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(54) **INTERLOCKING IMPACT PROTECTION SYSTEM FOR CONTACT SPORTS**

INEINANDERGREIFENDES AUFPRALLSCHUTZSYSTEM FÜR KONTAKTSPORTARTEN

SYSTÈME DE PROTECTION CONTRE UN IMPACT À VERROUILLAGE POUR SPORTS DE CONTACT

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to athletic safety and injury prevention. More particularly, the present invention relates to an impact protection device to be worn by an athlete participating in a contact sport, such as American football.

SUMMARY OF THE INVENTION

[0002] Many sports, such as American football, inherently involve physical contact between players, with the ground, and/or with equipment. Numerous efforts have been made to prevent or at least reduce the occurrence of injuries to players as a result of such contact. Protective equipment such as helmets, shoulder pads, and pads have been used for protecting portions of the body of athletes. Such protective equipment has often been constructed, at least in part, of a compressible material such as foam. These types of equipment have decreased, but not completely eliminated, injuries occurring due to playing and/or practicing contact sports such as American football.

[0003] The use of protective equipment has been mandated by various organizations that promulgate the rules of contact sports for participants. Often, the very athletes at risk for injury resist the use of additional protective equipment, whether mandated or voluntary. While every individual athlete may have his or her own reason for eschewing required or suggested protective gear, common explanations are complaints that the protective gear is uncomfortable, restricts motion, distracts the athlete, or otherwise negatively impacts the athlete's performance.

[0004] Accordingly, athletes participating in contact sports with a risk of injury may benefit from improved protective gear that protects the athlete from injury with minimal or no negative impact on the athlete's performance. Such protective gear should be comfortable and permit a full range of movement by the wearer, while still providing sufficient protection from impacts that may typically occur during participation in the sport.

[0005] US 4479269 discloses a protective device but does not disclose tab backers in accordance with the present invention.

[0006] A protective device in accordance with the present invention provides improved impact protection for athletes participating in contact sports such as American football, soccer (world football), hockey, lacrosse, or any other contact sport permitting participants to wear protective gear. A protective device in accordance with the present invention may be particularly suitable for protecting large muscle areas of the wearer from impact, but may be used to protect other portions of a wearer's anatomy without the party from the scope of the present invention. One example of a large muscle area that may be protected using a device in accordance with the present invention are the thighs of an American football player.

[0007] Protective devices in accordance with the present invention comprise at least two interlocking components that join along interlocking edge(s) in accordance with claim 1. Each component is shaped in three dimensions to conform to a sub-portion of the anatomy of the wearer to be protected, such that when the components are interlocked the protective device conforms to the portion of the anatomy to be protected when worn. Components of a protective device may be fabricated from semi-rigid, impact resistant materials. Examples of suitable materials may be various nylons, acrylonitrile butadiene styrene (ABS), polypropylene, copolyesters, moldable carbon fibers, plastics, composites, rubbers, nylons, elastomers, and the like. Interlocking edges of components may mechanically and/or frictionally retaining the components together along the interlocking edge(s) while still permitting a degree of flex or movement along the interlocking edge(s). Interlocking edges provide a plurality of tabs and notches that mate with corresponding notches and tabs of an interlocking edge of an adjacent component. A protective device may comprise any number of components and any number of interlocking edges.

BRIEF DESCRIPTION OF THE DRAWING

[0008] The drawings described herein are for illustrative purposes only of selected examples.

FIG. 1 illustrates a football player that may wear a protective device in accordance with the present invention;

FIGS. 2A-2C illustrate an example of a protective device in accordance with the present invention formed by interlocking components;

FIG. 3 illustrates a further example of a protective device in accordance with the present invention formed by interlocking components;

FIG. 4 illustrates an example of interlocking edges that may be used for components of a protective device, which is not part of the present invention; and

FIGS. 5A-5C illustrate a further example of interlocking edges that may be used for components of a protective device in accordance with the present invention;

FIG. 6 illustrates yet a further example of a protective device in accordance with the present invention;

FIGS. 7A-7B illustrate yet a further example of a protective device which is not part of the present invention; and

FIG. 8 illustrates yet a further example of a protective device which is not part of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0009] Referring now to FIG. 1, an athlete 100 wearing protective gear is illustrated. In the example shown in FIG. 1, the athlete 100 is an American football player, but athletes participating in any other contact sport may likewise benefit from protective devices in accordance with the present invention. Player 100 is shown wearing a helmet 110 and shoulder pads 120 beneath a jersey 102. In the example shown in FIG. 1, player 100 is also wearing chest protection 130, which may comprise a flak jacket or similar item, and abdominal protection 140 beneath jersey 102. Player is further illustrated wearing a right elbow pad 150 and a left elbow pad 152. Player 100 is also wearing a right thigh pad 160 and a left thigh pad 162 and a right knee pad 170 and a left knee pad 172 beneath pants 104. Pants 104 may have pockets (not shown) on either the outside or, more typically, the inside to retain pads such as thigh pads 160, 162 and knee pads 170, 172. Player 100 is further shown wearing shoes 108 and socks 106. While not currently typical in American football, socks 106 may retain additional pads such as a shin pad (not shown) as more commonly occurs for soccer.

[0010] While the example shown in FIG. 1 depicts an American football player 100 wearing specific examples of protective devices, the present invention is not limited to American football or the protective devices illustrated in the present example. Subsequent examples described below provide effective devices that may be used as thigh pads 160, 162, but protective devices in accordance with the present mention may be used in conjunction with other types of protection provided in the example shown in FIG. 1 or to protect portions of the wearer's anatomy other than those shown in the example of FIG. 1.

[0011] Referring now to FIGS. 2A-2C, an example of a protective device 200 formed from interlocking components in accordance with the present invention is illustrated. A protective device 200 may comprise a first component 210 and a second component 220 joined along an interlocking edge connection 230. Protective device 200 may have a thickness 214 that may be constant or may vary at different locations on protective device 200. Protective device 200 may have a three-dimensional shape when component 210 and a second component 220 are assembled along interlocking edge connection 230. The three-dimensional shape of protective device 200 may be determined by the portion of a wearer's anatomy to be protected by protective device 200. The three dimensional shape of protective device 200 may comprise a complex curve in three dimensions to conform to the portion of the wearer's anatomy to be protected by protective device 200. The first component 210 may conform to a sub-portion of the anatomy to be protected by protective device 200, and the second component 220 may conform to a second sub-portion of the anatomy to be protected by protective device 200. For example, first component 210 may conform to a medial portion of a thigh 290 while second component 220 may conform to a lateral portion of a thigh 290. The dimensions of the assembled protective device 200 and any and all components (such as first component 210 and second component 220) may also vary based upon the type of material used, the portion of a wearer's anatomy to be protected when the device is worn, the sport for which the protective device is to be used, the gender/size/position played by the athlete wearing the device, the types of impacts intended to be protected against, etc. In the example of a protective device 200 intended to be worn by an adult male American football player to protect his thigh, appropriate dimensions for an assembled protective device in accordance with the present invention may be between approximately 15 and 20 centimeters from top to bottom in an as worn position, between approximately 10 and 22 centimeters from side to side in an as worn position, and up to several millimeters in thickness. Other dimensions may be used for devices to protect different body parts, and the thickness of a protective device in accordance with the present invention may vary from about 1 to 3 millimeters for some material selections and uses to a centimeter or more for other materials (such as layers involving compressible materials) and uses. As shown in the examples of FIGS. 2A-2C, protective device 200 has a concave side 270 and a convex side 280. In the example of a thigh pad as illustrated in the example of FIGS. 2A-2C, concave side 270 may partially enclose the thigh of a wearer, either directly or indirectly. Protective device 200 may be retained in position to protect the desired anatomical portion of a wearer using garments, sleeves, tape, adhesives, straps, or any other mechanism. In the present example, may comprise a thigh pad retained within a pocket of pants 104 to be retained over a thigh 290 of a wearer.

[0012] Various materials may be used to form first component 210, second component 220, and any additional components used to form an interlocking protective device in accordance with the present invention. Different sports, athletes, and/or portions of a wearer's anatomy may require different physical properties for a protective device in order to protect against the impacts likely to be encountered by the wearer. Examples of suitable materials are various nylons, acrylonitrile butadiene styrene (ABS), polypropylene, copolyesters, moldable carbon fibers, plastics, rubbers, composites, and the like.

[0013] Referring now to FIG. 3, a further example of a protective device 300 in accordance with the present invention is illustrated. The example protective device 300 comprises a first component 310, a second component 320, and a third component 330. A first interlocking edge connection 340 may join first component 310 to second component 220, while a second interlocking edge connection 350 may join second component 320 to third component 330. In this example, protective device 300 possesses a top terminal edge 391 and a bottom terminal edge 392 comprised of a portion of each of first component 310, second component 320, and third component

330. The other hand, protective device 300 possesses a first side edge 393 comprised entirely of first component 310 and a second side edge 394 comprised entirely of third component 330. In this example, protective device may have a height 301 and a width 302 conforming to the anatomical portion to be protected when the device 300 is worn, while device may have a thickness 303 selected based upon the material(s) used and the types of impacts anticipated while the device 300 is worn.

[0014] While the examples depicted herein show interlocking edge connections that extend in a substantially vertical fashion, other types of interlocking edge connections may be utilized for protective devices in accordance with the present invention. For example, interlocking edge connections may extend substantially horizontally, diagonally, or in an irregular fashion. Further, different orientations of interlocking edge connections may be used to join different components of a single protective device in accordance with the present invention.

[0015] Referring now to FIG. 4, an example of a protective device 400 comprised of a first component 410 in a second component 420 is shown with the first component 410 and second component 420 not interlocked to form an interlocking edge connection. This example is not part of the invention. Interlocking edge 431 of first component 410 may comprise a plurality of tabs 412 and a plurality of notches 413 that mate with a plurality of tabs 422 and a plurality of notches 423 that comprise interlocking edge 432 of second component 420. The mating of the first interlocking edge 431 of the first component 410 with the second interlocking edge 432 of the second component 420 may form an interlocking edge connection when protective device 400 is assembled.

[0016] Protective device 400 may have an assembled height 401 of between approximately 15-20 centimeters, an assembled width 402 of approximately 10-22 centimeters, and a thickness 403 of approximately 1-5 millimeters. Each tab 412, 422 may extend a length 404 from an adjoining notch 413, 423. Tab length 404 may be approximately 2 centimeters, or within a range of about 1-3 centimeters for the present example.

[0017] The frictional force between first interlocking edge 431 and second interlocking edge 432 may secure first component 410 to second component 420. The connection between first component 410 and second component 420 may be further enhanced by a property referred to as 'stiction,' whereby materials in contact resist moving laterally with one another. The materials selected to form the components of a protective device in accordance with the present invention may, in some examples, comprise materials with high stiction properties. For example, copolyesters may have particularly desirable stiction properties for use in protective devices in accordance with the present invention. One example of a suitable copolyester is available from Eastman Chemical Company under the trade name TRITAN. Further, the structural integrity of an interlocking edge connection between a first component 410, a second component 420, or any number of components utilized in a protective device in accordance with the present invention may be enhanced by the structure, such as a pocket, that retains a protective device over the portion of the wearer's anatomy to be protected. However, the presence of an interlocking edge connection, rather than a single continuous component, may provide a degree of flexibility along the interlocking edge connection, thereby enhancing the comfort and mobility of the wearer.

[0018] Referring now to FIGS. 5A-5C, a further example of the interlocking edges 531, 532 of a first component 510 and a second component 520 of a protective device 500 in accordance with the present invention is illustrated. In this example, first component 510 has a first interlocking edge 531 comprising a plurality of tabs 512 and a plurality of notches 533. Second component 520 has an interlocking edge 532 comprising a plurality of tabs 522 and a plurality of notches 523 that mate with the corresponding tabs 512 and notches 533 of the first interlocking edge 531 of the first component 510. To provide further strength of the interlocking edge connection formed by mating first interlocking edge 531 and second interlocking edge 532, the notches 523 of the second interlocking edge 532 possess a thin backer 570 that further mates with tabs 512 of the first interlocking edge 531. As can be seen more particularly with regard to FIGS. 5B and 5C, tabs 512 may have a thickness 591 corresponding to a notch thickness 592 that is less than the thickness 590 of first component 510 and second component 520. Tab thickness 591 may be at least as thick as backer thickness 593, and tab thickness 591 may be greater than, for example by fifty percent, backer thickness 593. Accordingly, first interlocking edge 531 and second interlocking edge 532 may engage along three dimensions to provide a stronger interlocking edge connection between first component 510 and second component 520 than may be attainable without backers 570. In some examples of a protective device in accordance with the present invention backers may be additionally provided in notches 533 of first interlocking edge 531. If used, backers need not be present for all of the notches of a given interlocking edge.

[0019] Referring now to FIG. 6, yet a further example of a portion of a protective device 600 in accordance with the present invention is shown. Protective device 600 may comprise a first component 610 joined vertically to a second component 620 by connecting edge 660. Second component 620 may further connect laterally to fourth component 640 by connecting edge 670, and fourth component 640 may join vertically to third component 630 by connecting edge 680. In this example, first component 610, second component 620, third component 630, and fourth component 640 may connect via connecting edges 660, 670, 680 to leave a gap 690 between first component 610 and third component 630 to permit the assembled protective device 600 to flex and bend more during use than might be the case without a gap 690. If desired, a gap 690 may be used with any

number of components and/or connecting edges rather than the four illustrated in the example of FIG. 6, and any gap provided in accordance with the present invention may have a different shape, orientation, and size relative to the protective device than the example illustrated in FIG. 6. Further components of a protective device 600 beyond the four illustrated in the example shown in FIG. 6 may be assembled into a single protective device. Further, any number of gaps may be provided in the assembled protective device to enhance the flexibility of the protective device.

[0020] Referring now to FIGS. 7A-7B, a further example of a protective device 700 which is not part of the present invention is illustrated. Protective device 700 may comprise a first component 710 having a first hinge assembly 712 that mates with a second hinge assembly 722 of a second component 720. A pin 730 may be insertable through the mated first hinge component 712 and the second hinge component 722 to flexibly affix first component 710 and second component 720. The relative location, orientation, and/or size of a hinge used to affix components of a protective device in accordance with the present invention may vary from that illustrated in this example. Further, more than a single hinge may be used to flexibly affix any number of components to assemble a protective device in accordance with the present invention.

[0021] Referring now to FIG. 8, yet a further example of a protective device which is not part of the present invention is illustrated. Protective device 800 may comprise a first component 810 joined to a second component 820 by joining at least one ball 812 with at least one socket 822 to provide a flexible connection. More than a single ball and socket joint may be used in a protective device in accordance with the present invention, and one or more ball and socket joints may be used with connecting edges that are straight (as illustrated in FIG. 8), shaped in whole or in part as described in other examples herein, or shaped in any other way. The number of individual components joined using ball and socket joints may exceed the two illustrated in the example of FIG. 8. Further, the location of a ball and socket joint may differ from that shown, and may have different sizes, locations, and/or orientations relative to components of a protective device than what is shown in the present example.

[0022] Protective devices in accordance with the present invention may be formed in a variety of fashions. For example, an entire protective device may be formed via molding, machining, additive manufacturing processes, or any other technique and then cut (for example, with a saw, knife, or die) to form components with interconnecting edges. Alternatively, individual components with desired interconnecting edges may be formed via molding, machining, additive manufacturing processes, etc.

[0023] Interlocking edges for components of protective devices may have a variety of configurations beyond those described in the examples herein. Interlocking edges may comprise triangular tabs, posts and grooves, more complicated three dimensional structures than the examples provided, etc. Different degrees of protection desired, different anatomical portions to be protected, different types of sports, and/or different ability levels of athletes may benefit from different configurations of interlocking edges, different materials, and/or different configurations of protective devices in accordance with the scope of the present invention which is defined in the claims.

Claims

1. An interlocking protective device (200) to protect a portion of a wearer's anatomy, the interlocking protective structure comprising:

   a first component that extends in three dimensions and is configured to conform to a first sub-portion of the portion of the wearer's anatomy, the first component (210) having at least a first interlocking edge having a first plurality of tabs (412) and notches (413) and having tab backers (570) positioned in the notches and between the tabs of the first interlocking edge, whereby the tab backers need not be present for all of the notches of the first interlocking edge; and
   a second component (220) that extends in three dimensions and is configured to conform to a second sub-portion of the portion of the wearer's anatomy, the second component having at least a second interlocking edge having a second plurality of tabs (422) and notches (423) that interlocks with the first plurality of tabs and notches to form an interlocking edge connection (230) retaining the second component to the first component, such that the first component and the second component are configured to conform to the first sub-portion and the second sub-portion of the portion of the wearer's anatomy when the interlocking protective device is worn; and
   wherein the tabs of the second interlocking edge mate in the notches and between the tabs of the first interlocking edge and engage with the tab backers.

2. The interlocking protective device of claim 1, wherein the second component includes a first thickness and the tab of the second plurality of tabs includes a second thickness, which is thinner than the first thickness.

3. The interlocking protective device of claim 1, further comprising a third component (330) that extends in three dimensions to conform to a third sub-portion of the wearer's anatomy, and wherein: the third component further comprises a third interlocking edge

having a third plurality of tabs and notches, which mates with a fourth interlocking edge of the second component, having a fourth plurality of tabs and notches that mate with the third plurality of tabs and notches of the third interlocking edge to form a second interlocking edge connection (350).

4. The interlocking protective device of claim 3, wherein the first interlocking edge connection and the second interlocking edge connection extend in a vertical orientation with respect to one another.

5. The interlocking protective device of claim 3, wherein the third component is spaced apart from the first component.

6. The interlocking protective device of claim 1, wherein the first component and the second component are made of a copolyester.

7. The interlocking protective device of claim 1, wherein the first component and the second component are made of a nylon.

8. The interlocking protective device of claim 1, wherein the first component and the second component are made of acrylonitrile butadiene styrene.

9. The interlocking protective device of claim 1, wherein the first component and the second component are made of polypropylene.

10. The interlocking protective device of claim 1, wherein the first component and the second component are made of moldable carbon fibers.

11. The interlocking protective device of claim 1, wherein the first interlocking edge and the second interlocking edge are formed by cutting the first component and the second component from an integrally formed piece having the size, shape, and configuration of the intended assembled interlocking protective device.

12. The interlocking protective device of claim 11, wherein the integrally formed piece is formed by molding.

13. The interlocking protective device of claim 11, wherein the integrally formed piece is formed by an additive manufacturing process.

14. The interlocking protective device of claim 1, wherein the first component and the second component are formed separately.

15. The interlocking protective device of claim 1, wherein the second component includes a third interlocking edge having a third plurality of tabs and notches; and further comprising a third component including a fourth interlocking edge having a fourth plurality of tabs and notches, which mates with the third interlocking edge of the second component to form a second interlocking edge connection, wherein the third component includes a fifth interlocking edge having a fifth plurality of tabs and notches; and
a fourth component (640) including a sixth interlocking edge having a sixth plurality of tabs and notches, which mates with the fifth interlocking edge of the third component to form a third interlocking edge connection, wherein the fourth component is retained in a position spaced apart from the first component.

Patentansprüche

1. Ineinandergreifende Schutzvorrichtung (200) um einen Abschnitt der Anatomie des Trägers zu schützen, wobei die ineinandergreifende Schutzvorrichtung umfasst:

eine erste Komponente, die sich in drei Dimensionen erstreckt und eingerichtet ist, um sich an einen ersten Teilabschnitt des Abschnittes der Anatomie des Trägers anzupassen, wobei die erste Komponente (210) mindestens eine erste ineinandergreifende Kante mit einer ersten Vielzahl an Vorsprüngen (412) und Aussparungen (413) aufweist und Vorsprungsverstärker (570) aufweist, die in den Aussparungen und zwischen den Vorsprüngen der ersten ineinandergreifenden Kante positioniert sind, wobei die Vorsprungsverstärker nicht für alle der Aussparungen der ersten ineinandergreifenden Kante vorliegen müssen; und
eine zweite Komponente (220), die sich in drei Dimensionen erstreckt und gestaltet ist, um sich an einen zweiten Teilabschnitt des Abschnittes der Anatomie des Trägers anzupassen, wobei die zweite Komponente mindestens eine zweite ineinandergreifende Kante mit einer zweiten Vielzahl an Vorsprüngen (422) und Aussparungen (423) aufweist, die mit der ersten Vielzahl an Vorsprüngen und Aussparungen ineinandergreifen, um eine ineinandergreifende Kantenverbindung (230) zu bilden, welche die zweite Komponente an der ersten Komponente festhält, so dass die erste Komponente und die zweiten Komponente eingerichtet sind, um sich dem ersten Teilabschnitt und dem zweiten Teilabschnitt des Abschnittes der Anatomie des Trägers anzupassen, wenn die ineinandergreifenden Schutzvorrichtung getragen wird; und
wobei die Vorsprünge der zweiten ineinandergreifenden Kante in die Aussparungen und zwi-

schen die Vorsprünge der ersten ineinandergreifenden Kante passen und mit den Vorsprungsverstärkern eingreifen.

2. Ineinandergreifende Schutzvorrichtung nach Anspruch 1, wobei die zweite Komponente eine erste Dicke einschließt und der Vorsprung der zweiten Vielzahl an Vorsprüngen eine zweite Dicke einschließt, die dünner als die erste Dicke ist.

3. Ineinandergreifende Schutzvorrichtung nach Anspruch 1, weiter umfassend eine dritte Komponente (330), die sich in drei Dimensionen erstreckt, um sich an einen dritten Teilabschnitt der Anatomie des Trägers anzupassen, und wobei: die dritte Komponente weiter eine dritte ineinandergreifende Kante mit einer dritten Vielzahl an Vorsprüngen und Aussparungen umfasst, die mit einer vierten ineinandergreifenden Kante der zweiten Komponente zusammenpassen, die eine vierte Vielzahl an Vorsprüngen und Aussparungen aufweist, die mit der dritten Vielzahl an Vorsprüngen und Aussparungen der dritten ineinandergreifenden Kante zusammenpassen, um eine zweiten ineinandergreifende Kantenverbindung (350) zu bilden.

4. Ineinandergreifende Schutzvorrichtung nach Anspruch 3, wobei die erste ineinandergreifende Kantenverbindung und die zweite ineinandergreifende Kantenverbindung sich in eine vertikale Ausrichtung in Bezug zueinander erstrecken.

5. Ineinandergreifende Schutzvorrichtung nach Anspruch 3, wobei die dritte Komponente in einem Abstand von der ersten Komponente ist.

6. Ineinandergreifende Schutzvorrichtung nach Anspruch 1, wobei die erste Komponente und die zweite Komponente aus einem Copolyester hergestellt sind.

7. Ineinandergreifende Schutzvorrichtung nach Anspruch 1, wobei die erste Komponente und die zweite Komponente aus Nylon hergestellt sind.

8. Ineinandergreifende Schutzvorrichtung nach Anspruch 1, wobei die erste Komponente und die zweite Komponente aus Acrylonitril-Butadien-Styrol hergestellt sind.

9. Ineinandergreifende Schutzvorrichtung nach Anspruch 1, wobei die erste Komponente und die zweite Komponente aus Polypropylen hergestellt sind.

10. Ineinandergreifende Schutzvorrichtung nach Anspruch 1, wobei die erste Komponente und die zweite Komponente aus formbaren Kohlefasern hergestellt sind.

11. Ineinandergreifende Schutzvorrichtung nach Anspruch 1, wobei die erste ineinandergreifende Kante und die zweite ineinandergreifende Kante durch das Schneiden der ersten Komponente und der zweiten Komponente aus einem einstückig gebildeten Stück mit der Größe, Form, und Gestaltung der vorgesehenen zusammengesetzten ineinandergreifenden Schutzvorrichtung gebildet werden.

12. Ineinandergreifende Schutzvorrichtung nach Anspruch 11, wobei das einstückig gebildete Stück durch Formen gebildet wird.

13. Ineinandergreifende Schutzvorrichtung nach Anspruch 11, wobei das einstückig gebildete Stück durch einen additiven Herstellungsprozess gebildet wird.

14. Ineinandergreifende Schutzvorrichtung nach Anspruch 1, wobei die erste Komponente und die zweite Komponente einzeln gebildet werden.

15. Ineinandergreifende Schutzvorrichtung nach Anspruch 1, wobei die zweite Komponente eine dritte ineinandergreifende Kante mit einer dritten Vielzahl an Vorsprüngen und Einsparungen einschließt; und die weiter eine dritte Komponente umfasst, die eine vierte ineinandergreifende Kante mit einer vierten Vielzahl an Vorsprüngen und Aussparungen einschließt, die mit der dritten ineinandergreifenden Kante der zweiten Komponente zusammenpasst, um eine zweite ineinandergreifende Kantenverbindung zu bilden, wobei die dritte Komponente eine fünfte ineinandergreifende Kante mit einer fünften Vielzahl an Vorsprüngen und Aussparungen einschließt; und
eine vierte Komponente (640) eine sechste ineinandergreifende Kante mit einer sechsten Vielzahl an Vorsprüngen und Aussparungen einschließt, die mit der fünften ineinandergreifenden Kante der dritten Komponente zusammenpassen, um eine dritte ineinandergreifende Kantenverbindung zu bilden, wobei die vierte Komponente an einer Position mit Abstand von der ersten Komponente gehalten wird.

Revendications

1. Dispositif protecteur à emboîtement (200) pour protéger une portion de l'anatomie d'un porteur, la structure protectrice à emboîtement comprenant :

un premier composant qui s'étend dans trois dimensions et est configuré pour se conformer à une première portion secondaire de la portion de l'anatomie du porteur, le premier composant (210) ayant au moins un premier bord à emboîtement ayant une première pluralité de languet-

tes (412) et d'encoches (413) et ayant des renforts de languette (570) positionnés dans les encoches et entre les languettes du premier bord à emboîtement, moyennant quoi les renforts de languette n'ont pas besoin d'être présents pour l'ensemble des encoches du premier bord à emboîtement ; et

un deuxième composant (220) qui s'étend dans trois dimensions et est configuré pour se conformer à une deuxième portion secondaire de la portion de l'anatomie du porteur, le deuxième composant ayant au moins un deuxième bord à emboîtement ayant une deuxième pluralité de languettes (422) et d'encoches (423) qui s'emboîte avec la première pluralité de languettes et d'encoches pour former une connexion de bords à emboîtement (230) retenant le deuxième composant au premier composant de sorte que le premier composant et le deuxième composant sont configurés pour se conformer à la première portion secondaire et la deuxième portion secondaire de la portion de l'anatomie du porteur lorsque le dispositif protecteur à emboîtement est porté ; et

dans lequel les languettes du deuxième bord à emboîtement se conjuguent dans les encoches et entre les languettes du premier bord à emboîtement et s'engagent avec les renforts de languette.

2. Dispositif protecteur à emboîtement selon la revendication 1, dans lequel le deuxième composant inclut une première épaisseur et la languette de la deuxième pluralité de languettes inclut une seconde épaisseur qui est plus fine que la première épaisseur.

3. Dispositif protecteur à emboîtement selon la revendication 1, comprenant en outre un troisième composant (330) qui s'étend dans trois dimensions pour se conformer à une troisième portion secondaire de l'anatomie du porteur, et dans lequel : le troisième composant comprend en outre un troisième bord à emboîtement ayant une troisième pluralité de languettes et d'encoches qui se conjugue avec un quatrième bord à emboîtement du deuxième composant, ayant une quatrième pluralité de languettes et d'encoches qui se conjugue avec la troisième pluralité de languettes et d'encoches du troisième bord à emboîtement pour former une deuxième connexion de bords à emboîtement (350).

4. Dispositif protecteur à emboîtement selon la revendication 3, dans lequel la première connexion de bords à emboîtement et la deuxième connexion de bords à emboîtement s'étendent dans une orientation verticale l'une par rapport à l'autre.

5. Dispositif protecteur à emboîtement selon la revendication 3, dans lequel le troisième composant est espacé du premier composant.

6. Dispositif protecteur à emboîtement selon la revendication 1, dans lequel le premier composant et le deuxième composant sont réalisés en un copolyester.

7. Dispositif protecteur à emboîtement selon la revendication 1, dans lequel le premier composant et le deuxième composant sont réalisés en un nylon.

8. Dispositif protecteur à emboîtement selon la revendication 1, dans lequel le premier composant et le deuxième composant sont réalisés en acrylonitrile butadiène styrène.

9. Dispositif protecteur à emboîtement selon la revendication 1, dans lequel le premier composant et le deuxième composant sont réalisés en polypropylène.

10. Dispositif protecteur à emboîtement selon la revendication 1, dans lequel le premier composant et le deuxième composant sont réalisés en fibres de carbone moulables.

11. Dispositif protecteur à emboîtement selon la revendication 1, dans lequel le premier bord à emboîtement et le deuxième bord à emboîtement sont formés en découpant le premier composant et le deuxième composant d'une pièce formée de manière intégrale ayant la taille, forme et configuration du dispositif protecteur à emboîtement assemblé envisagé.

12. Dispositif protecteur à emboîtement selon la revendication 11, dans lequel la pièce formée de manière intégrale est formée par moulage.

13. Dispositif protecteur à emboîtement selon la revendication 11, dans lequel la pièce formée de manière intégrale est formée par un processus de fabrication additive.

14. Dispositif protecteur à emboîtement selon la revendication 1, dans lequel le premier composant et le deuxième composant sont formés séparément.

15. Dispositif protecteur à emboîtement selon la revendication 1, dans lequel le deuxième composant inclut un troisième bord à emboîtement ayant une troisième pluralité de languettes et d'encoches ; et comprenant en outre un troisième composant incluant un quatrième bord à emboîtement ayant une quatrième pluralité de languettes et d'encoches qui se conjugue avec le troisième bord à emboîtement du deuxième composant pour former une deuxième

connexion de bords à emboîtement, dans lequel le troisième composant inclut un cinquième bord à emboîtement ayant une cinquième pluralité de languettes et d'encoches ; et

un quatrième composant (640) incluant un sixième bord à emboîtement ayant une sixième pluralité de languettes et d'encoches qui se conjugue avec le cinquième bord à emboîtement du troisième composant pour former une troisième connexion de bords à emboîtement, dans lequel le quatrième composant est retenu dans une position espacée du premier composant.

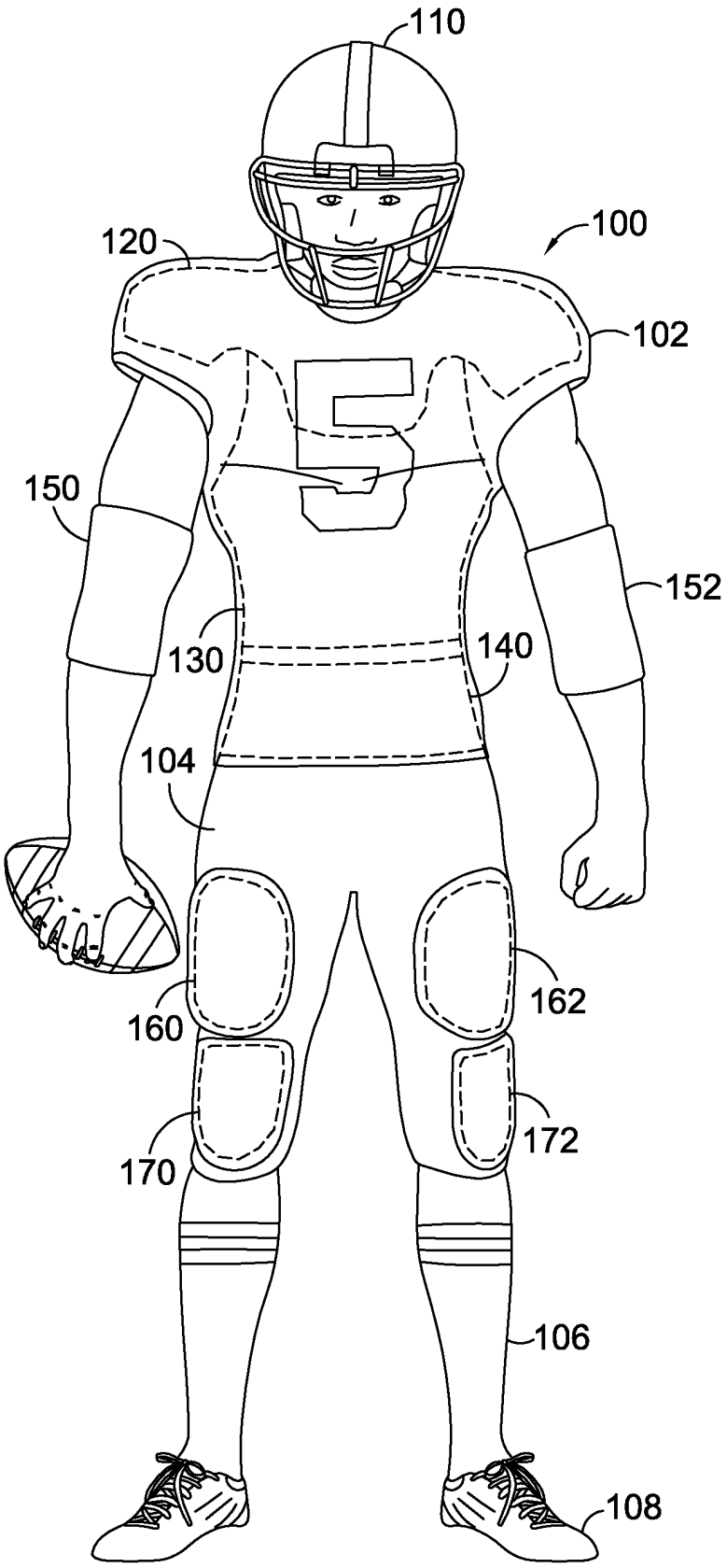

FIG. 1.

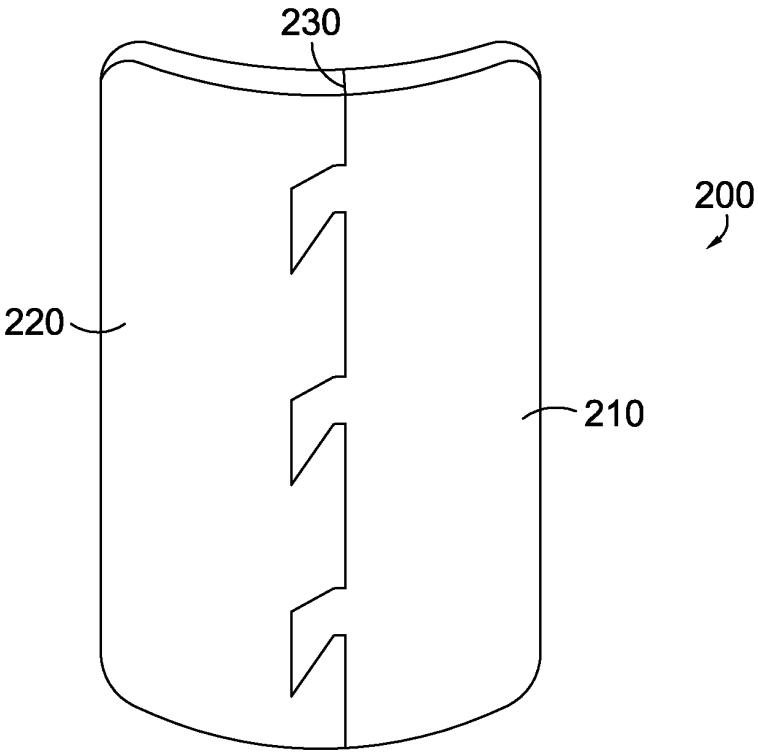

FIG. 2A.

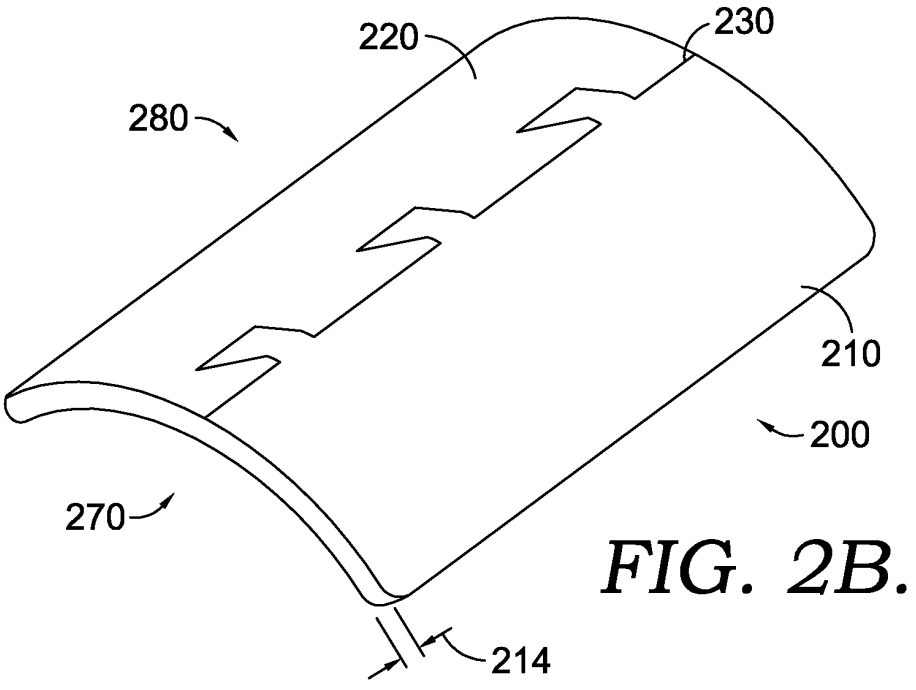

FIG. 2B.

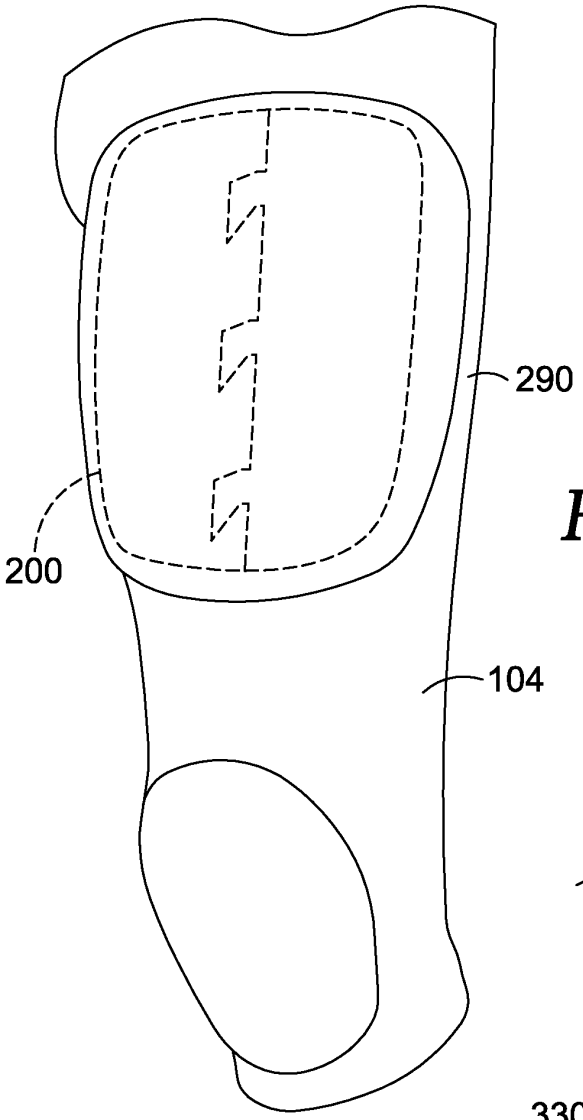

FIG. 2C.

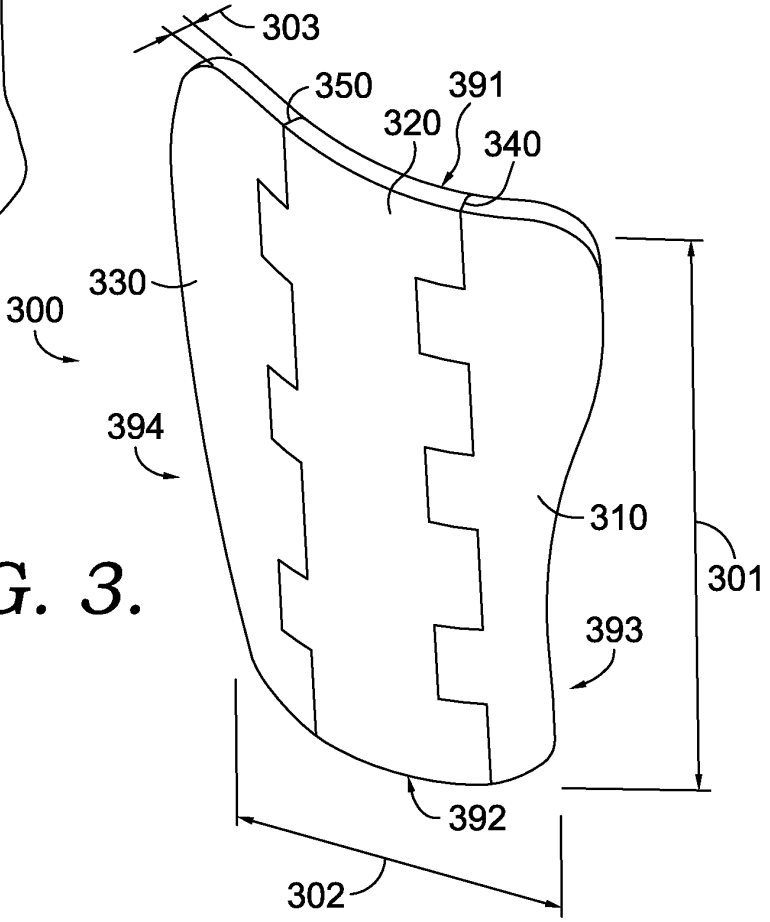

FIG. 3.

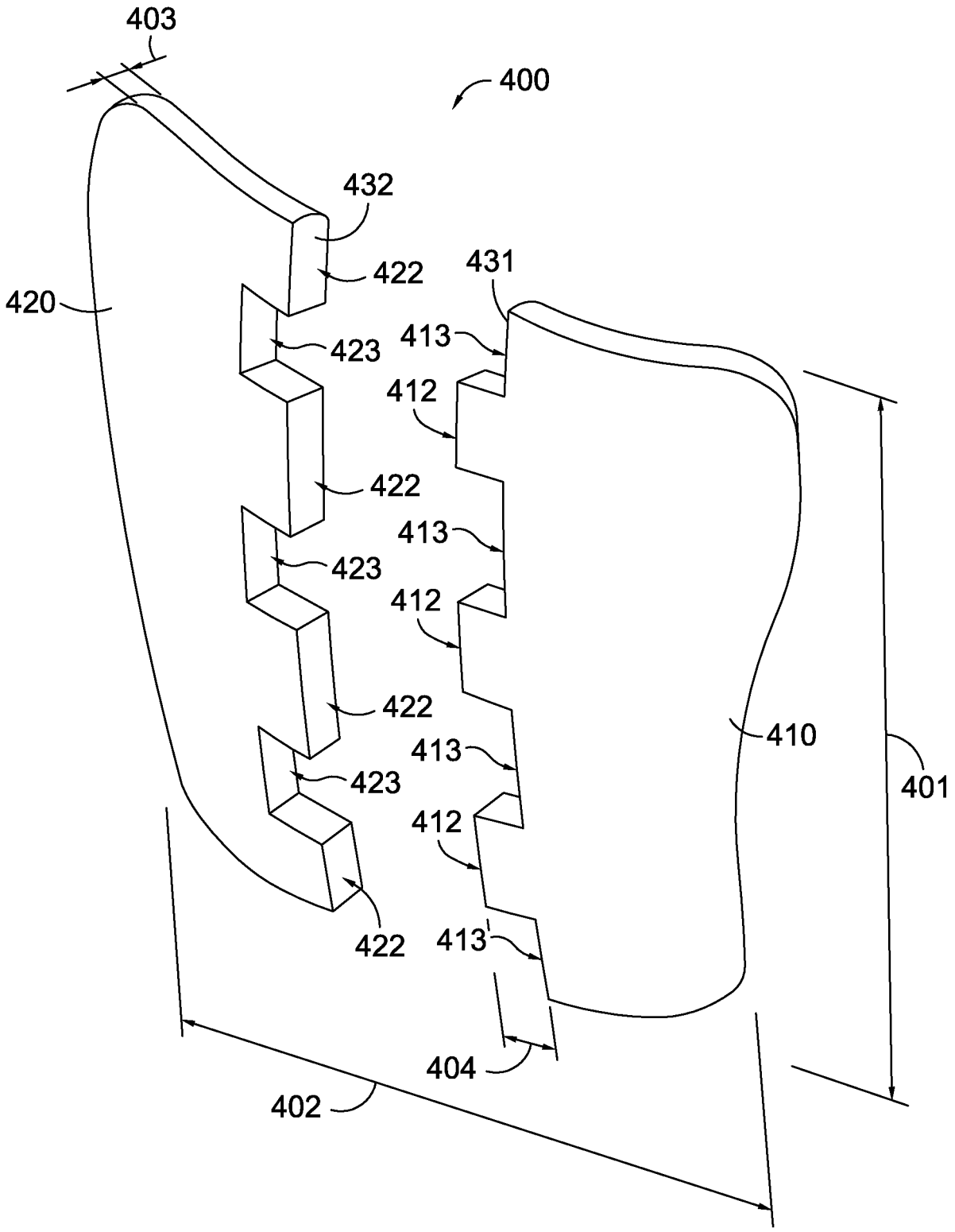
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FIG. 4.

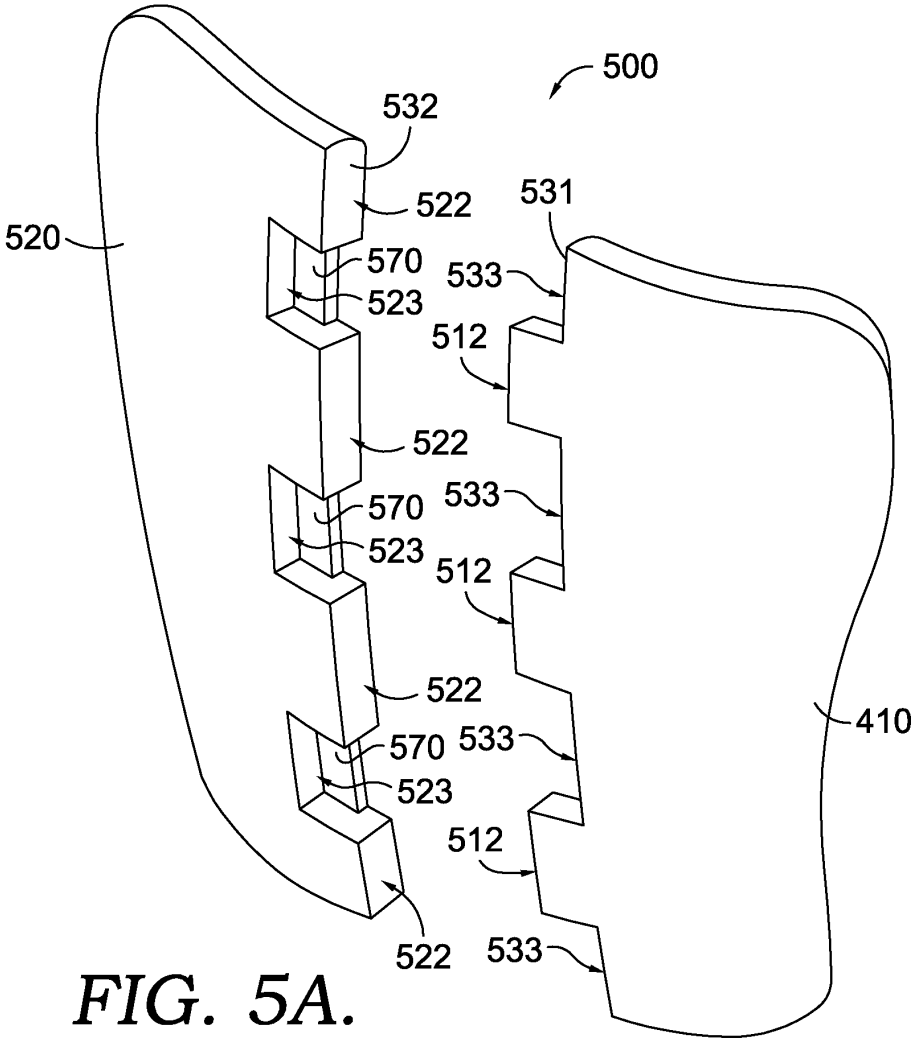

FIG. 5A.

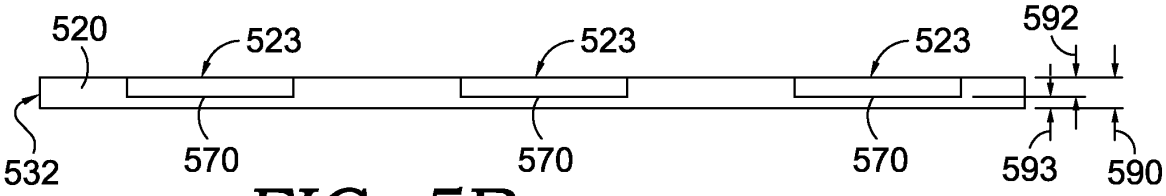

FIG. 5B.
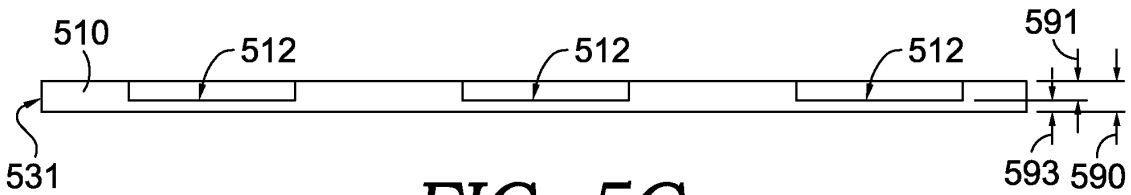
FIG. 5C.

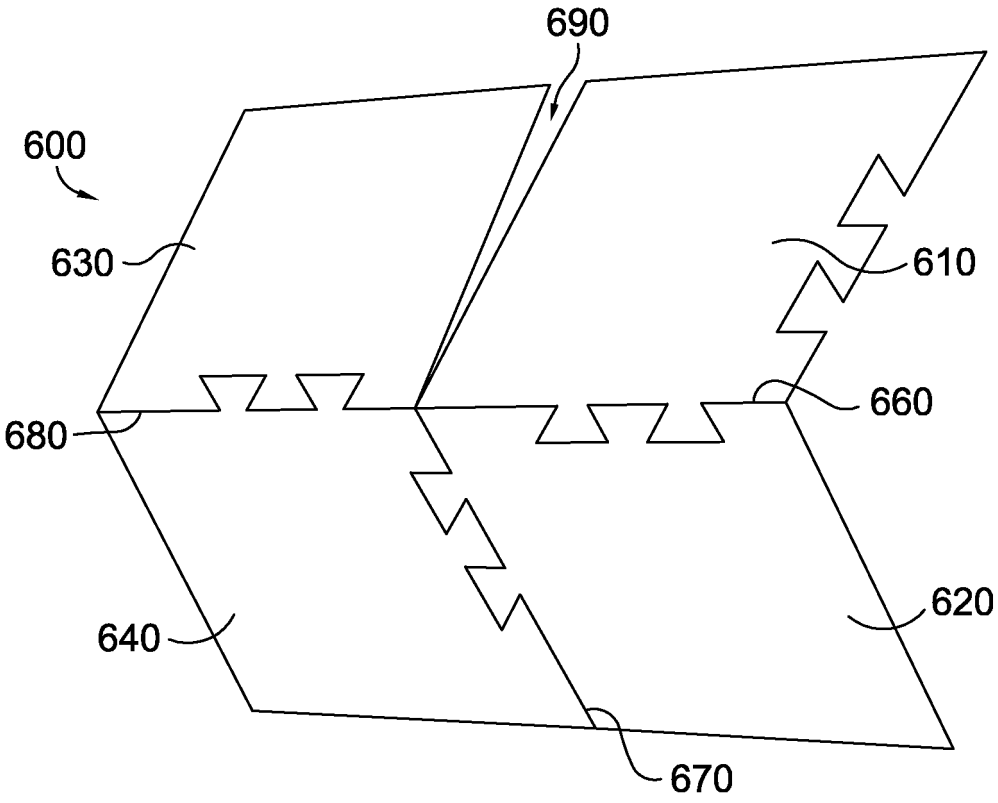

FIG. 6.

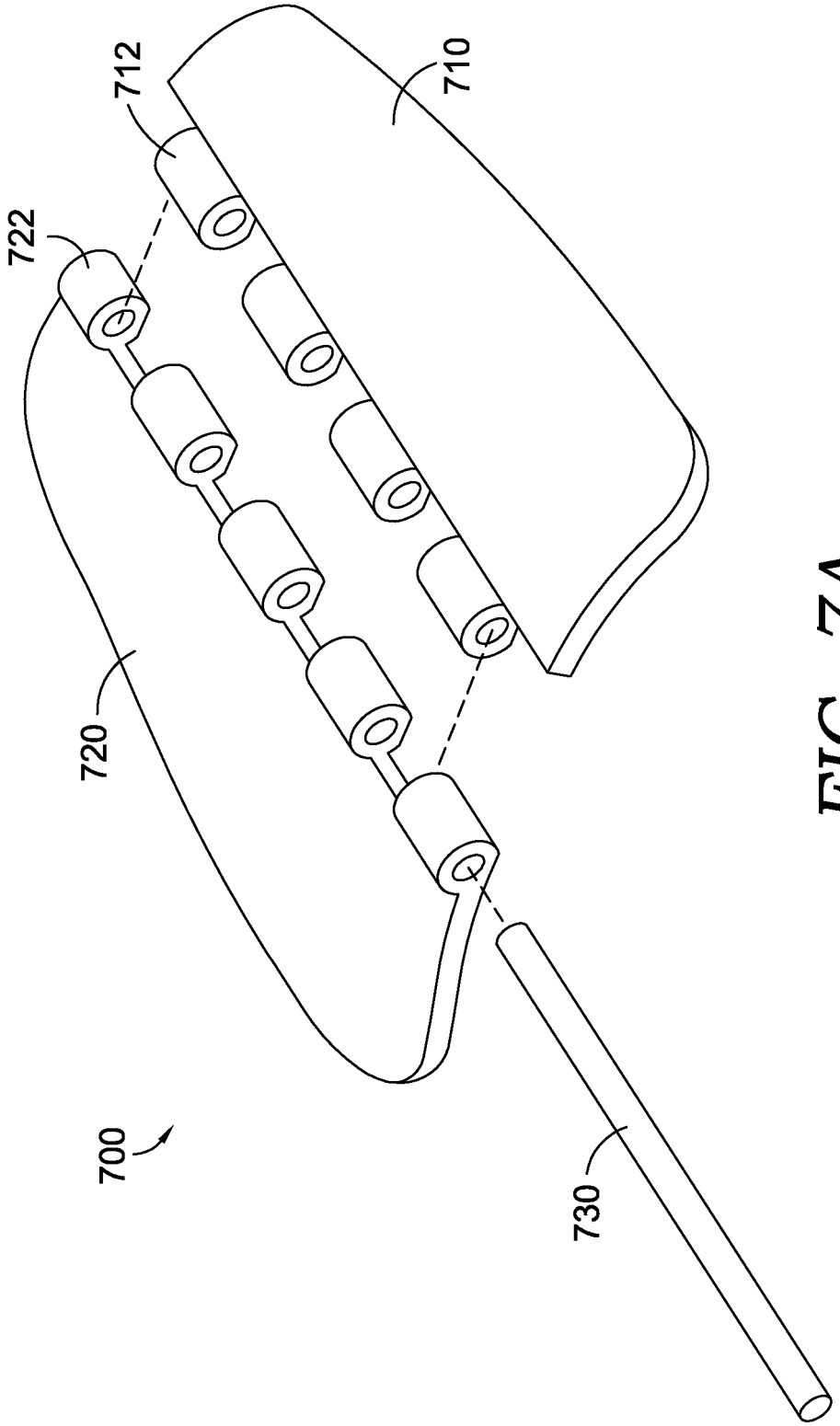

FIG. 7A.

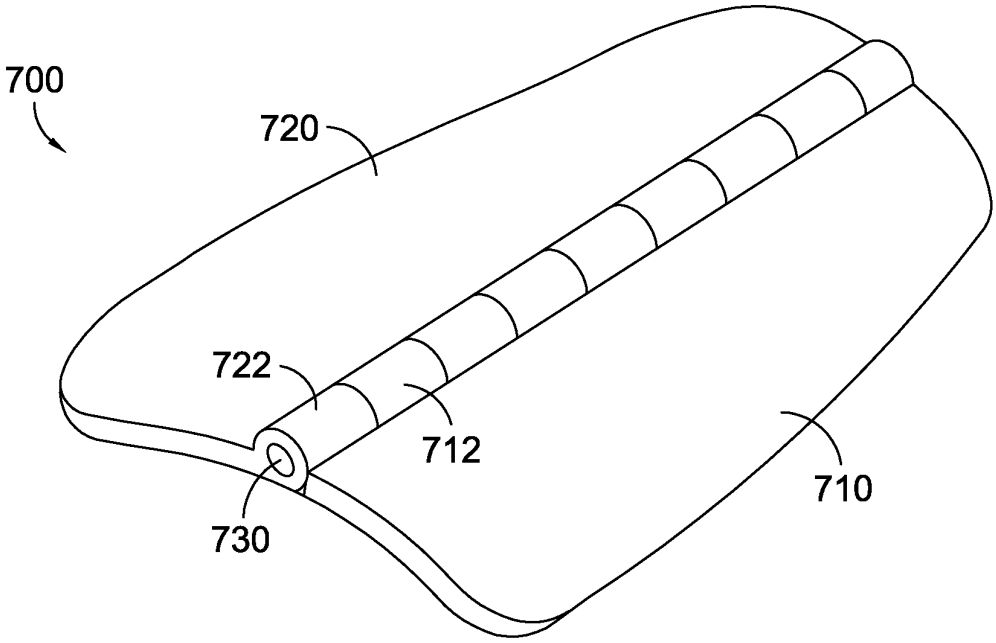

FIG. 7B.

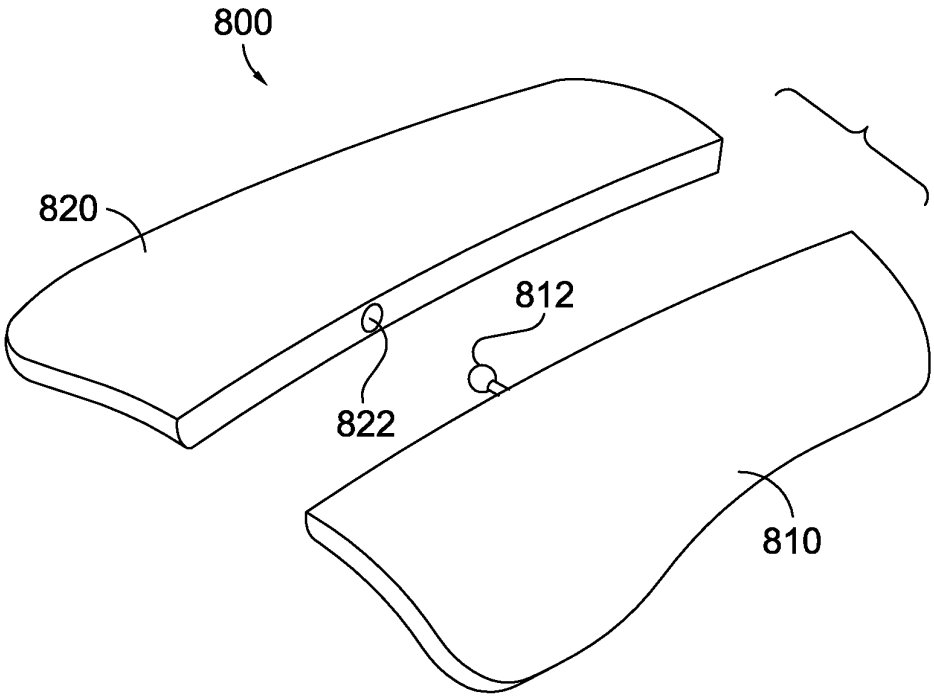

FIG. 8.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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