Referring to FIGS. 4a and 4b, and FIGS. 5a and 5b, the protective sports apparel system 10 can be applied to a pair of shorts 70 and to other configurations of the shirt 80 having the padding assemblies 40-54. The shorts 70 and the shirt 80 can be substantially the same as the pants 20 and the shirt 30 of FIGS. 1-3 including the various sections of the apparel articles. The shorts 70 and the shirt 80 can include additional seams 82 or stitch patterns than the pants 20 and the shirt 30. The present invention contemplates numerous combinations and patterns, shapes and sizes of seams, stitches or other section configurations.

[0033] The padding assemblies 40-54 can be positioned over the base layer or layers forming the shorts 70 and/or shirt 80 and an additional protective layer 72 can be applied over the padding assemblies 40-54 to secure retain the padding assemblies 40-50 to the shorts 70 and/or the shirt 30. The protective layer 72 can be attached to the base layer or layers of the shorts and/or the shirt 80 through a stitching 74. In other implementations, the protective layer 72 can be attached to the base layer or layers of the shorts 70 or the shirt 80 through other means, such as, for example, bonding, welding, adhesives, snap-fit connections, hook and loop fastening mechanisms, zippers, buckles, and combinations thereof. The protective layer 72 in combination with the base layer or layers of the shorts 70 or the shirt 80 can define a cavity 76 for retaining the padding assembly 40-54 to the apparel article. In one implementation, the padding assembly 40-54 can free to move within the cavity 76. In another implementation, the padding assembly 40-54 can also be secured to one or both of the base layer or layers of the shorts 70 or the shirt 80, or to the protective layer 72 through an adhesive, stitching, hook and loop fastening mechanisms, snaps, buckles, rivets, other fasteners, or combinations thereof. Referring to FIG. 4a, a zipper 84 can be attached to the protective layer 72, and/or to the

adjacent material of the apparel article, to provide an opening for installing, removing and/or replacing the padding assembly 42. In other implementations, other mechanisms can be used to provide a releasable opening in association with the protective layer 72 and to provide access to the cavity 76. In other implementations, snaps, buckles, clips, hook and loop fastening mechanisms, other recloseable fasteners and combinations thereof can be used.

[0034] The protective layer 72 is preferably formed of a lightweight, breathable woven or non-woven textile material, such as a Lycra®. In other implementations, other materials, such as, for example, nylon, rayon, polyester, elastane, polyacrylic, spandex, linen, wool, cotton, silk and combinations thereof. In some implementations, the protective layer 72 can be formed of a translucent, semi-translucent, transparent or semi-transparent material. In other implementations, the protective layer 72 can include a mesh or a knit to facilitate breathability, heat transfer, and/or air flow through the protective layer 72. In another implementation, the protective layer 72 help form a water proof barrier for the padding assembly 40-54. The protective layer 72 can increase the structural integrity, durability and reliability of the protective apparel system 10. In other implementations, one or more of the padding assemblies can be applied to other forms of protective apparel articles, such as, for example arm sleeves, leg sleeves, jackets, etc. In other implementations, the sports apparel article can be formed without a protective layer extending over one or more of the padding assemblies.

[0035] Referring to FIGS. 1 and 6, one implementation of the padding assembly, the rib padding assembly 40, is shown in greater detail. The padding assembly 40 includes an inner padding layer 86 having an inner surface 88 (see FIG. 14b), an outer surface 90 and a side surface 92. The inner layer 86 is formed of a sheet of a first material that is formed into the desired pattern to form the cells 60 and the linking members 62. The cells 60 can be formed of one size and one shape. In another implementation, the cells 60 can be formed of two or more sizes, and/or two or more shapes. The cells 60 of FIG. 6 have three distinct oval sizes. The cells 60 can define a cell area that is within the range of 200 mm² to 2000 mm². In other implementations, one or more of the cells can be formed with an area outside of this range.

[0036] The first material is a compressible, highly resilient, shock absorbing material, such as an ethylene vinyl acetate (EVA) foam. In alternative embodiments, the first material can be other resilient materials, such as, for example, other compressible polymeric foam materials, a non-foamed polymeric material, and combinations thereof. In one implementation, the inner layer 86 is die cut into the desired pattern and the inner layer 86 extends throughout the entire padding assembly 40 including all of the cells 60 and all of the linking members 62. In other implementations, the inner layer can be molded, formed and/or cut into the desired shape and configuration. In another implementation, the inner layer can extend over just the cells 60 and not the linking members. In another implementation, the inner layer can be used to form a portion of the cells and/or a portion of the linking members. The first material has a first density and a first durometer within the range of 20 to 40 when measured on an Asker C hardness scale. The inner layer 86 can define one or more inner layer holes 94 extending through one or more of the cells 60. In one implementation, the holes 94 extend entirely through the inner layer 86 from the inner surface 88 to the outer surface 90. In another implementation, each inner layer

hole 94 extends over a cell opening area of at least 50 mm². The inner layer 86 of some of the cells 60 can include the inner layer hole 94 and the inner layer 86 of other cells 60 of the padding assembly 40 can be formed without the inner layer hole 94. The inner layer 86 has a thickness within the range 2 to 20 millimeters. In one implementation, the inner layer 86 has a thickness within the range of 4 to 8 millimeters. The protective inner layer 86 provides protection for the user from impacts with other players, balls or other projectiles, the ground or playing surface, and/or other sport implements. In another implementation, the inner layer 86 can be formed of two or more layers that are laminated or otherwise positioned over each other to collectively form the inner layer 86.

[0037] The padding assembly 40 can also include an outer padding layer 96 formed of a second material. The second material is a compressible, resilient, shock absorbing material, such as an EVA foam. In alternative embodiments, the first material can be other resilient materials, such as, for example, other compressible polymeric foam materials, a non-foamed polymeric material, and combinations thereof. The second material has a second density and a second durometer within the range of 50 to 70 when measured on an Asker C hardness scale. In one implementation, the second density is greater than the first density. In another implementation, the second durometer value is greater than the first durometer value. Accordingly, the second material is a harder material than the first material providing additional strength to the padding assembly and an extra layer of protection for the user. In another implementation, the durometer values of the first and second materials can be outside of the above-listed ranges. In one implementation, the second material is die cut and then thermal compression molded to increase the density and hardness of the second material. In other implementations, the outer layer 96 can be formed by injection molded, cut from preformed sheets or produced in other conventional manners. In one implementation, the density and the hardness (durometer value) of the outer layer 96 is consistent throughout the outer layer 96. In other implementations, the density and/or durometer value of the outer layer 96 can be varied over its thickness, width or length.

[0038] The outer padding layer 96 can be bonded to the outer surface 90 of the inner padding layer 86. In other implementations, the outer layer 96 can be attached to the inner padding layer 86 by thermal bonding, ultrasonic welding, stitching, hook and loop type fasteners, snaps, rivets, other fasteners and combinations thereof. In one implementation, the outer layer 96 is fixedly and non-removably attached to the inner layer 86. In another implementation, the outer layer 96 is removably connected to the inner layer 86. In one implementation, the second layer 96 extends over at least 30 percent of the outer surface 90 of the inner layer 86. In other implementations, the second layer 96 can extend over more than 30 percent of the outer surface 90 and can extend over the entire outer surface 90 of the inner layer 86. In one implementation, the second layer 96 extends over the perimeter of the outer surface 90 of the first layer 86 forming a loop and defining an outer layer hole 98 in the second layer 96. In one implementation, each outer layer hole 98 extends over a cell opening area of at least 50 mm².

[0039] In one implementation, the outer layer 96 extends over at least two of the plurality of the cells 60 such that at least two of the cells 60 include the inner layer 86 and the outer layer 96. In one implementation, the outer peripheral edges of the padding assembly 40 generally define a pad area

100 having first and second pad regions **102** and **104**. The first pad region **102** includes cells **60** having inner and outer layers **86** and **96** and the first pad region is defined by the outer peripheral edges of the cells **60** that include the inner and outer layers **86** and **96**. The second pad region **104** includes cells **60** formed of the inner layer **86** but without the outer layer **96**, and is defined by the area within the pad area **100** that is not included in the first pad region **102**. In one implementation, each of the first and second pad regions extends over at least 25 percent of the pad area **100**. In one implementation, the first region **102** extends over greater than 50 percent of the pad area **100**. In another implementation, the second region **104** extends over greater than 50 percent of the pad area **100**. In one implementation, the linking members **62** within the first region **102** include the inner layer **86** and the outer layer **96**, and the linking members **62** of the second region **104** include only the linking members **62**. In another implementation, the linking members **62** of the first and/or the second regions can be formed of one or both of the inner and/or outer layers, or of another layer of flexible material.

[0040] In one implementation, the linking members **62** are linearly extending linking members that each extend about an axis, when the padding assembly **40** is positioned about a flat surface. One of skill in the art will understand that the first and second materials of the inner layer **86** and the outer layer **96** have sufficient flexibility to enable the padding assembly **40** to conform or curve to follow the contour of the user's body. As the padding assembly **40** curves to conform to the user's body, the linearly extending linking members **62** can bend or curve to follow the contour. When lying on a horizontal surface, such as shown in FIG. 6, the linking members **62** will define a plurality of axes. For example, the linking members **62** of the padding assembly **40** define at least first, second, third, fourth, fifth and six axes **110**, **112**, **114**, **116**, **118** and **120**. The first axis **110** and the second axis **112** define a first angle α and the first axis **110** and the fourth axis **116** define a second angle β . The first angle α can be within the range of 20 to 90 degrees. The second angle β can also be within the range of 20 to 90 degrees. In one implementation, the first and second angles α and β and are substantially the same with the exception of the second angle β having an angular polarity that is opposite the angular polarity of the first angle α . In one particular implementation, as illustrated in FIG. 6, the first angle α is approximately positive 45 degrees and the second angle β is approximately negative 45 degrees. In another implementation, the angles between pairs of axes can vary between the pairs such that angles of different magnitude or polarity can be used. Two or more of the axes can be configured to be substantially parallel with each other. For example, the first axis **110** can be parallel to the third axis **114**, the second axis **112** can be parallel to fifth axis **118**, and the fourth axis **116** can be parallel to the sixth axis **120**. Other axes can also be defined by the linking members **62** of the pad assembly **40**. The spacing of the cells **60**, the positioning and alignment of the axes, and the size of angles between the axes can be varied to provide the optimal protection, freedom of movement and performance for each padding assembly. The present invention contemplates these factors and the characteristics of the inner and outer layers **86** and **96** such as thickness, density, hardness, porosity, etc., to be varied to provide an optimized padding assembly for every position on the user's body and for every application.

[0041] The linking member **62** includes first and second ends **130** and **132**. The first end **130** extends from and is

coupled to the side surface **92** of one of the cells **60** and the second end **132** of the linking member **62** is coupled to the side surface **92** of another one of the cells **60**. In one implementation, every one of the cells **60** of the padding assembly **40** is directly connected to at least one linking member **62**. In another implementation, a majority of the cells **60** of the padding assembly are directly connected to at least one of the linking members **62**. In one implementation, at least 40 percent of the cells **60** are to no more than two adjacent cells by linking members **62**. In one implementation, at least 40 percent of the cells **60** are directly connected to no more than two adjacent cells by linking members **62**. In another implementation, at least 70 percent of the cells **60** are directly connected to no more than two adjacent cells by two or one linking members **62**. In another implementation, at least 20 percent of the cells are directly connected to only one other of the cells **60** by no more than one of the linking members **62**.

[0042] In one implementation, when the padding assembly **40** is positioned on a flat surface, the cells **60** are preferably spaced apart from each other by at least 2 mm. In another implementation, the cells **60** are spaced apart from each other by at least 5 mm. The spaced apart configuration of the cells **60** and the linking members **62** and the resilient properties of the first and second materials of the inner and outer layers **86** and **96** provide a flexible, comfortable padding assembly that enables the user to flex, move, turn, twist his or her body, and move his or her extremities without binding, discomfort or pad assemblies inhibiting the movement. The spaced apart arrangement of the cells **60** and the small number of linking members **62** provides for a padding assembly that readily allows for air flow between, through and around the cells **60** and the linking members **62**. The spaced apart arrangement of the cells **60** and the linking members **62** allows for a high level of flexibility while maintaining the structural integrity of the padding assembly as a whole. The alignment of the linking members **62** and the axes of the linking members enables the padding assembly to be tailored and customized to move, flex and function with different locations of the user, such as the rib padding assembly **40**, without degrading the performance of the user or the padding assembly.

[0043] Referring to FIGS. 1, 3 and 6, the second region **104** of the padding assembly **40** is sized and positioned to underlie the external shoulder pads **120** of a player, and the first region **102** of the padding assembly is sized and positioned to not be overlapped by the external shoulder pads **120**. Accordingly, the second region **104** of the padding assembly **40** provides an extra layer of padding, comfort and protection to the player in the locations beneath the external shoulder pads **120**. Additionally, the first region **102** of the rib padding assembly **40** provides a higher level of protection for the player in the locations just outside of the area covered by the external shoulder pads and further protects the player's ribs from impacts thereby reducing the risk of potential injury. The use of the rib padding assembly **40** can enable players who would normally wear an external rib pad in addition to the external shoulder pads **120** to go without the external rib pad. As a result, the player can receive an exceptional level of protection without having to put on and carry around another external padding assembly that typically reduces the movement and flexibility of the user. The rib padding assembly **40** with the first and second regions **102** and **104** provides the appropriate level of comfort and protection to the user over the entire portion of the body covered by the rib padding assembly **40**. The player is not burdened with an excessively thick or

hard pad beneath the external shoulder pad, and yet receives reinforced, dual density pad protection in areas just outside the coverage of the external shoulder pads 120.

[0044] Referring to FIG. 7, the spine padding assembly 50 is shown in greater detail. The spine padding assembly 50 is substantially the same as the rib padding assembly 40 with the exception of the configuration, number, size, shape and orientation of the cells 60 and the linking members 62. Accordingly, the discussion above relating to the rib padding assembly 40 is directly applicable to the spine padding assembly 50.

[0045] Like the rib padding assembly 40, the spine padding assembly 50 is positioned on the shirt 30 to extend partially beneath the external shoulder pads 120 and partially outside of the external shoulder pads 120. Accordingly, the spine padding assembly 50 includes the pad area 100 and the first and second regions 102 and 104.

[0046] The orientation and sizes of the cells 60 are selected for optimal protection of the player's spine in area covered by the spine padding assembly 50. In one implementation, the spine padding assembly 50 can include a single set of cells 60 and linking members 62 extending along, and generally parallel with, the portion of the user's spine when worn by the player. The padding assembly 50 can also include a plurality of cells and linking members extending at an angle with respect to the parallel set of cells discussed above. The padding assembly 50 can include three separate sizes of cells 60. In other implementations, two or four or more different sized cells could also be used. In other implementations, other numbers, configurations, sizes, and orientations of the padding assembly 50 can be used.

[0047] Referring to FIG. 8, the thigh padding assembly 42 is shown in greater detail. The thigh padding assembly 42 is substantially the same as the rib padding assembly 40 with the exception of the configuration, number, size, shape and orientation of the cells 60 and the linking members 62, and the use of the inner and outer layers 86 and 96 over the entire padding assembly 42. Accordingly, the discussion above relating to the rib padding assembly 40 is directly applicable to the thigh padding assembly 42.

[0048] The thigh padding assembly 42 is configured to be worn by the user without the need to also use an external thigh pad. Accordingly, the thigh padding assembly 42 includes the inner and the outer layers 86 and 96 over each of the cells 60 and each of the linking members 62. The orientation and sizes of the cells 60 are selected for optimal protection of the player's thigh. In one implementation, the thigh padding assembly 42 can include five parallel sets of cells 60 and linking members 62 extending along, and generally parallel with, the length of the player's thigh when worn by the player. The padding assembly 42 can also include a plurality of cells and linking members extending at an angle with respect to the parallel set of cells discussed above. The padding assembly 42 can include three separate sizes of cells 60. In other implementations, two or four or more different sized cells could also be used. The inner layer 86 of the padding assembly 42 is formed without inner layer holes 94, and the second layer 96 extends over all of the cells and includes the outer layer holes 98 in each of the cells 60. In other implementations, other numbers, configurations, sizes, and orientations of the padding assembly 42 can be used.

[0049] Referring to FIG. 9, the right hip padding assembly 46 is shown in greater detail. The right hip padding assembly 46 is substantially the same as the left hip padding assembly 44, except the left hip padding assembly is essentially a mir-

ror image of the right hip padding assembly 46. Further, the right hip padding assembly 46 is substantially the same as the rib padding assembly 40 with the exception of the configuration, number, size, shape and orientation of the cells 60 and the linking members 62, and the use of the inner and outer layers 86 and 96 over the entire padding assembly 42. Accordingly, the discussion above relating to the rib padding assembly 40 is directly applicable to the hip padding assembly 46.

[0050] The right hip padding assembly 46 is configured to be worn by the user without the need to also use an external hip pad. Accordingly, the right hip padding assembly 46 includes the inner and the outer layers 86 and 96 over each of the cells 60 and each of the linking members 62. The orientation and sizes of the cells 60 are selected for optimal protection of the player's hip. The right hip padding assembly 46 can include three parallel sets of cells 60 and linking members 62 vertically extending along, and generally parallel with, the player's hip when worn by the player. The padding assembly 46 can also include a plurality of cells 60 and linking members 62 extending at an angle with respect to the parallel set of cells 60 discussed above. The padding assembly 46 can include three separate sizes of cells 60. In other implementations, two or four or more different sized cells could also be used. The inner layer 86 of the padding assembly 46 is formed without inner layer holes 94, and the second layer 96 extends over all of the cells and includes the outer layer holes 98 in each of the cells 60. In other implementations, other numbers, configurations, sizes, and orientations of the padding assembly 46 can be used.

[0051] Referring to FIG. 10, the tail bone padding assembly 48 is shown in greater detail. The tail bone padding assembly 48 is substantially the same as the rib padding assembly 40 with the exception of the configuration, number, size, shape and orientation of the cells 60 and the linking members 62, and the use of the inner and outer layers 86 and 96 over the entire padding assembly 42. Accordingly, the discussion above relating to the rib padding assembly 40 is directly applicable to the tail bone padding assembly 48.

[0052] The tail bone padding assembly 48 is configured to be worn by the user without the need to also use an external tail bone pad. Accordingly, the tail bone padding assembly 48 includes the inner and the outer layers 86 and 96 over each of the cells 60 and each of the linking members 62. The orientation and sizes of the cells 60 are selected for optimal protection of the player's hip. The tail bone padding assembly 48 can include a set of cells 60 and linking members 62 vertically extending along, and generally parallel with, the player's tail bone when worn by the player. The padding assembly 48 can also include a plurality of cells 60 and linking members 62 extending at an angle with respect to the parallel set of cells 60 discussed above. The padding assembly 48 can include three separate sizes of cells 60. In other implementations, two or four or more different sized cells could also be used. The inner layer 86 of the padding assembly 46 is formed without inner layer holes 94, and the second layer 96 extends over all of the cells and includes the outer layer holes 98 in each of the cells 60. In other implementations, other numbers, configurations, sizes, and orientations of the padding assembly 48 can be used.

[0053] Referring to FIG. 11, the knee padding assembly 64 is shown in greater detail. The knee padding assembly 64 is substantially the same as the rib padding assembly 40 with the exception of the configuration, number, size, shape and orientation of the cells 60 and the linking members 62, and the

use of the inner and outer layers **86** and **96** over the entire padding assembly **42**. Accordingly, the discussion above relating to the rib padding assembly **40** is directly applicable to the knee padding assembly **64**.

[0054] The knee padding assembly **64** is configured to be worn by the user without the need to also use an external knee pad. Accordingly, the knee padding assembly **64** includes the inner and the outer layers **86** and **96** over each of the cells **60** and each of the linking members **62**. The orientation and sizes of the cells **60** are selected for optimal protection of the player's knee. The knee padding assembly **64** can include a set of cells **60** and linking members **62** vertically extending along, and generally parallel with, the player's knee when worn by the player. The padding assembly **64** can also include a plurality of cells **60** and linking members **62** extending at an angle with respect to the parallel set of cells **60** discussed above. The padding assembly **64** can include three separate sizes of cells **60**. In other implementations, two or four or more different sized cells could also be used. The inner layer **86** of the padding assembly **64** is formed without inner layer holes **94**, and the second layer **96** extends over all of the cells and includes the outer layer holes **98** in each of the cells **60**. In other implementations, other numbers, configurations, sizes, and orientations of the padding assembly **64** can be used.

[0055] Referring to FIG. 12, the right shoulder padding assembly **54** is shown in greater detail. The right shoulder padding assembly **54** is substantially the same as the left shoulder padding assembly **52**, except the left shoulder padding assembly is essentially a mirror image of the right shoulder padding assembly **54**. Further, the right shoulder padding assembly **54** is substantially the same as the rib padding assembly **40** with the exception of the configuration, number, size, shape and orientation of the cells **60** and the linking members **62**, and the use of only the inner layer **86** over the entire padding assembly **42**. Accordingly, the discussion above relating to the rib padding assembly **40** can be directly applicable to the shoulder padding assembly **54**.

[0056] The right shoulder padding assembly **54** is configured to be worn by the user under the external shoulder pads **120** (FIG. 3). Accordingly, the right shoulder padding assembly **54** includes only the inner layer **86** to provide an extra layer of protection and comfort for the user without providing a bulky hard cumbersome pad that would interfere with the comfort and performance of the external shoulder pads **120**. The orientation and sizes of the cells **60** are selected for optimal protection of the player's shoulder. The right shoulder padding assembly **54** can include a first single set of cells **60** and linking members **62** and can also include a plurality of cells **60** and linking members **62** extending at an angle with respect to the first single set of cells **60** discussed above. The padding assembly **54** can include three separate sizes of cells **60**. In other implementations, two or four or more different sized cells could also be used. The inner layer **86** of the padding assembly **54** is formed with inner layer holes **94** in each of the cells **60**. In other implementations, other numbers, configurations, sizes, and orientations of the padding assembly **54** can be used. In another implementation, the knee padding assembly **64** can be configured like the shoulder padding assembly **54** with only the inner padding layer **86** when the knee padding assembly **64** is configured for use in with an external knee pad.

[0057] Referring to FIG. 13, another implementation of a thigh padding assembly **142** is illustrated. The thigh padding assembly **142** is substantially the same as the thigh padding

assembly **42** with the exception of the shape and configuration of certain cells **60** of thigh padding assembly **142**. The cells **60a**, **60b** and **60c** of the thigh padding assembly **142** are oval shaped and include the inner padding layer **86** and the outer padding layer **96**. Unlike the cells shown in FIG. 8, the outer padding layer **96** can extend over different portions of the inner padding layer **86** of the cells. The cell **60a** illustrates the outer padding layer **96** positioned at four separate locations about the periphery of the cell **60a**. The cell **60c** illustrates the outer padding layer **96** positioned over two separate portions of the outer periphery of the cell **60c**. In other implementations, one, three, five or more locations can be used for the positioning of the outer padding layer **96** over the inner padding layer **86**. In other implementations, one or more of the cells **60** can be formed without the outer padding layer **96**. The **60b** illustrates the outer padding layer **96** positioned in a central region of the oval shaped cell away from the outer periphery of the cell. In other implementations, the outer padding layer **96** can be positioned in other locations away from or in contact with the outer periphery of the cell. Accordingly, it is contemplated in the present invention, that the outer padding layer can extend over the inner padding layer in any shape, size or orientation.

[0058] The cells **60** can be formed in any shape. The cell **60d** is hexagonal in shape and the cell **60h** is diamond shaped. In other implementations, other polygonal shapes such as triangular, rectangular, octagonal, etc. can be used. The cell **60e** is generally circular in shape. In other implementations, the cell **60** can be formed in other curved shapes. The cell **60f** is generally X-shaped, the cell **60g** is generally 8-shaped or hour glass shaped, and the cell **60i** is generally C-shaped. The other implementations, other alphanumeric shaped cells can be used such as for example, S-shaped, T-shaped, L-shaped, etc. In other implementations, any combination of one or more cell shapes and sizes can be used.

[0059] Referring to FIGS. 14a and 14b, two adjoining cells **60** from the padding assembly system **10** are shown in greater detail. The inner padding layer **86** can extend along the entire cells **60** and the linking members **62**, and can be formed without the inner pad hole **94**. The outer padding layer **96** can be applied over the perimeter of the inner layer **86** of the cells **60** and over the inner padding layer **86** of the linking member **62**. The outer padding layer **96** can be formed with a variable thickness, such that the thickness of the outer layer **96** can be smaller at the linking member **62** than at the cells **60**. The thickness can also vary about the cell **60**. The inner surface **88** of the inner padding layer **86** can be connected to the apparel article.

[0060] Referring to FIG. 15, another implementation of two cells **60** and the linking member **62** of the system **10** are shown. The inner padding layer **86** can have a variable thickness. For example, the thickness of the inner padding layer **86** can be smaller at the linking member **62** than at the cell **62**. In other implementations, other variations of thickness of the inner layer are contemplated. Referring to FIG. 16, in another implementation, the configuration, shape and thickness of the outer padding layer **96** can be varied to provide a different appearance and configuration. Other variations of the thickness of the outer padding layer are also contemplated.

[0061] Many embodiments of the padding assemblies and of the apparel articles of the present invention are specifically configured for providing optimum performance in one or more levels of competitive, organized play. For example, many embodiments are built in accordance with the present

application fully meet the rules and/or requirements of one or more of the following sport organizations, such as, for example, the Sports Rules of the National Federation of State High School Associations (“NFHS”); the Sports Rules and Interpretations of the National Collegiate Athletic Association (“NCAA”); the Official Football Rules of the National Football League (“NFL”) and the Football Leagues of Pop Warner Little Scholars, Inc., the rules of Little League baseball, and the Official Rules of the Federation International de Basketball Amateur (“FIBA”). Accordingly, the term “padding assembly configured for organized, competitive play” or “apparel article configured for organized, competitive play” refers to a padding assembly or a sports apparel article, respectively that fully meets the rules and/or requirements of, and is fully functional for play in, one or more of the above listed organizations.

[0062] The present invention provides a protective sports apparel article with one or more padding assemblies configured to protect the user without negatively affecting the user’s performance. Embodiments of the present application provide a lightweight breathable padding assembly for a sports apparel article that enables the user to comfortably perform all the desired movements for a particular sport or activity without causing binding, obstruction or undesirable restriction. Protective sport apparel article with a protective padding assembly built in accordance with the embodiments of the present invention can be configured to be used, worn and perform with other external pad assemblies, such as, for example, shoulder pads. The padding assembly of the present invention provides exceptional structural integrity, durability and reliability while conforming to the contour of the user’s body and allowing for free uninhibited movement by the user. Additionally, the protective sports apparel articles of the present invention provide a pleasing unique aesthetic.

[0063] While the preferred embodiments of the invention have been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the invention. One of skill in the art will understand that the invention may also be practiced without many of the details described above. Accordingly, it will be intended to include all such alternatives, modifications and variations set forth within the spirit and scope of the appended claims. Further, some well-known structures or functions may not be shown or described in detail because such structures or functions would be known to one skilled in the art. Unless a term is specifically and overtly defined in this specification, the terminology used in the present specification is intended to be interpreted in its broadest reasonable manner, even though may be used conjunction with the description of certain specific embodiments of the present invention.

What is claimed is:

1. A multi-layered pad assembly configured for use with an article of athletic apparel, the pad assembly comprising:

a plurality of spaced apart cells, the cells including, an inner layer having an inner surface, an outer surface and a side surface and being formed of a first material having a first durometer value measured on an Asker C hardness scale, the inner surface coupled to the article of athletic apparel, and at least two of the plurality of cells including an outer layer formed of a second material, the second material having a second durometer value measured on an Asker C hardness scale, the second durometer value being greater than the first durometer value; and

a plurality of linking members, each of the linking members having first and second ends, the first end connected to one of the cells and the second end connected to another of the cells.

2. The pad assembly of claim **1**, wherein the first end of the linking member is connected only to a single one of the cells, and wherein the second end of the linking member is connected only to another one of the cells.

3. The pad assembly of claim **1**, wherein each the plurality of cells include the inner and outer layers.

4. The pad assembly of claim **1**, wherein the at least two cells including the inner and outer layers defining a first region of the pad assembly, and wherein the cells formed without the outer layer defining a second region of the pad assembly.

5. The pad assembly of claim **1**, wherein the linking members are formed of at least the first material.

6. The pad assembly of claim **5**, wherein at least one of the linking members is formed of the first and second materials.

7. The pad assembly of claim **1** wherein the plurality of cells define at least one shape having area within the range 200 mm² to 2000 mm².

8. The pad assembly of claim **7**, wherein the outer layer of the at least two cells extends over at least 30 percent of the outer surface of the inner layer.

9. The pad assembly of claim **1**, wherein at least one of the inner and outer layers define an opening that extends through at least one of the inner and outer layers.

10. The pad assembly of claim **1**, wherein at least 40 percent of the cells are directly connected to no more than two adjacent cells by the linking members.

11. The pad assembly of claim **1**, wherein the first material is a foam material, and wherein the second material is a compressed, thermal molded foam material.

12. The pad assembly of claim **1**, wherein the first end of the linking member is directly connected to the side surface of one of the cells and wherein the second end is directly connected to the side surface of another of the cells.

13. A pad assembly configured for use with an article of athletic apparel, the pad assembly comprising:

a plurality of spaced apart cells including an inner layer having an inner surface and an outer surface and being formed of a first material, the inner surface coupled to the article of athletic apparel;

a plurality of linearly extending linking members connecting the cells together, the plurality of linearly extending linking members including at least first and second linking members defining at least first and second axes, respectively, the first and second axes defining a first angle, the first angle being within the range of 20 degrees to 90 degrees, each of the linking members having first and second ends, the first end connected to one of the cells and the second end connected to another of the cells.

14. The pad assembly of claim **13**, wherein the at least first and second linking members defining at least first and second axes include at least first, second and third linking members defining at least first, second and third axes, respectively, and wherein the third axes is substantially parallel to the first axis.

15. The pad assembly of claim **13**, wherein the at least first and second linking members defining at least first and second axes include at least first, second, third and fourth linking

members defining at least first, second, third and fourth axes, respectively, and wherein the fourth and first axes define a second angle.

16. The pad assembly of claim 15, wherein the second angle is approximately the same as the first angle, and wherein the polarity of the second angle is opposite the first angle.

17. The pad assembly of claim 13 wherein the plurality of cells define at least one shape having area within the range 200 mm² to 2000 mm².

18. The pad assembly of claim 17 wherein the shape of the cells is ovalar.

19. The pad assembly of claim 17 wherein the shape of the cells is selected from the group consisting of are circular, triangular, rectangular, hour glass shaped, polygonal shaped, semi-circular, an alphanumeric shape and combinations thereof.

20. The pad assembly of claim 17, wherein the cells are formed in at least first and second different sizes.

21. The pad assembly of claim 17, wherein the cells are formed in at least first, second and third different sizes

22. The pad assembly of claim 13, wherein a majority of the plurality of cells define a through-cell opening extending from the outer surface to the inner surface.

23. The pad assembly of claim 20, wherein the through cell openings define cell opening area of at least 50 mm².

24. A protective sports garment comprising:
an article of clothing;
at least a first pad assembly having an inner surface and an outer surface, the pad assembly including a plurality of spaced apart cells coupled together by a plurality of linking members, and first and second regions, the outer surface of the first pad assembly defining a pad area,

each of the first and second regions extending over at least 25 percent of the pad area, the first region being formed of a first inner layer and a first outer layer, and the second region being formed of the first inner layer and not including the first outer layer, the first inner and outer layers being formed of first and second materials having first and second durometer values measured on a hardness scale, respectively, the second durometer value being greater than the first durometer value, the inner surface of the pad assembly engaging the article of clothing.

25. The protective sports garment of claim 24, further comprising a second pad assembly, wherein the second pad assembly is formed of a second inner layer and a second outer layer, wherein the second inner and outer layers are formed of third and fourth materials having third and fourth materials durometer values, respectively, the third durometer value being greater than the fourth durometer value, wherein the second pad assembly includes a plurality of cells, and wherein each of the cells includes the second and outer layers.

26. The protective sports garment of claim 24, further comprising a third pad assembly formed of a continuous third padding layer having an outer surface, wherein the third pad assembly includes a plurality of cells coupled together by a plurality of linking members, wherein the outer surface of the third layer is the outer surface of the third pad assembly.

27. The protective sports garment of claim 24, wherein the inner surface of the first pad assembly is fixedly attached to the article of clothing.

28. The protective sports garment of claim 24, wherein the article of clothing includes a flexible cover layer extending over the outer surface of the first pad assembly.

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