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(54) **HEAD PROTECTOR**

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

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(57)

ABSTRACT

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(22) Filed: **Jul. 22, 2019**

Related U.S. Application Data

(63) Continuation-in-part of application No. 15/401,589, filed on Jan. 9, 2017, Continuation-in-part of application No. 29/664,287, filed on Sep. 24, 2018, now Pat. No. Des. 854,754, which is a continuation-in-part of application No. 15/401,589, filed on Jan. 9, 2017.

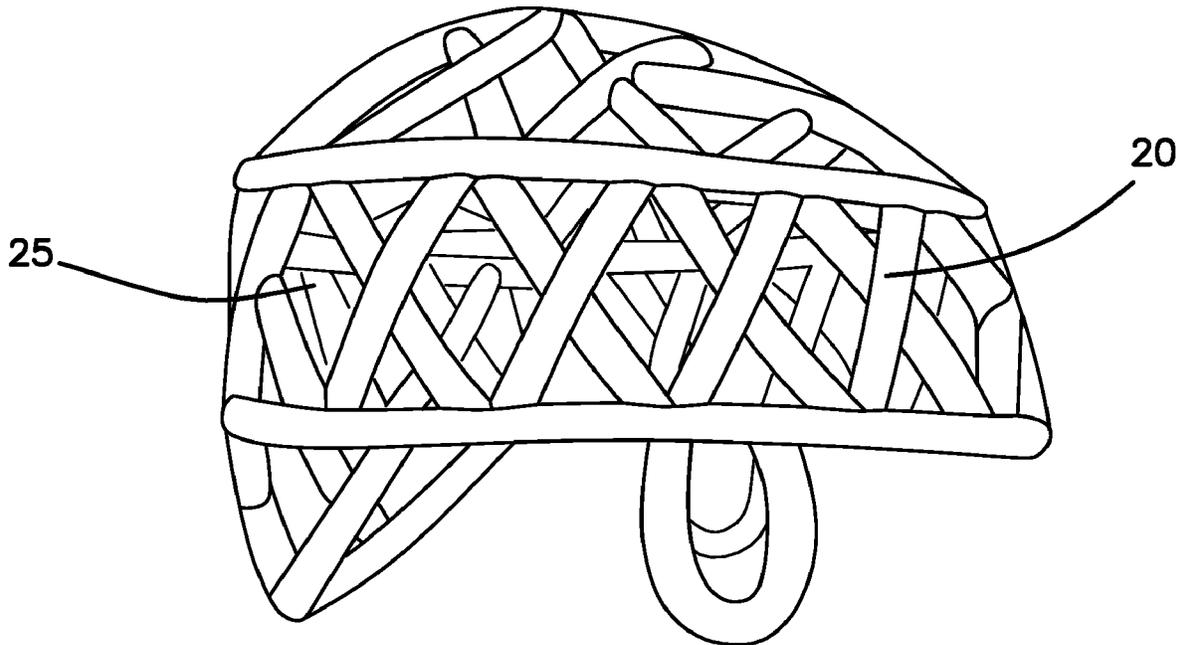
A headgear enhancer or head protector of a molded thermoplastic elastomer (TPE), which may include a styrene ethylene butylene styrene (SEBS) material to provide desired resiliency for comfort, force distribution, and protection while also providing suitable molding characteristics related to management of flash, demolding, and deforming. The head protector may include a plurality of elements molded in a network, mesh, or grid of connected polygons forming a single unitary construction with an outer diameter of the elements ranging from about 6 mm (1/4 inch) to about 16 mm (5/8 inch). The elements are formed of a material having a durometer range from 40-90 on the Shore A Hardness scale. The head protector may be a headband having a width of 2-10 cm with an open top or crown and bottom and may be worn beneath a helmet or cap, such as a baseball cap or water polo cap.

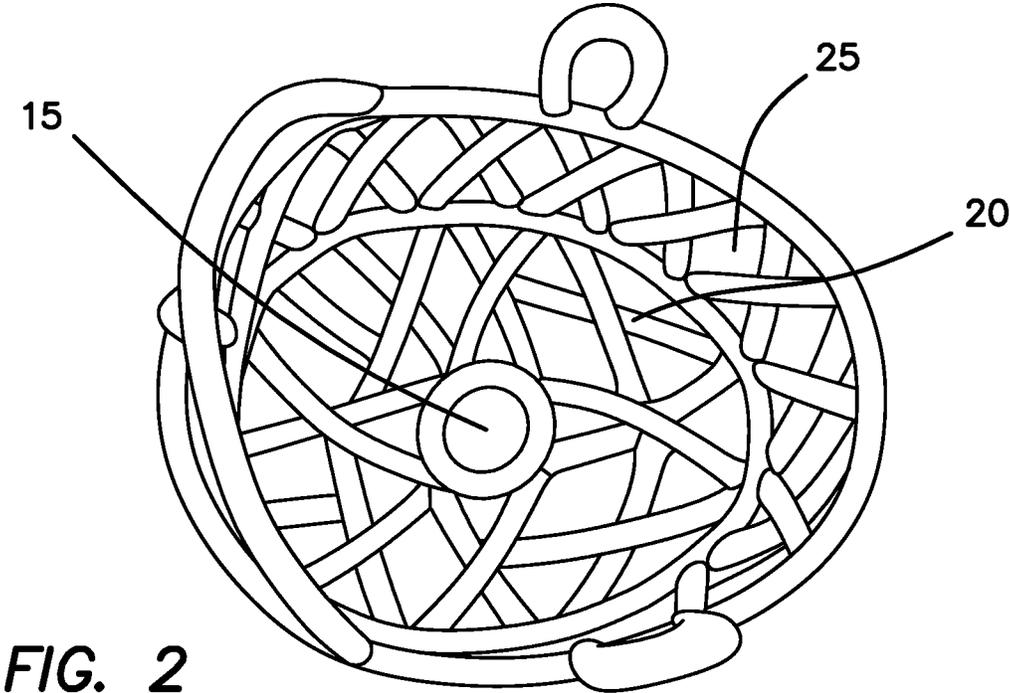
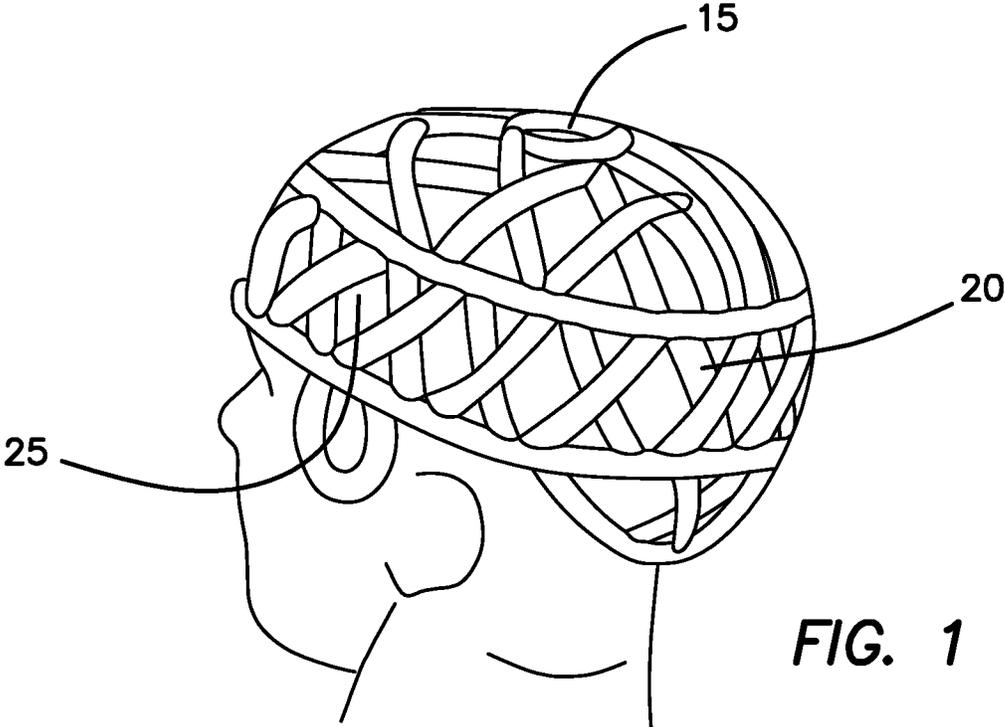
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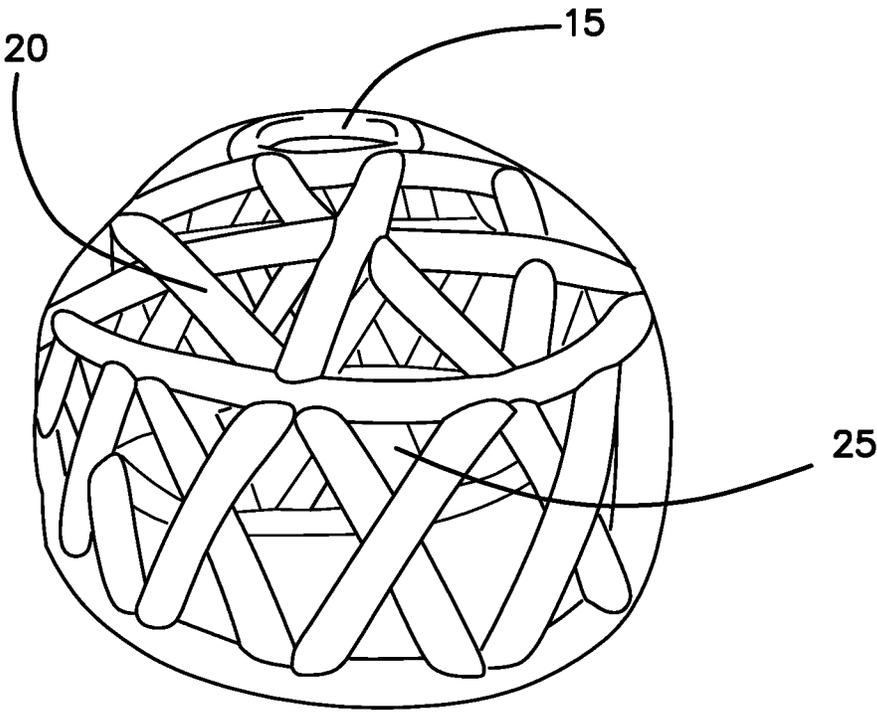


FIG. 3

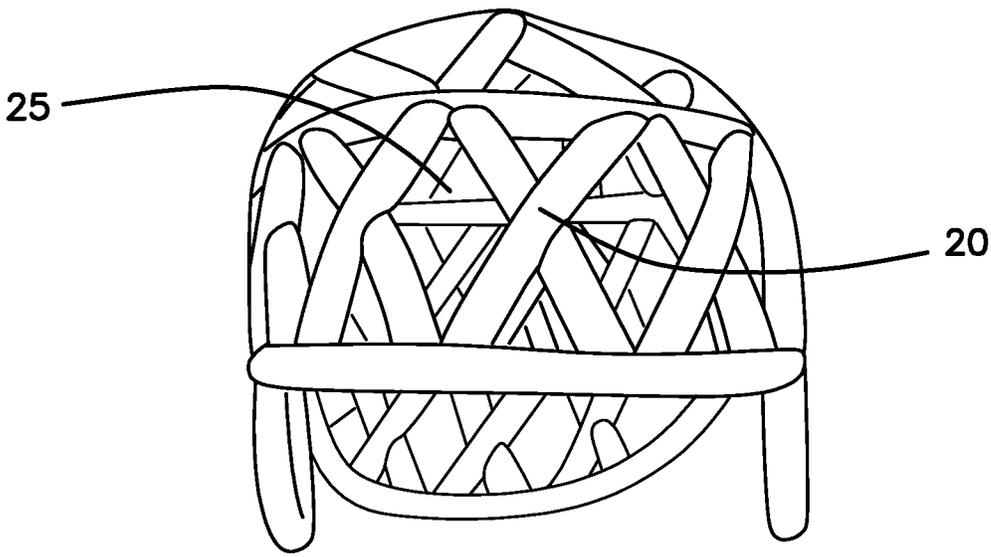


FIG. 4

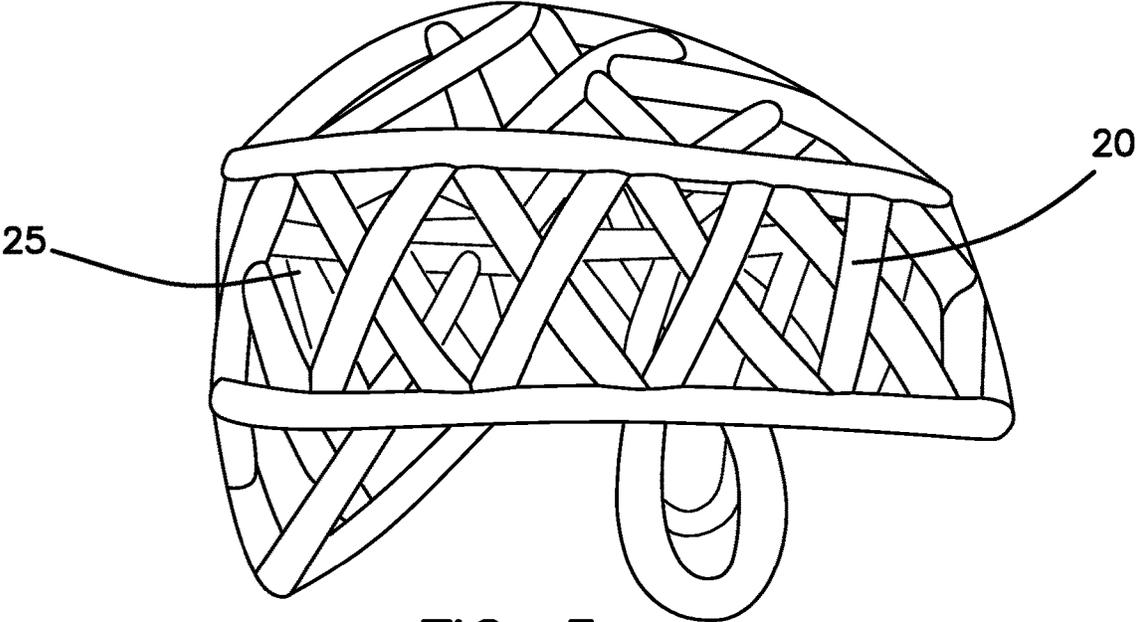


FIG. 5

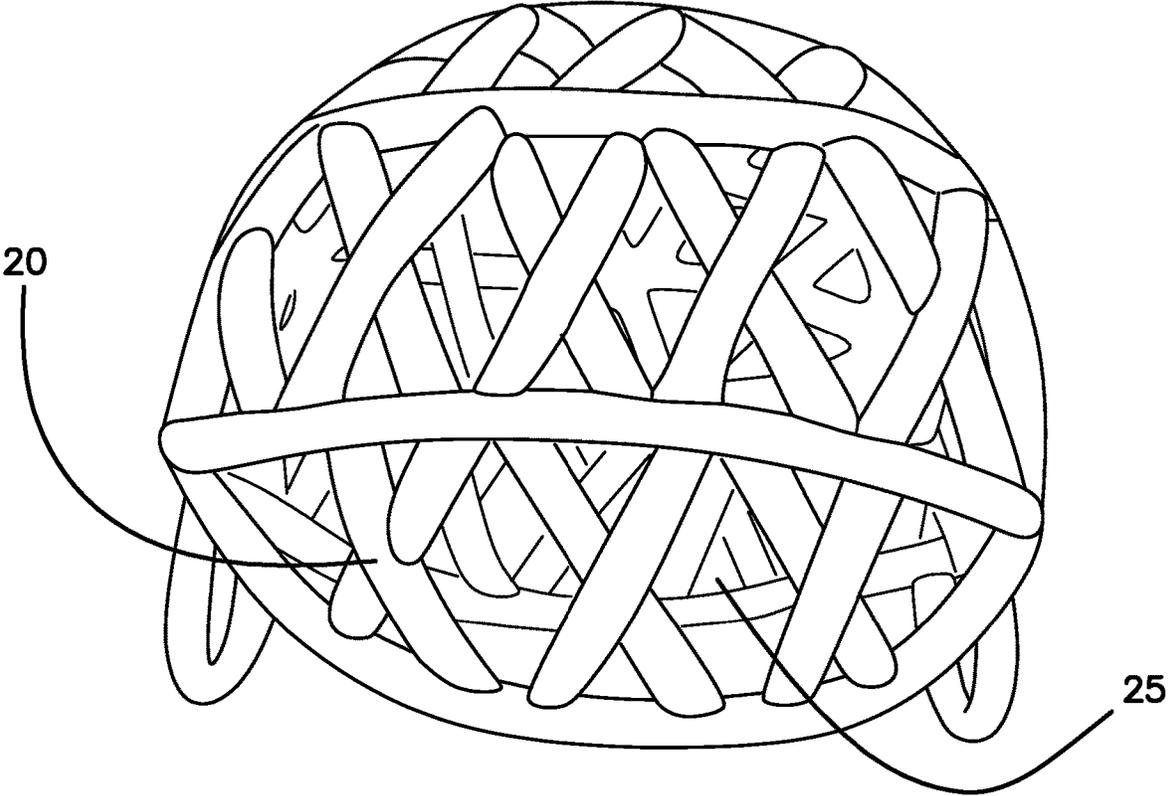


FIG. 6

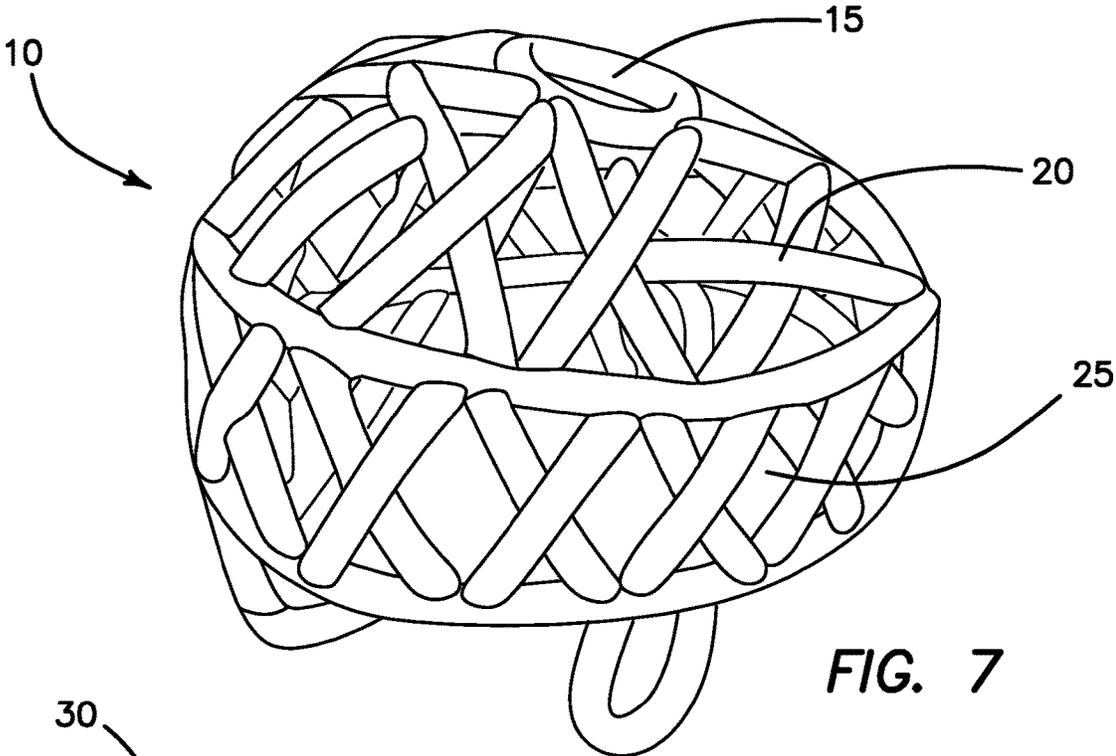


FIG. 7

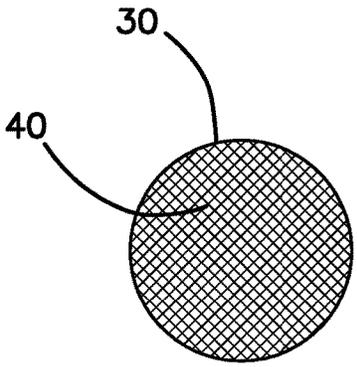


FIG. 8

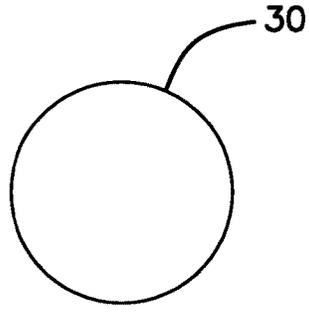


FIG. 9

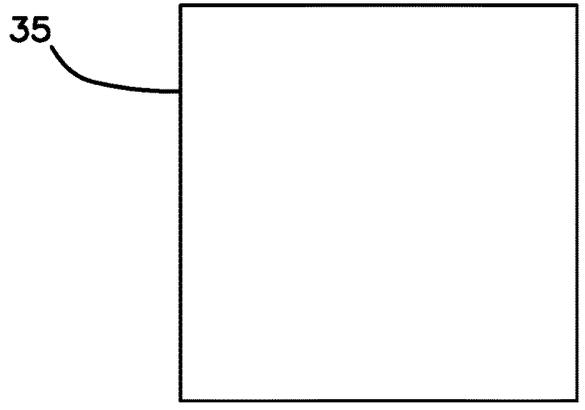


FIG. 10

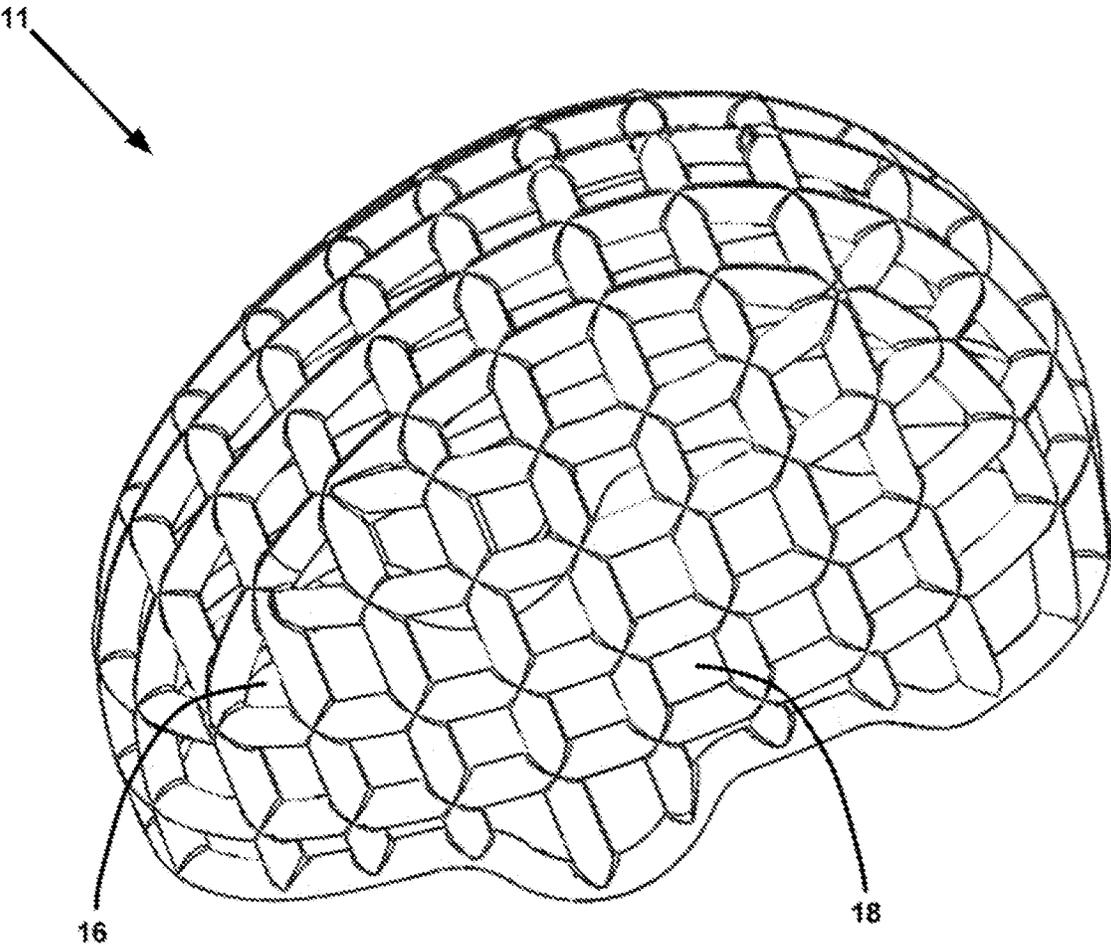


FIG. 11

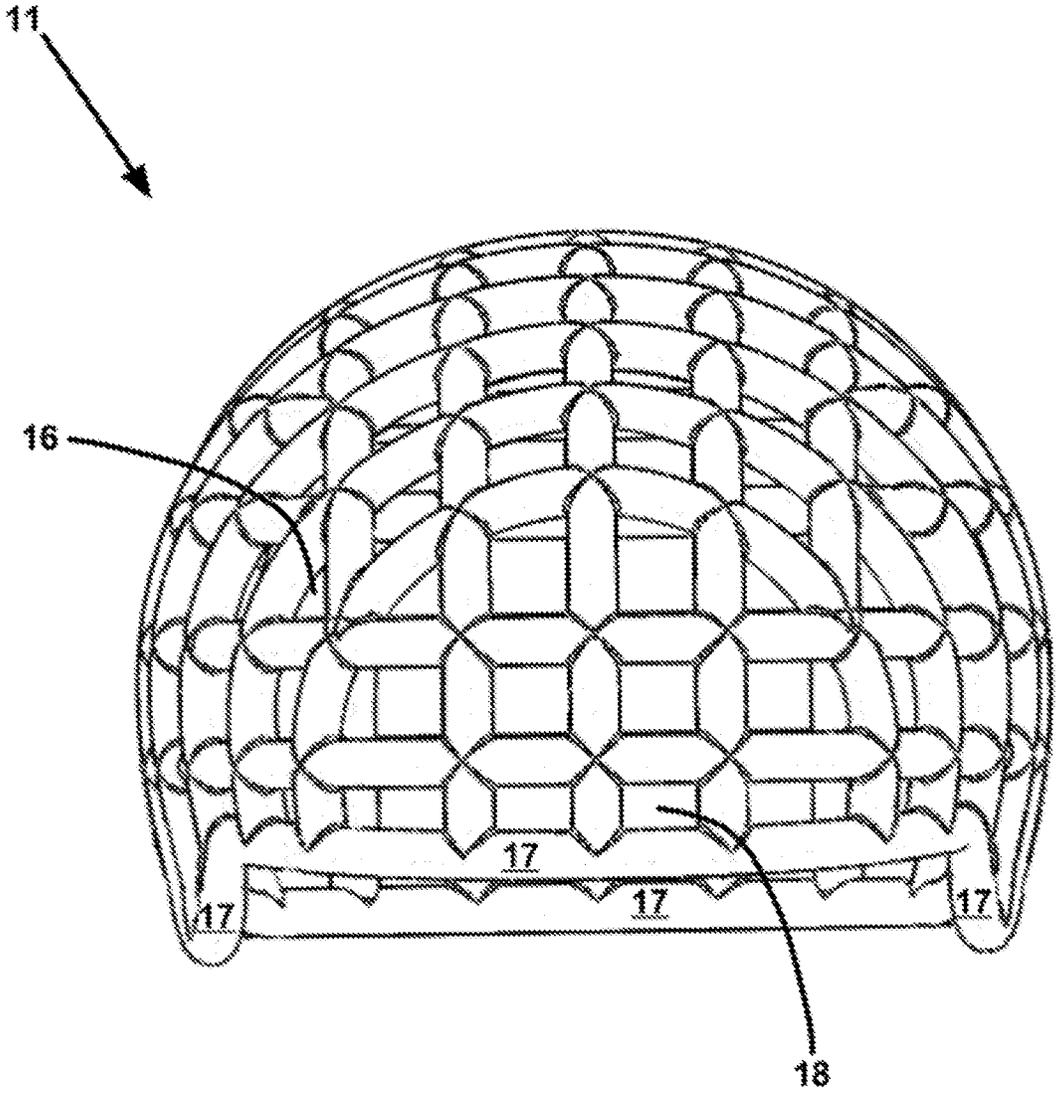


FIG. 12

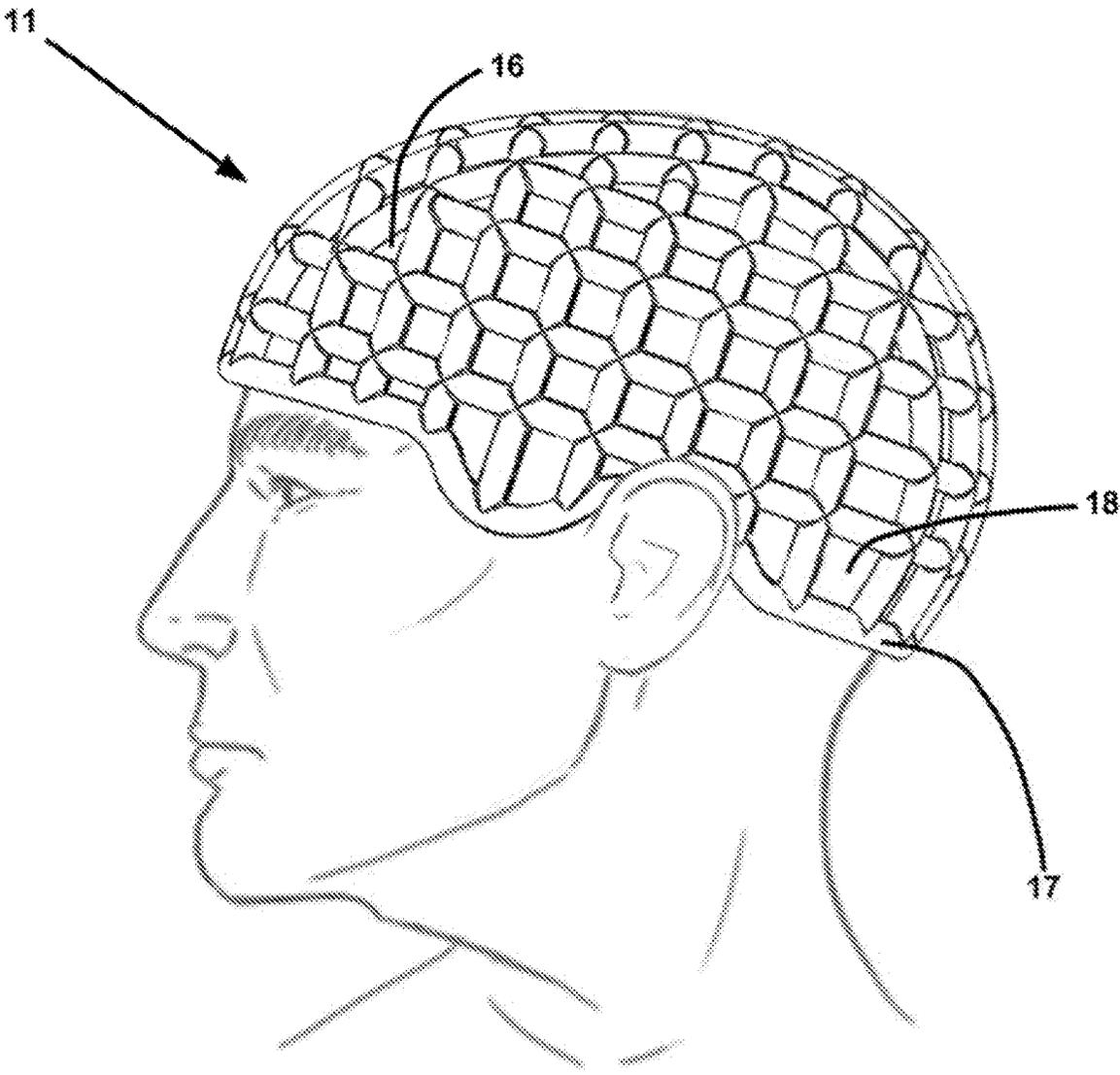


FIG. 13

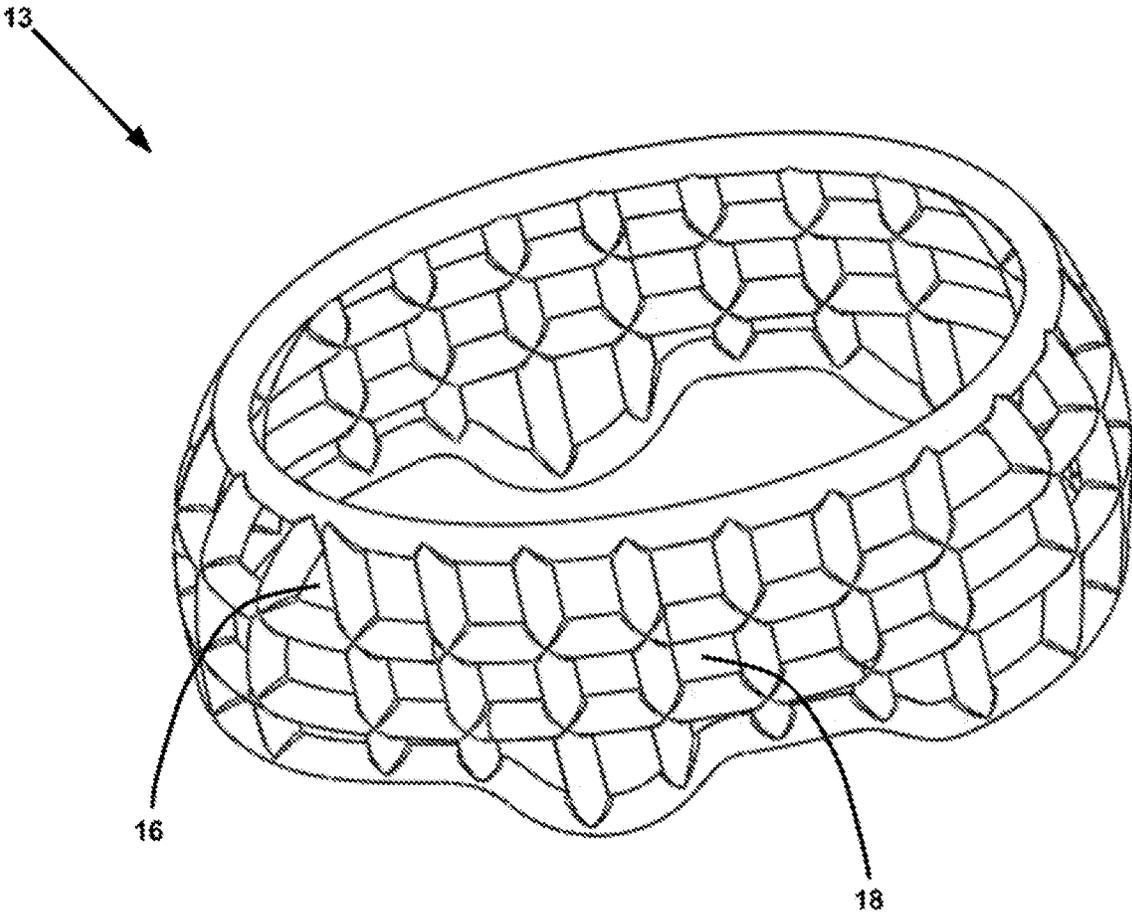


FIG. 14

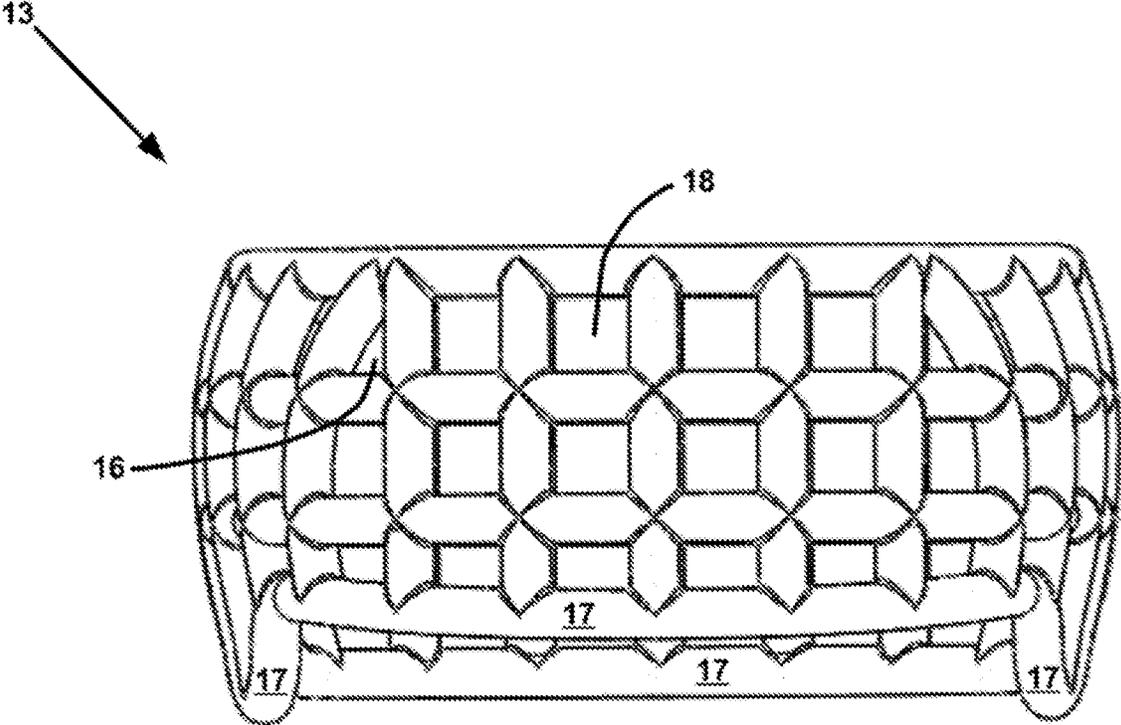


FIG. 15

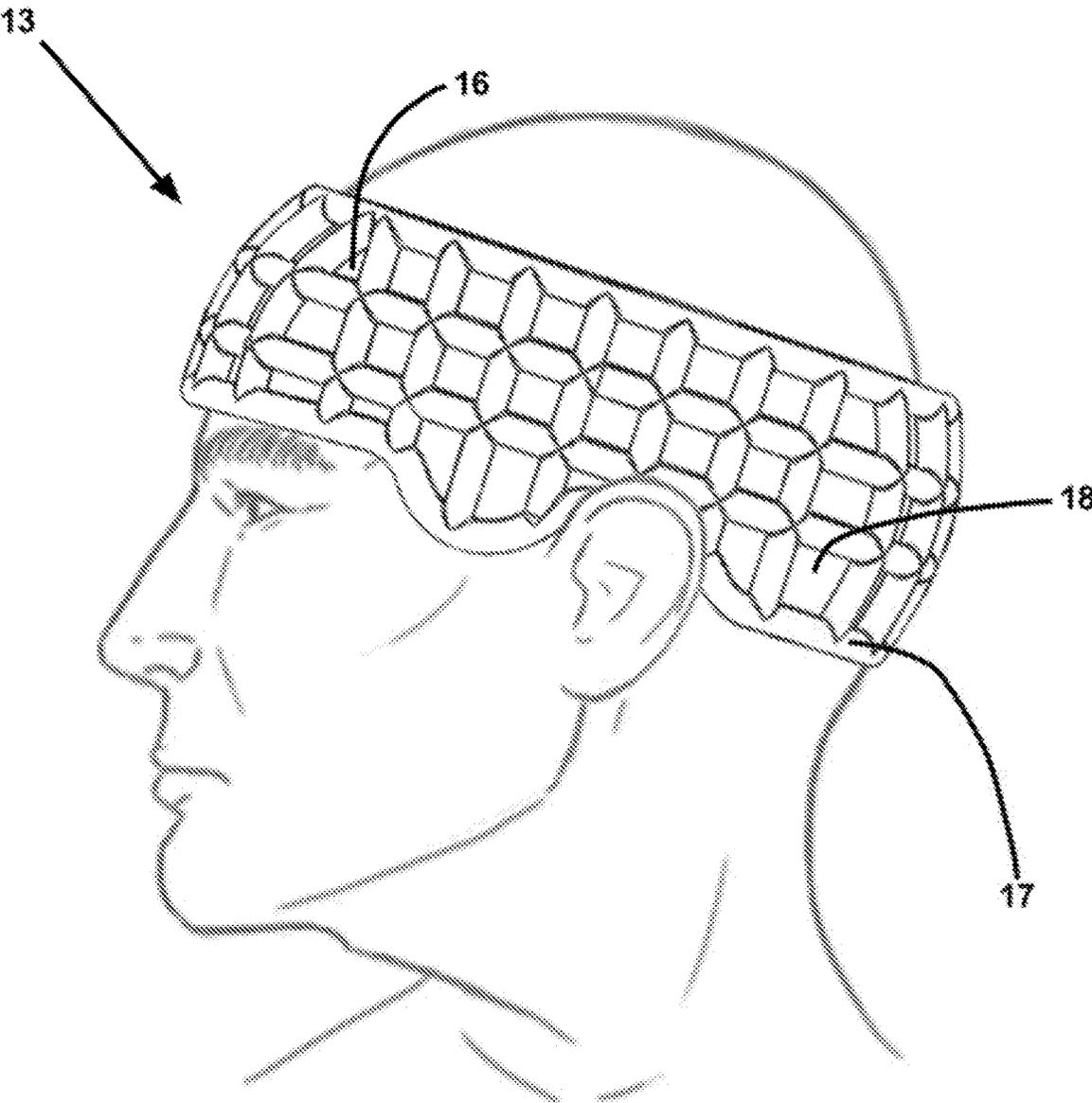


FIG. 16

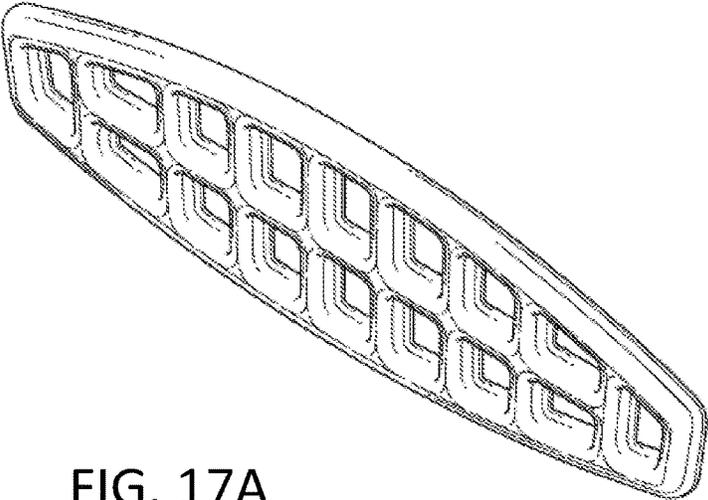


FIG. 17A

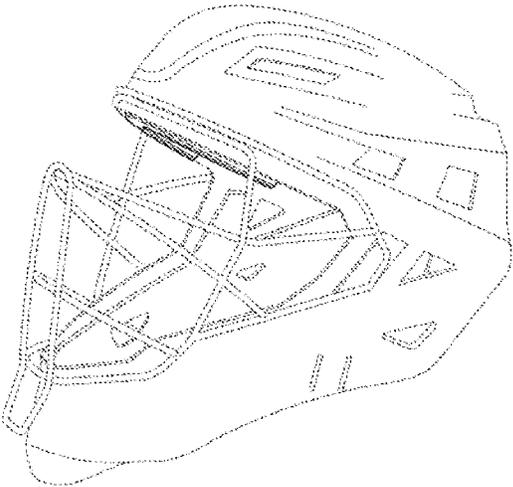


FIG. 17B

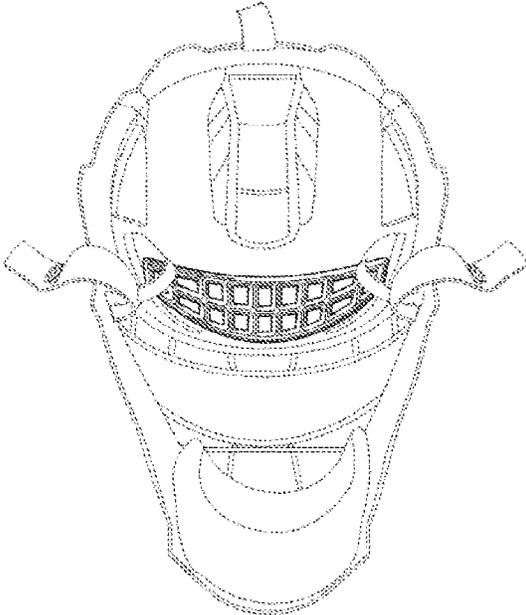


FIG. 17C

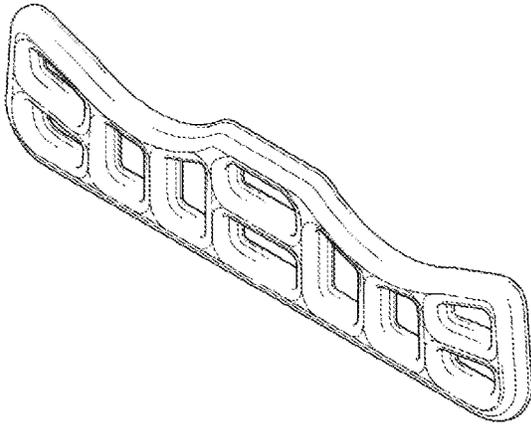


FIG. 18

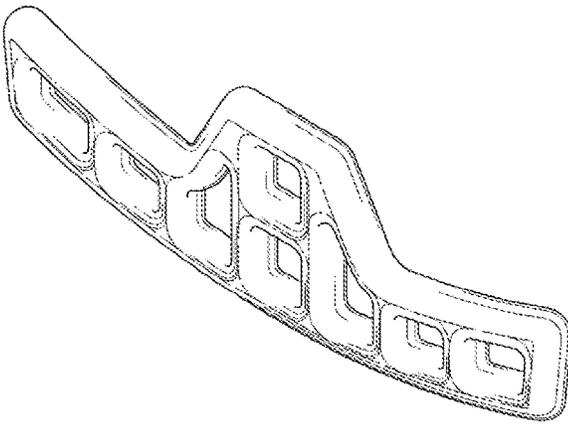


FIG. 19

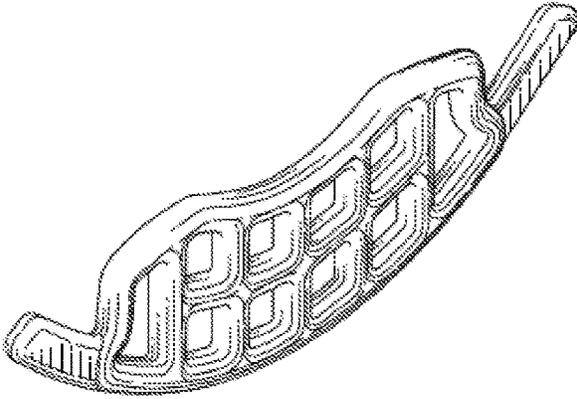


FIG. 20

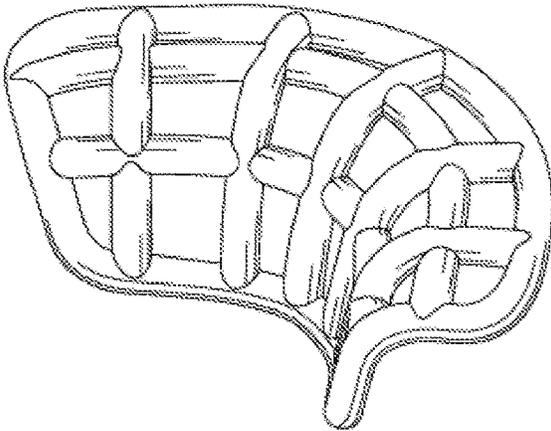


FIG. 21A

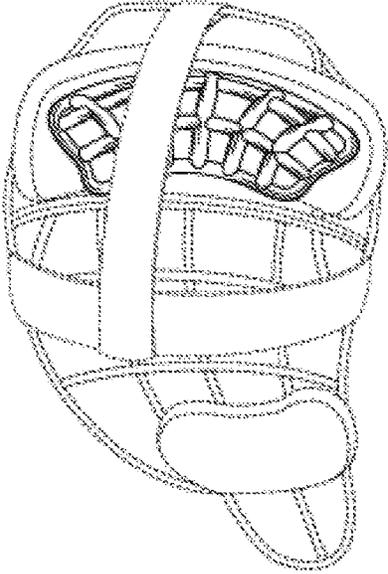


FIG. 21B

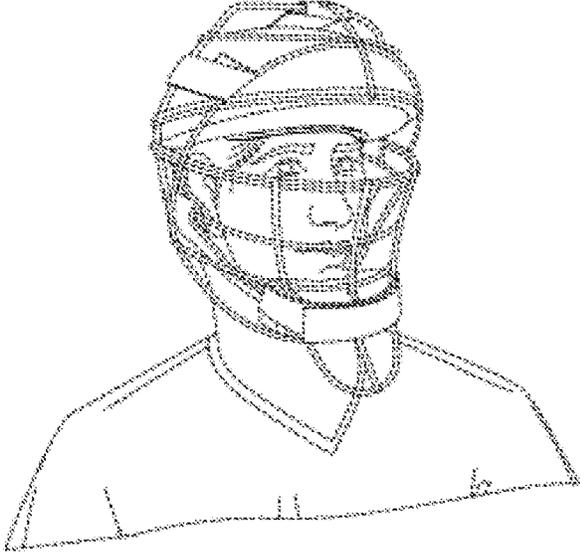


FIG. 21C

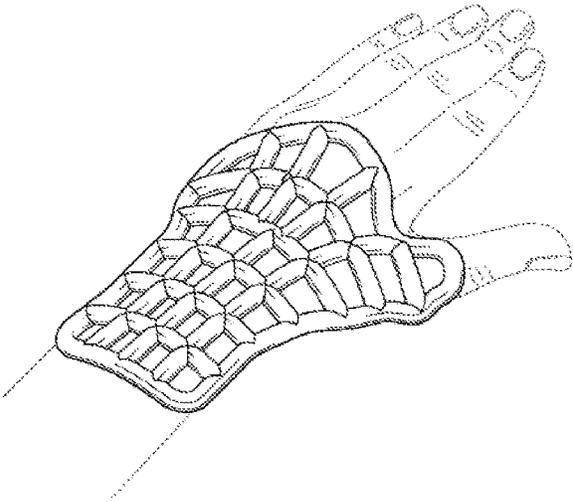


FIG. 22

HEAD PROTECTOR

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of commonly owned and copending U.S. application Ser. No. 15/401,589 filed Jan. 9, 2017. This application is also a continuation-in-part of commonly owned and copending U.S. application Ser. No. 29/664,287 filed Sep. 24, 2018, which is a continuation in part of commonly owned and copending U.S. application Ser. No. 15/401,589 filed Jan. 9, 2017, the disclosures of all of which are hereby incorporated by reference in their entirety.

TECHNICAL FIELD

[0002] This disclosure relates to a head protector or protective headgear enhancer for wearing under a hat, cap, helmet, mask, or similar headgear.

BACKGROUND

[0003] Protective headgear and similar protective equipment often includes a hard outer shell with interior padding to reduce and/or distribute the force of an impact and reduce the potential for injury to the user. However, recent data suggests that traditional protective gear may be insufficient to reduce the occurrence of concussion or other mild traumatic brain injury. Furthermore, some sports, such as water polo, do not traditionally use headgear designed to mitigate impact forces and/or reduce the incidence of concussion.

SUMMARY

[0004] Embodiments according to the disclosure may include a molded protector or enhancer made of a thermoplastic elastomer (TPE), which may include a styrene ethylene butylene styrene (SEBS) material to provide desired resiliency for comfort, force distribution, and protection while also providing suitable molding characteristics related to management of flash, demolding, and deforming. According to one embodiment, a head protector comprises a plurality of elements molded in a grid or connected geometric shapes with an outer diameter of the elements ranging from about 6 mm ($\frac{1}{4}$ inch) to about 16 mm ($\frac{5}{8}$ inch). The elements are formed of a material having a range from 40-90 durometer. The elements form a pattern containing openings of at least $\frac{3}{8}$ of an inch in width. The elements may have either a solid, generally homogeneous cross-section or may be made of a material providing sponge-like cross-section with regular or irregular pockets or cells. The headgear or enhancer may be constructed of natural or synthetic rubber including TPE, SEBS, SEPS, or other polyolefinic rubber, EPDM rubber, silicone, or KRATON polymers. In one or more embodiments, the headgear or enhancer weighs between 2-9 ounces. The headgear may be configured for securing to a mask or helmet to provide additional cushioning and related protection to the forehead of a user. Alternatively, the headgear may be configured to conform to the head of the user and be worn under a hat, cap, or similar headwear.

[0005] In one or more embodiments, the headgear or enhancer may be configured to conform to a user's head and be made of resilient material so that it remains in place during use without requiring securing straps. This facilitates use under headwear such as a baseball cap, water polo cap,

or similar headwear to provide additional cushioning and/or protection from impact forces. The material provides a customizable fit that provides additional protection for the head and a comfortable fit to the user. Embodiments may also include protectors or enhancers for various other body parts, such as the hand/wrist, for example.

[0006] In one embodiment, a protective headgear comprises a network of molded segments forming a single unitary construction of connected polygons, the network configured to form a headband having a width of between 2-10 cm with an open top and bottom, the segments molded of a resilient material and having an outer diameter ranging from 5-17 mm and a hardness ranging from 15-60 Shore A Hardness scale.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Various embodiments of the claimed subject matter are described in detail with reference to the following figures. The drawings are provided for purposes of illustration only and merely depict typical or example embodiments. These drawings are provided to facilitate the reader's understanding and shall not be considered limiting of the breadth, scope, or applicability of the claimed subject matter. It should be noted that for clarity and ease of illustration these drawings are not necessarily made to scale.

[0008] Some of the figures included herein illustrate various embodiments from different viewing angles. Although the accompanying descriptive text may refer to such views as "front", "rear", "top," "bottom" or "side" views, such references are merely descriptive and do not imply or require that the claimed subject matter be implemented or used in a particular spatial orientation unless explicitly stated otherwise.

[0009] FIG. 1 is a left side view of a head protector or headgear enhancer constructed and assembled in accordance with one embodiment, shown in position as worn by a user.

[0010] FIG. 2 is a bottom perspective view of the inside of the top of the head protector of FIG. 1, showing a grid or network of resilient elements molded in a unitary construction.

[0011] FIG. 3 is an angled back view of the head protector of FIG. 1 illustrating a pattern in the shape of an X which continues from the front of the headgear to the back of the headgear.

[0012] FIG. 4 is a front view of the head protector of FIG. 1.

[0013] FIG. 5 is a right side view of the head protector of FIG. 1, illustrating that the back side of the headgear is configured to the back of a head while the front allows for an opening so a user can see

[0014] FIG. 6 is a rear view of the head protector of FIG. 1.

[0015] FIG. 7 is a right side elevational view of the head protector of FIG. 1.

[0016] FIG. 8 is a cross-section of a representative element for protective gear having a circular shape with a sponge-like material having an outer diameter of between about 6 mm and about 16 mm.

[0017] FIG. 9 is a cross-section of a representative element for protective gear having a circular shape with a generally uniform material having an outer diameter of between about 6 mm and about 16 mm.

[0018] FIG. 10 is a cross-section of a representative element having a rectangular shape with a generally uniform or homogeneous material.

[0019] FIG. 11 is an upper left side isometric view of a second embodiment of a molded head protector according to the disclosure.

[0020] FIG. 12 is a front view of the second embodiment of the head protector.

[0021] FIG. 13 is a side view of the second embodiment of the head protector as worn by a user.

[0022] FIG. 14 is an upper left side isometric view of a third embodiment of the head protector according to the disclosure.

[0023] FIG. 15 is a front view of the third embodiment.

[0024] FIG. 16 is a side view of the third embodiment.

[0025] FIG. 17A illustrates a protector or headgear enhancer according to one embodiment of the disclosure.

[0026] FIGS. 17B and 17C illustrate side and rear views, respectively, of the embodiment of FIG. 17A installed in a baseball catcher's helmet.

[0027] FIGS. 18-20 illustrate alternative embodiments of a protector or headgear enhancer according to the disclosure.

[0028] FIG. 21A illustrates another embodiment of a protector or headgear enhancer according to the disclosure;

[0029] FIG. 21B is a rear view illustrating the headgear enhancer embodiment of FIG. 21A installed in a baseball catcher's or umpire's mask.

[0030] FIG. 21C is a front view illustrating the embodiment of FIG. 21A in use in a baseball catcher's or umpire's mask.

[0031] FIG. 22 is an alternative embodiment of a protective gear enhancer configured to be worn over the wrist of a user according to the disclosure.

DETAILED DESCRIPTION

[0032] As generally depicted in FIGS. 1-7, one embodiment of a protective headgear enhancer or a head protector 10 for protection of the human head, having a network of deformable elements is shown. FIGS. 1-7 show an embodiment that may be molded to have single, unitary construction of various types of natural or synthetic rubber or silicone, which may include TPE, SEBS, SEPS, or other polyolefinic rubber, EPDM rubber, or KRATON polymers, for example. The elements that form the protective network or mesh have a hardness as measured by a durometer of between 40-90 on the Shore A Hardness scale. In one embodiment, the head protector 10 ranges from 2-9 ounces in weight to provide suitable comfort and associated protection from impact forces. In one example embodiment, the elements form a mesh or network pattern 20 in the shape of an X. In other embodiments, the elements form connected polygons such as squares, rectangles, trapezoids, etc.

[0033] In the embodiment of FIG. 1, at least some of the elastomeric elements form a pattern 20 in the shape of an X around a circular element 15 in the center of the head, each containing openings of at least 9.5 mm ($\frac{3}{8}$ inch) in width 25. FIG. 1 also shows how the head protector 10 fits securely on a head without requiring straps.

[0034] Referring to FIG. 2, the interior of the top of the device, has a circular element 15 in the center and a network of elements extending outward across the top of the headgear 10, forming a pattern 20 in the shape of an X. FIGS. 3 and 6 depict a back view looking through the openings of at least 9.5 mm ($\frac{3}{8}$ inch) in width 25. The X pattern 20

continues from the front to the back of the head gear. FIG. 4 is a front view and FIG. 5 is a right side view of the head gear embodiment of FIG. 1. FIGS. 4-5 illustrate that the back side of the headgear is configured to cover the back of a user's head, while the front allows for an opening for the face. FIG. 7 is a right side elevational view of the headgear, further illustrating that the back side is longer than the front side, as there is a slight downward slope from the center of the device to the front. FIGS. 8-10 depict cross-sectional views of representative elements forming a single, unitary construction of the molded headgear. FIGS. 8-9 illustrate elements having circular cross-sections 30 and FIG. 10 illustrates elements having a rectangular cross-section 35. Depending on the particular application and implementation, elements of a single enhancer or protector may have different cross-sectional shapes and/or sizes. FIG. 8 illustrates a cross-section of an element molded with a sponge-like interior with the outer diameter of the elements ranging from about 6 mm ($\frac{1}{4}$ inch) to about 16 mm ($\frac{5}{8}$ inch) 40. FIGS. 9-10 illustrate elements having a generally uniform or solid cross-section.

[0035] FIG. 11 shows a second embodiment of a head protector identified as reference 11. Head protector 11 is designed to protect the circumference about the head defined by the upper and lower boundaries of the forehead, temples on both sides of the head, and the crown of the head above the upper boundary of the forehead. Head protector 11 uses a network of geometric shapes that are for the most part either triangular elements 16 or rectangular elements 18. Rectangular elements 18 protect those portions of the head that is relatively smooth while triangular elements 16 protect those portions of the head that angles more sharply. The combinations of triangular elements 16 and rectangular elements 18 may be altered to accommodate varying head shapes from children to adult. The edges of a triangular element 16 or a rectangular element 18 have a durometer of 15-60 on the Shore A Hardness scale. The triangular elements 16 and rectangular elements 18 are connected and molded to form a unitary construction that when head protector 11 is impacted by an object the force of the impact is distributed throughout the network of connected triangular elements 16 and rectangular elements 18 thus reducing the pressure from the impact on the head of the user. The length of one edge of a triangular element 16 or a rectangular element 18 is at least 9.5 mm ($\frac{3}{8}$ inch).

[0036] FIG. 12 shows a front view of head protector 11. Lower lateral element 17 is designed to run parallel and above the user's eyebrows, curve downward both sides of the head over the temples, and then complete the circuit behind the head. The network or mesh of elements forming polygons including triangular elements 16 and rectangular elements 18 protecting the circumference about the head defined by the upper and lower boundaries of the forehead, temples on both sides of the head, and the crown of the head above the upper boundary of the forehead.

[0037] FIG. 13 shows a left side view of head protector 11 as worn by a user. Lower lateral element 17 is shown positioned above the user's eyebrows, passing over the user's temples, and arching above the ear before passing about the back of the user's head. The network or mesh of elements including triangular elements 16 and rectangular elements 18 protecting the circumference about the head defined by the upper and lower boundaries of the forehead,

temples on both sides of the head, and the crown of the head above the upper boundary of the forehead.

[0038] FIG. 14 shows a third embodiment of a head protector identified as reference 13. Headgear enhancer or head protector 13 is designed to protect the circumference about the head defined by the upper and lower boundaries of the forehead and the temples on both sides of the head. Head protector 13 uses a network of geometric shapes that are for the most part either triangular elements 16 or rectangular elements 18. Rectangular elements 18 protect those portions of the head that is relatively smooth or flat while triangular elements 16 protect those portions of the head that includes sharper slopes or contours. The combinations of molded triangular elements 16 and rectangular elements 18 may be altered to accommodate varying head shapes from children to adult. The edges of a triangular element 16 or a rectangular element 18 have a durometer of 15-60 Shore A Hardness. The triangular elements 16 and rectangular elements 18 are molded of unitary construction in communication with each other such that when head protector 11 is impacted by an object the force of the impact is distributed to reduce pressure (force/unit area) on the head in an effort to mitigate head injury as well as mild traumatic brain injury including concussion.

[0039] FIG. 15 shows a front view of head protector 13. Lower lateral element 17 is designed to run parallel and above the user's eyebrows, curve downward both sides of the head over the temples, and then complete the circuit behind the head. Again is shown a network of triangular elements 16 and rectangular elements 18 protecting the circumference about the head defined by the upper and lower boundaries of the forehead and the temples on both sides of the head.

[0040] FIG. 16 shows a left side view of head protector 13 as worn by a user. Lower lateral element 17 is shown positioned above the user's eyebrows, passing over the user's temples, and arching above the ear before passing about the back of the user's head. Reshown is the network of triangular elements 16 and rectangular elements 18 protecting the circumference about the head defined by the upper and lower boundaries of the forehead and the temples on both sides of the head.

[0041] As illustrated in FIGS. 14-16, head protector 13 forms a headband extending about the circumference of the head between the brow line and top of the forehead with an open crown and extensions extending downward on either side of the ears. In another embodiment not specifically illustrated, the front extension covering the temple area is omitted.

[0042] FIGS. 17-22 illustrate protective gear enhancers configured to distribute impact forces and reduce injury according to the disclosure. Similar to the previously described embodiments, the protective gear enhancers include a connected network or mesh of elements molded of a resilient material such as previously described to form a single unitary construction. The embodiments illustrated in FIGS. 17-22 may be secured to or beneath protective gear having a hard outer shell. Enhancers illustrated in FIGS. 17-21 may be secured by associated straps, adhesive, hook/loop, or other means within a mask or helmet, such as a baseball catcher's helmet or a baseball catcher's mask, or umpire's mask, for example. Unlike the protective headgear embodiments illustrated in FIGS. 1-16, the enhancers of FIGS. 17-21 extend only across the forehead of the user and

are secured in place by an outer helmet or mask. The enhancers of FIGS. 17-21 are configured to cover the forehead and extend from approximately tangent to the eye sockets across the forehead.

[0043] The enhancer in the embodiment of FIG. 22 may be secured beneath a baseball batter's wrist protector, for example.

[0044] FIG. 17A illustrates a protector or headgear enhancer according to one embodiment of the disclosure. FIGS. 17B and 17C illustrate side and rear views, respectively, of the embodiment of FIG. 17A installed in a baseball catcher's helmet.

[0045] FIGS. 18-20 illustrate alternative embodiments of a protector or headgear enhancer according to the disclosure. The alternative embodiments illustrated include various geometries to accommodate placement within various types and styles of helmets or headgear such as worn in baseball or hockey, for example.

[0046] FIG. 21A illustrates another embodiment of a protector or headgear enhancer according to the disclosure that may be secured within a face mask or protector. FIG. 21B is a rear view illustrating the headgear enhancer embodiment of FIG. 21A installed in a baseball catcher's or umpire's mask, and FIG. 21C is a front view illustrating the embodiment of FIG. 21A in use in a baseball catcher's or umpire's mask.

[0047] While exemplary embodiments are described above, it is not intended that these embodiments describe all possible forms encompassed by the claims. The words used in the specification are words of description rather than limitation, and it is understood that various changes can be made without departing from the spirit and scope of the disclosure. As previously described, the features of various embodiments can be combined to form further embodiments of the invention that may not be explicitly described or illustrated. While various embodiments could have been described as providing advantages or being preferred over other embodiments or prior art implementations with respect to one or more desired characteristics, those of ordinary skill in the art recognize that one or more features or characteristics can be compromised to achieve desired overall system attributes, which depend on the specific application and implementation. These attributes may include, but are not limited to cost, strength, durability, life cycle cost, marketability, appearance, packaging, size, serviceability, weight, manufacturability, ease of assembly, etc. As such, embodiments described as less desirable than other embodiments or prior art implementations with respect to one or more characteristics are not outside the scope of the disclosure and can be desirable for particular applications.

What is claimed is:

1. A protective head gear, comprising:

a network of segments that define the outer boundary of triangular elements and rectangular elements;

said network configured to cover the circumference about the head defined by the upper and lower boundaries of the forehead, the temples on both sides of the head, and the crown of the head;

said segments molded together to form a single, unitary construction and configured to distribute forces resulting from an impact;

said segments having an outer diameter ranging from 5-17 mm and having a hardness ranging from 15-60 Shore A Hardness scale.

* * * * *