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(71) Applicant: **Bauer Hockey Corp.**
St-Jérôme, QC J7Y 5G2 (CA)

(72) Inventor: **Durocher, Jacques**
St-Jérôme, Québec J7Z 6T9 (CA)

(74) Representative: **Cabinet Plasseraud**
52, rue de la Victoire
75440 Paris Cedex 09 (FR)

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(54) **Ear protector for a hockey or lacrosse helmet**

(57) The present invention provides an ear protector (32) for a hockey or lacrosse helmet (10), the ear protector having a front portion (34), a top portion (36), a rear portion (38), a bottom portion (40) with a bottom edge (42) and inner and outer sides (44, 46), the ear protector being made of a first material and a second material, the

first material being a clear rigid material and the second material being a soft material, wherein the second material is overmolded onto the first material for covering the bottom edge such that the bottom edge is at least partially made of the second material overmolded onto the first material.

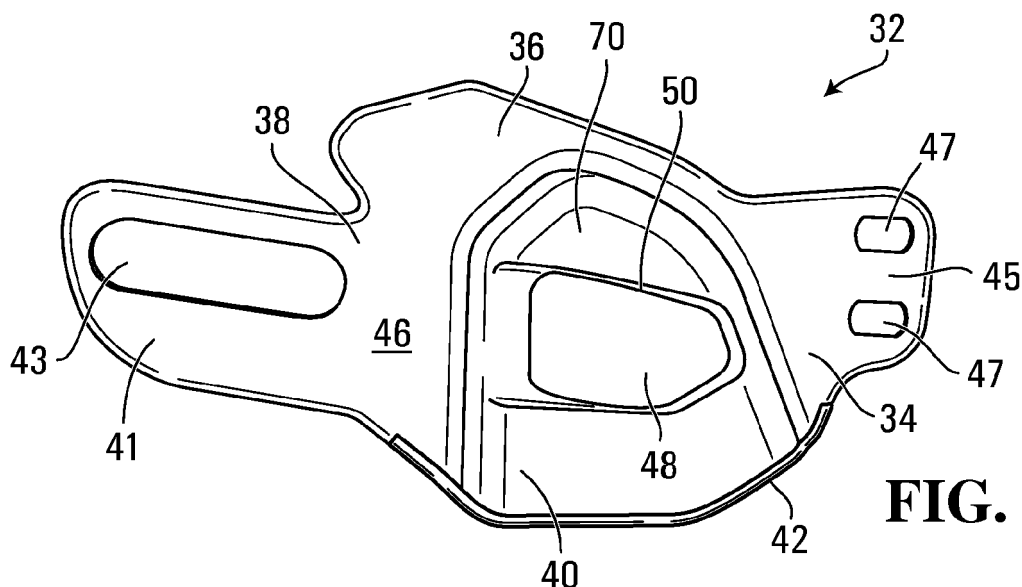


FIG. 10

Description

Field of the invention

[0001] The present invention relates to an ear protector for a hockey or lacrosse helmet.

Background of the invention

[0002] Ear protectors are often made of a clear material in order to minimize their visual impact and thus provide a resemblance between recreational players and those with high skill level who do not wear ear guards.

[0003] For many years, the design of the ear protectors has not evolved because the United States ASTM norms required the presence of a protective foam piece covering the portion of the ear protector that may contact the ear due to an impact to the ear protector. Hence, prior ear protectors are transparent with a piece of foam of approximately 2mm in thickness affixed to the inner bottom portion of the ear protector.

[0004] In the event of an impact with a puck, the small foam piece of 2 mm in thickness is not presumed to offer great protection and the most frequent injury is a cut induced by the edges of the ear protector which are more or less sharp depending on the design of the piece and the rigidity of the material used.

[0005] It is therefore a feature of the invention to diminish the risk of cutting by eliminating the sharp edges of the ear protector by providing a soft material (e.g. thermoplastic elastomer (TPE)) on a ear protector body made of a clear rigid material (e.g. polycarbonate (PC)), the soft material covering a portion of the bottom edge of the ear protector.

Summary of the invention

[0006] According to one aspect of the present invention, there is provided an ear protector for a hockey or lacrosse helmet, the ear protector having a front portion, a top portion, a rear portion, a bottom portion with a bottom edge and inner and outer sides, the ear protector being made of a first material and a second material, the first material being a clear rigid material and the second material being a soft material, wherein the second material is overmolded onto the first material for covering the bottom edge such that the bottom edge is at least partially made of the second material overmolded onto the first material.

[0007] According to a further aspect, the invention provides an ear protector for a hockey or lacrosse helmet, the ear protector having a front portion, a top portion, a rear portion, and a bottom portion with a bottom edge, wherein the ear protector has an ear protector body made of a first material and the bottom edge is at least partially made of a second material overmolded onto the first material of the ear protector body, and wherein the first material is a clear rigid material and the second material is

a soft material.

[0008] This and other aspects and features of the present invention will now become apparent to those of ordinary skill in the art upon review of the following description of specific embodiments of the invention and the accompanying drawings.

Brief description of the drawings

[0009] A detailed description of the embodiments of the present invention is provided herein below, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a head of a hockey or lacrosse player;

Figure 2 is a right side elevational view of the head of the player of Figure 1;

Figure 3 is a front perspective exploded view of a helmet having ear protectors constructed in accordance with an embodiment of the invention;

Figure 4 is a rear perspective exploded view of the helmet of Figure 3;

Figure 5 is a front perspective view of the helmet of Figure 3;

Figure 6 is a rear side perspective view of the helmet of Figure 3;

Figure 7 is an enlarged outer side view of the ear protector body made of a clear material;

Figure 8 is an inner side view of the ear protector body of Figure 7;

Figure 9 is a rear view of the ear protector body of Figure 7;

Figure 10 is an enlarged outer side view of the ear protector made in accordance with an embodiment of the invention;

Figure 11 is an inner side view of the ear protector of Figure 10; and

Figure 12 is a rear view of the ear protector of Figure 10.

[0010] In the drawings, embodiments of the invention are illustrated by way of examples. It is to be expressly understood that the description and drawings are only for the purpose of illustration and are an aid for understanding. They are not intended to be a definition of the limits of the invention.

Detailed description of the embodiments of the invention

[0011] To facilitate the description, any reference numeral designating an element in one figure will designate the same element if used in any other figures. In describing the embodiments, specific terminology is resorted to for the sake of clarity but the invention is not intended to be limited to the specific terms so selected, and it is understood that each specific term comprises all equivalents.

[0012] Unless otherwise indicated, the drawings are intended to be read together with the specification, and are to be considered a portion of the entire written description of this invention. As used in the following description, the terms "horizontal", "vertical", "left", "right", "up", "down" and the like, as well as adjectival and adverbial derivatives thereof (e.g., "horizontally", "rightwardly", "upwardly", "radially", etc.), simply refer to the orientation of the illustrated structure. Similarly, the terms "inwardly", "outwardly" and "radially" generally refer to the orientation of a surface relative to its axis of elongation, or axis of rotation, as appropriate.

[0013] Figures 1 and 2 illustrate a head of a hockey or lacrosse player. The head comprises a crown region CR, left and right side regions LS, RS, a top region TR, a back region BR and an occipital region OR. The crown region CR has a front part that substantially corresponds to the forehead and a top part that substantially corresponds to the front top part of the head. In fact, the crown region CR generally corresponds to the frontal bone region of the head. The left and right side regions LS, RS are approximately located above the ears of the player. The occipital region OR substantially corresponds to the region around and under the external occipital protuberance of the head.

[0014] Figures 3 and 4 show an adjustable helmet 10 for receiving the head of the hockey or lacrosse player. The helmet 10 extends along a longitudinal axis A-A and comprises a front shell 12 and a rear shell 14 interconnected together. The front shell 12 and rear shell 14 may be made of a relatively rigid material, such as polyethylene, NYLON, polycarbonate materials, thermoplastics, or thermosetting resins or any other suitable material. The front and rear shells 12, 14 include a plurality of ventilation apertures that provide the added comfort of allowing air to circulate around the head of the player.

[0015] The front shell 12 has a first top portion for facing at least partially the top region TR of the player's head, a front portion for facing at least partially the crown region CR of the player's head, and left and right side portions extending rearwardly from the front portion for facing at least partially the left and right side regions LS, RS of the player's head.

[0016] The rear shell 14 has a second top portion for facing at least partially the top region TR of the player's head, a rear portion for facing at least partially the back and occipital regions BR, OR of the player's head, and

left and right side portions extending forwardly from the rear portion for facing at least partially the left and right side regions LS, RS of the player's head.

[0017] The front shell 12 overlays left and right front inner pads 15, 16 while the rear shell 14 overlays left and right rear side inner pads 18, 20 and a rear top inner pad 22. The left and right front inner pads 15, 16 face the crown region CR and face at least partially the left and right side regions LS, RS. The left and right rear side inner pads 18, 20 at least partially face the left and right side regions LS, RS. The rear top inner pad 22 faces the back and top regions BR, TR of the head. The inner pads 15, 16, 18, 20, 22 may be made of shock absorbing materials such as expanded polypropylene (EPP) or expanded polyethylene (EPE). Other materials can also be used without departing from the spirit of the invention.

[0018] The front inner pads 15, 16 have a three-dimensional external configuration that matches the three-dimensional internal configurations of the front shell 12 and are mounted to the front shell 12 by any suitable means such as glue, stitches, tacks, staples or rivets. Similarly, the left and right rear side inner pads 18, 20 and rear top inner pad 22 have three-dimensional external configurations that match the three-dimensional internal configurations of the rear shell 14 and are mounted to the rear shell 14 by any suitable means, such as glue, stitches, tacks, staples or rivets.

[0019] The helmet 10 may also comprise left and right comfort pads 24, 26 facing the left and right side regions LS, RS and located just above the ears and left and right comfort pads 28, 30 facing the left and right temple regions of the head. The helmet 10 may further comprise left and right comfort pads 25, 27 located just above the ears and between the front and rear shells 12, 14. The comfort pads 24, 25, 26, 27, 28, 30 may be made of soft materials such as polyvinyl chloride (PVC) or such a foam sold under the trade-mark PORON XRD. Other materials can also be used without departing from the spirit of the invention. The comfort pads 24, 25, 26, 27, 28, 30 may be affixed on the inner surface of the corresponding inner pads or shells by any suitable means, such as glue or an adhesive layer.

[0020] The helmet 10 also comprises left and right ear protectors 32 (32L: 32R) for protecting the ears of the player.

[0021] Referring to Figures 10 to 12, the ear protector 32 has a front portion 34, a top portion 36, a rear portion 38, a bottom portion 40 with a bottom edge 42, an inner side 44 and an outer side 46. The rear portion 38 may comprise a rear extension 41 with a slot 43 extending along an axis generally parallel to the axis A-A. The front portion 34 may also comprise a front extension 45 with one or two apertures 47. The ear protector 32 may also comprise a central aperture 48 defined by an internal peripheral edge 50 and being adapted to be located generally adjacent the external auditory canal of the player's ear such that sounds may be more easily detected by the player. In addition, the inner side 44 may define a

recessed region 60 for facing the player's ear. As such, the ear protector 32 can be understood to have a generally curved arrangement proximate the player's ear such as to permit a comfortable fit or such that the recessed region 60 generally surrounds the player's ear. In addition, the ear protector 32 may also be understood to present a raised region 70 along the outer side 46 of the ear protector 32, wherein the raised region 70 can generally be seen as being opposed to the recessed region 60.

[0022] The ear protector 32 shown in Figures 10 to 12 is made of a first clear rigid material and of a second softer material that is overmolded onto portions of the first material for covering at least partially specific portions of the ear protector 32.

[0023] As best seen in Figures 7 to 9, which show the ear protector 32 without the second soft material, a substantial part of the ear protector 32 is made of an ear protector body 132 being made of the first, relatively rigid, clear material, such as polycarbonate (PC), acrylic, clear polymer, polypropylene, SURLYN™, or styrene-butadiene copolymer (SBC). The ear protector body 132 has a bottom portion 140 with a bottom edge 142, an inner side 144 and an outer side 146 and an internal peripheral edge 150.

[0024] It is understood that the terms "clear material" cover a material for which one can see through the material (e.g. transparent material; translucent material).

[0025] In one embodiment, the first material is polycarbonate (PC) having for example the following properties: tensile strength between 8,000psi and 12,000psi and Rockwell hardness between 70R and 121 R. The maximum temperature of the polycarbonate (PC) may be 250°F (121°C) and its minimum temperature may be -40°F (-40°C).

[0026] Reverting to Figures 10 to 12, which show the ear protector 32 with the second soft material, at least a portion of the ear protector 32 is made of the second soft material that is overmolded onto the first material while the remaining of the ear protector 32 is made of the first material only. The terms "soft material" cover a material that offers a greater flexibility and better shock absorbing properties than the first material. The second material is more flexible than the first material and thus has a "softer feel" than the first material.

[0027] The second material may be selected in the group consisting of thermoplastic elastomer (TPE), thermoplastic polyurethane (TPU), polypropylene and medium density polyethylene (MDPE). For example, in some embodiments, the second material may be made of medium density polyethylene such as MDPE 50. In another non-limiting example, the second material may be made of a thermoplastic elastomer (TPE) such as PEBAX™ 5533. In yet another non-limiting example, the second material may be polypropylene 7633U.

[0028] In one embodiment, the second material is thermoplastic elastomer (TPE) having a durometer hardness between 40 Shore A and 60 Shore A.

[0029] Continuing with Figures 10 to 12, the second material is overmolded onto the first material for covering at least partially the bottom edge 42. The part of the bottom edge 42 that is made of the second material generally corresponds to the portion that is adapted to be generally adjacent the player's ear. As such, at least a portion of the bottom edge 42 is made of the second material overmolded onto the first material while remaining of the ear protector body 132 is made of the first material only.

[0030] The second material may also be overmolded onto other portions of the ear protector body 132 such that specific portions of the ear protector 32 are made of the second material overmolded onto the first material while remaining portions of the ear protector 32 are made of the first material only. In some embodiments, the overmolding of the second material onto the first material may be done such that at least a portion of the ear protector body 132 is covered on both the inner side 44 and the outer side 46 by the second material while the remaining of the ear protector body 132 may be covered on one side only. As such, a "sandwiched" arrangement can be seen between the first material and the second material in the portion of the ear protector body 132 which is covered on both sides by the second material. For example, the first material may be overmolded onto the first material for covering the inner and outer sides 144, 146 of the bottom edge 142 of the ear protector body 132 and for covering at least partially the inner side 144 of the ear protector body 132. As best shown in Figure 11, the portion of the inner side 44 that is made of the second material overmolded onto the first material generally corresponds to the portion that is adapted to be generally adjacent the player's ear such that the portion located below the central aperture 48 is substantially made of the second material overmolded onto the first material.

[0031] In other embodiments, the overmolding of the second material onto the first material may imply that at least a portion of the inner side 144 and the internal peripheral edge 150 is covered by the second material (note the exposure of the internal peripheral edge 150 on Figure 8 in comparison to Figure 11 wherein the internal peripheral edge 50 has been covered with second material). In such an arrangement, it is possible that the outer side 146 of the ear protector body 132 is not at all covered by second material, thus permitting the overmolding of the second material onto the first material without a "sandwiched" arrangement. For example, such an arrangement can be adopted for the overmolding of the second material onto the first material for covering at least partially the internal peripheral edge 50 defining the central aperture 48 as best shown in Figure 11.

[0032] In yet other embodiments, the second material may be overmolded onto the first material such that only a portion of the inner side 144 of the ear protector body 132 is covered by the second material. For example, in some embodiments, a portion of the recessed region 60 of the inner side 44 may be overmolded with second material such that the second material is thick enough to

provide a substantial clearance between the player's ear and the internal peripheral edge 150. In such embodiments, the internal peripheral edge 150 may or may not be overmolded with second material. In embodiments wherein the internal peripheral edge 150 is not overmolded with second material, the clearance provided by the thickness of the second material may suffice to prevent contact between portions of the ear which would otherwise be likely to contact the internal peripheral edge 150 in the absence of second material.

[0033] In addition, with reference to Figures 7 and 8, it can be noted that in some embodiments, the bottom edge 142 may comprise at least one indented region 160 for receiving the overmolded second material onto the first material such that once the second material has set onto the first material, the first material and the second material may define a flush arrangement between one another such that the bottom edge 42 of the ear protector 32 does not present significant discontinuities (see figures 10 and 11).

[0034] In other embodiments wherein the ear protector body 132 does not comprise such indented regions 160, the overmolding of the second material onto the first material may present a discontinuous arrangement on the bottom edge 42 of the ear protector 32. However, in other embodiments not having indented regions 160, a flush arrangement between the second material and the first material may still be accomplished depending on the overmolding specifications.

[0035] Furthermore, although the embodiments of the figures show several distinct portions of second material overmolded onto the first material, it is understood that a single portion of second material may be overmolded onto the first material such as to cover all areas of the ear protector 32 which are likely to cause an injury to the player due to sharper edges present therein. For example, in one embodiment (not shown), the second material can be overmolded onto the first material as a single piece such as to cover both the internal peripheral edge 150 and the bottom edge 142 of the ear protector body 132.

[0036] As such, prevention against possible injury or discomfort to the player's ears is afforded via the overmolding of the softer second material onto the first (rigid) material without compromising the level of protection afforded by the first material. More specifically, regions of the ear protector 32 which would otherwise be more or less sharp can be covered by (or made of) the second softer material hence reducing the possibility of cutting the player's ear.

[0037] It is therefore to be understood that any portion of the ear protector 32 may be covered by (or made of) the second material as to provide added comfort to the player's ears and to reduce the likelihood of injury thereto. For example, in some embodiments, the overmolding of the second material onto the first material near the central aperture 48 of the ear protector 32 on the inner side 44 of the ear protector may extend to more than the internal

peripheral edge 50 of the central aperture 48 of the ear protector 32 such that a substantial portion of the ear protector 32 that is adapted to generally face, receive or surround the player's ear is made of the second material overmolded onto the first material while the remaining of the ear protector 32 is made of the first material only.

[0038] Overmolding techniques provide a simple, cost-efficient and quick means of mass-producing the ear protector 32.

[0039] In a non-limiting embodiment, the ear protector 32 is produced in a dual-injection shell mold that includes two cavities. A molding core closes with the first cavity and the first material of the ear protector 32 is injected into the mold. When the core (ear protector body 132) is pulled away, the first material has formed on the core the shape it is to assume. The ear protector body 132 is then inserted into the second cavity and the second material is injected for overmolding where appropriate.

[0040] In a non-limiting embodiment two cores are used such that both cavities can be used at the same time. In this example, the two cavities are in one wall and the two cores are mounted on a platform in a way that they can both be inserted into the cavities at the same time. While the first cavity/core combination is molding the first material, the second cavity/core is overmolding the second material on a previously-molded layer of first material. When the cores and cavities are separated, the completed outer shell (the one that had been undergoing the overmolding step) is removed and the platform pivots such that the other, semi-completed, shell inserts into the second cavity. The first cavity receives the now-empty core. This, of course, is only one way of performing the overmolding and it is to be understood that any suitable molding techniques and technologies may be used.

[0041] The first and second materials are selected based on a number of factors. For the first material, characteristics determining its ability to protect the player's ear from impact may be of interest. For the second material, one concern may be the physical feel of the material. Many other characteristics such as flexibility, tensile strength, hardness, density and cost may be considered in selecting the first and second materials.

[0042] In a non-limiting embodiment, they are also selected based on their suitability for overmolding. For example, the materials may be selected for their ability to adhere to one another. In a non-limiting example, the second material has a higher melting point such that it slightly melts the surface of the first material during overmolding. It is understood that the second material must have a melting point equal or higher. Preferably the melting points of the first and second materials will be similar and in a non-limiting embodiment, the melting points of the respective materials are within 75°C of each other.

[0043] Also preferably, the two materials are selected from the same family as materials from the same family tend to be more compatible.

[0044] The ear protector 32 may be used for an adjustable helmet where the player can expand or contract the

size of the helmet 10 by pushing or pulling the front and rear shells 12, 14 in relation to each other. The ear protector 32 is thus affixed to the front shell 12 via affixing means passing through the apertures 47 and movement of the rear shell 14 relative to the rear extension 41 is allowed by the longitudinal slot 43. Because the rear extension 41 must be mounted between the rear shell 14 and inner rear pads 18, 20, the use of a first material that allows reducing the thickness of the rear extension 41 will allow to reduce the overall thickness of the helmet sides or to increase the thickness of the padding protection.

[0045] If polycarbonate (PC) is used for the first material, the thickness of the rear extension 41 may be about 1.5mm. If SURLYN™ is used for the first material, the thickness of the rear extension 41 may be about 2.5mm.

[0046] The above description of the embodiments should not be interpreted in a limiting manner since other variations, modifications and refinements are possible within the scope of the present invention. The scope of the invention is defined in the appended claims and their equivalents.

Claims

1. An ear protector (32) for a hockey or lacrosse helmet (10), said ear protector having a front portion (34), a top portion (36), a rear portion (38), a bottom portion (40) with a bottom edge (42) and inner and outer sides (44, 46), said ear protector being made of a first material and a second material, said first material being a clear rigid material and said second material being a soft material, being **characterized in that** said second material is overmolded onto said first material for covering said bottom edge such that said bottom edge is at least partially made of said second material overmolded onto said first material.
2. An ear protector as defined in claim 1, wherein said second material is overmolded onto said first material for covering at least partially said inner side.
3. An ear protector as defined in claim 1 or 2, wherein said first material is polycarbonate (PC).
4. An ear protector as defined in any one of claims 1 to 3, wherein said first material is selected in the group consisting of polycarbonate (PC), acrylic, clear polymer, polypropylene, SURLYN™, and styrene-butadiene copolymer (SBC).
5. An ear protector as defined in any one of claims 1 to 4, wherein said first material has a Rockwell hardness between 70R and 121 R.
6. An ear protector as defined in any one of claims 1 to 5, wherein said first material has a tensile strength

between 8,000psi and 12,000psi.

7. An ear protector as defined in any one of claims 1 to 6, wherein said second material is thermoplastic elastomer (TPE).
8. An ear protector as defined in any one of claims 1 to 7, wherein said second material is selected in the group consisting of thermoplastic elastomer (TPE), thermoplastic polyurethane (TPU), polypropylene and Medium Density Polyethylene (MDPE).
9. An ear protector as defined in any one of claims 1 to 8, wherein said second material has a durometer hardness between 40 Shore A and 60 Shore A.
10. An ear protector as defined in claim 1, wherein said first material and said second material are selected from a same family of materials.
11. An ear protector as defined in any one of claims 1 to 10, wherein said second material is more flexible than said first material.
12. An ear protector as defined in any one of claims 1 to 11, wherein said inner side (44) of said ear protector defines a recessed region (60) for facing an ear of a player.
13. An ear protector as defined in claim 12, wherein at least a portion of said recessed region (60) is overmolded with second material.
14. An ear protector as defined in any one of claims 1 to 13, wherein said second material is overmolded onto said first material such that at least a portion of said first material is covered on both said inner side (44) and said outer side (46) of said ear protector by said second material.
15. An ear protector as defined in any one of claims 1 to 14, wherein said bottom edge comprises at least one indented region (160) for receiving said second material onto said first material.
16. An ear protector as defined in claim 15, wherein said first material and said second material define a flush arrangement between one another along said bottom edge of said ear protector.
17. An ear protector as defined in any one of claims 1 to 16, further comprising a central aperture (48) defined by an internal peripheral edge (50) and being adapted to be located generally adjacent the external auditory canal of the player's ear and wherein said second material is overmolded onto said first material for covering at least partially said internal peripheral edge (50).

18. An ear protector as defined in any one of claims 1 to 17, wherein said front portion (34) has at least one aperture (47) for affixing said ear protector to a front shell (12) of the hockey or lacrosse helmet (10) and said rear portion (38) has a rear extension (41) defining a longitudinal slot (43) for mounting said rear extension to a rear shell (14) of the hockey or lacrosse helmet (10), said longitudinal slot (43) allowing movement of the rear shell (14) relative to said rear extension (41) when the front and rear shells (12, 14) move relative to each other.
19. An ear protector as defined in any one of claims 1 to 18, said ear protector comprising an ear protector body (132) made of said first material.
20. A hockey or lacrosse helmet (10) comprising an ear protector (32) as defined in any one of claims 1 to 19.

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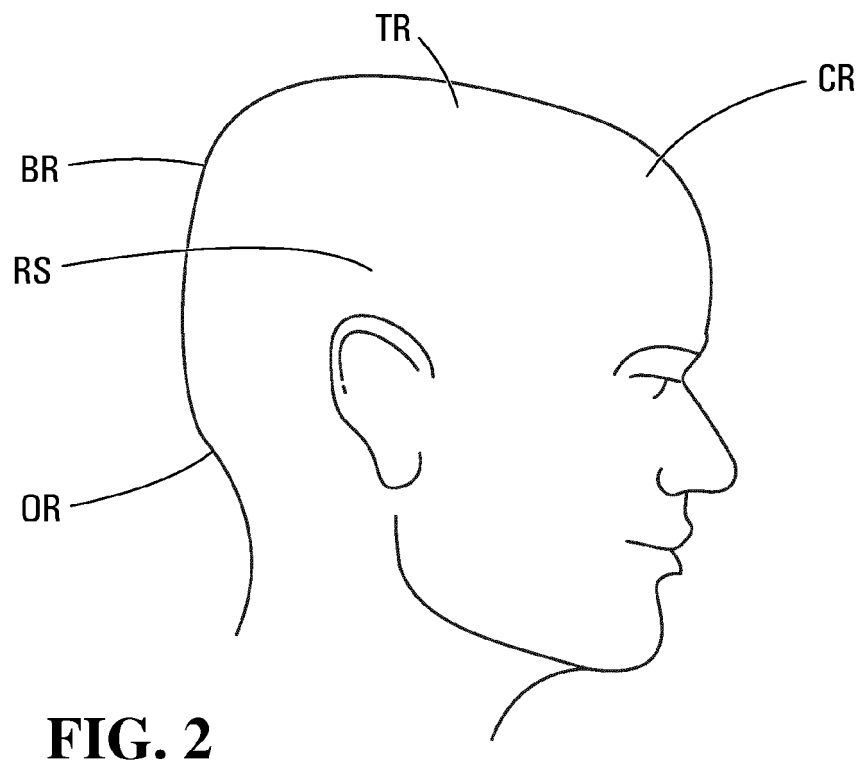
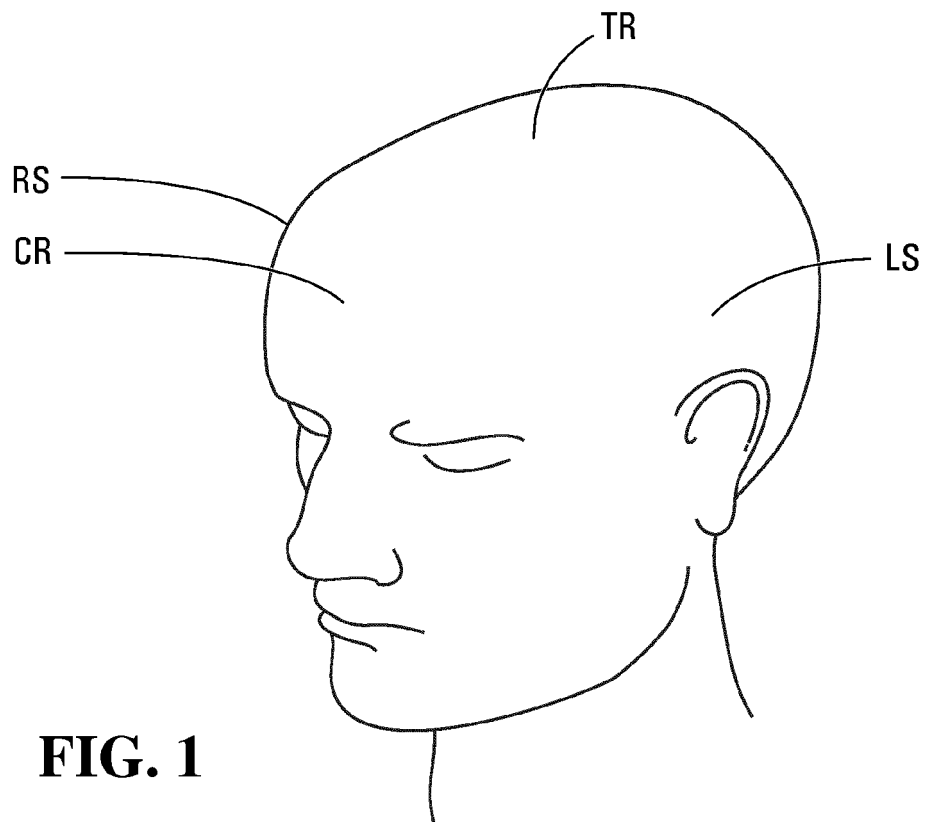
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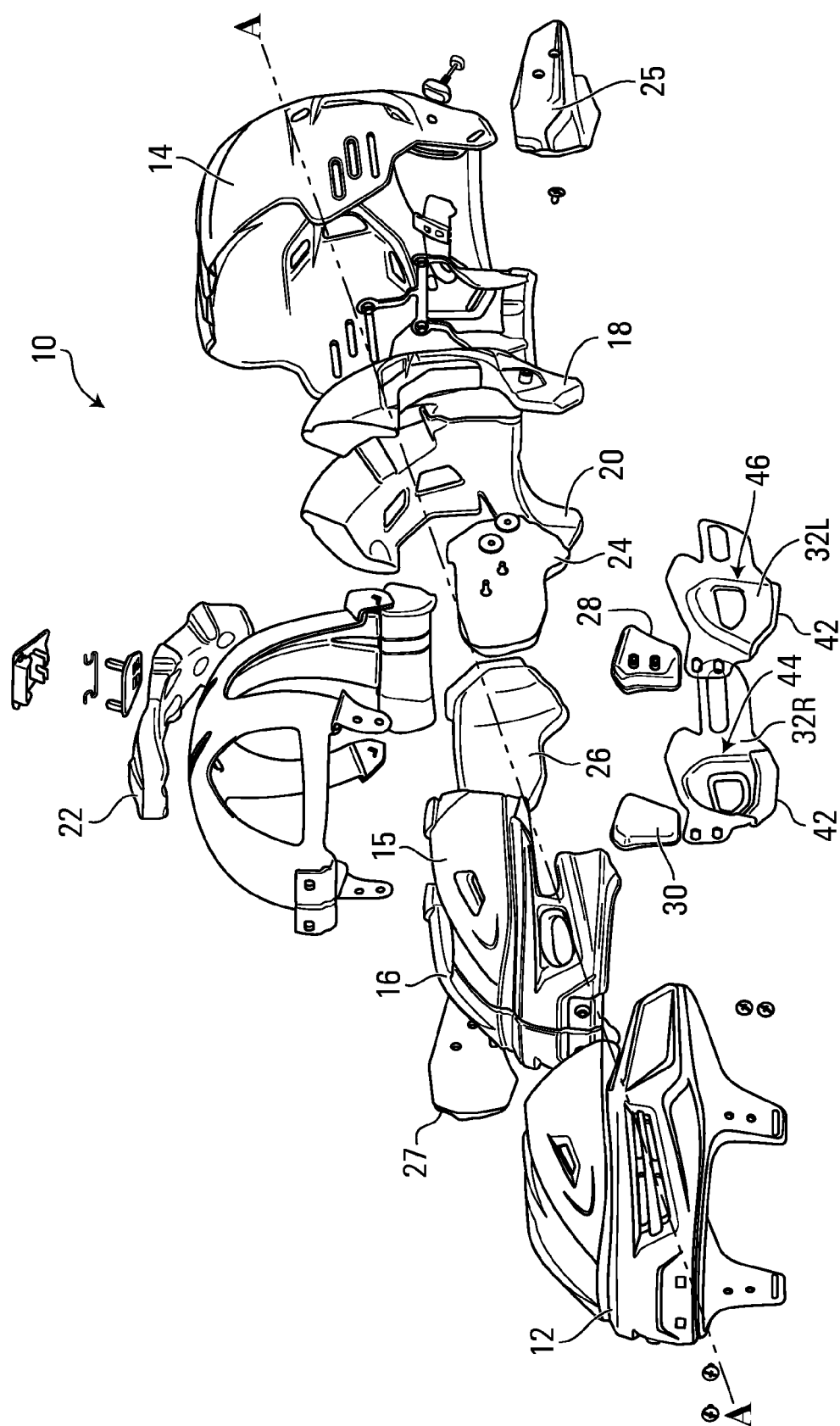


FIG. 3

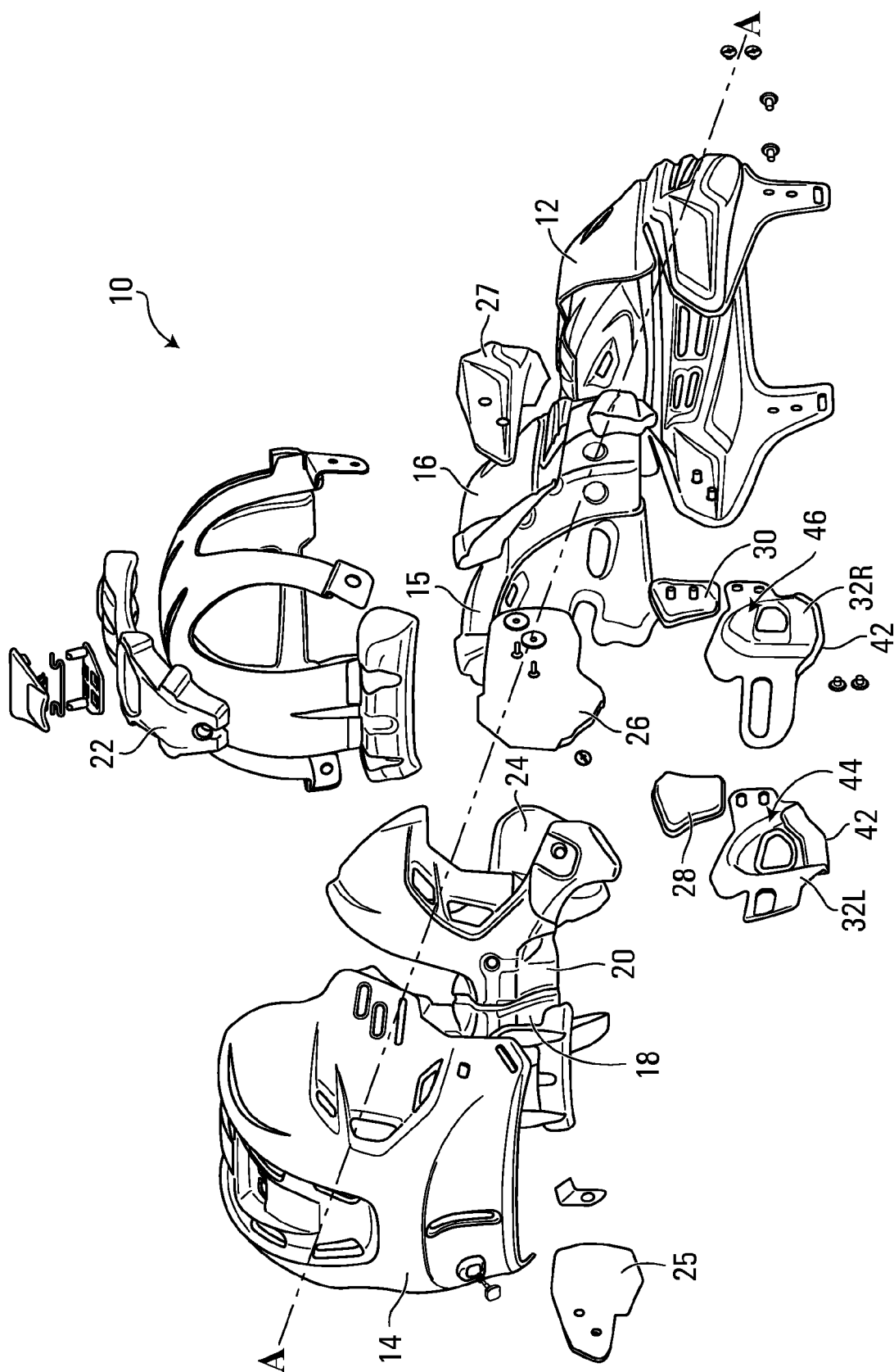


FIG. 4

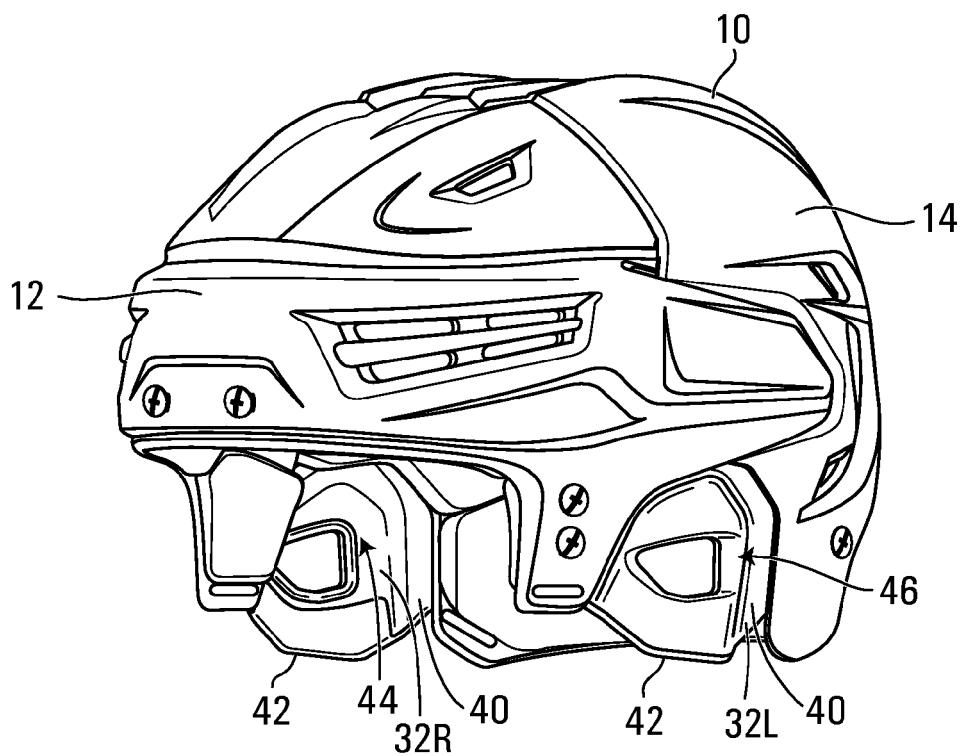


FIG. 5

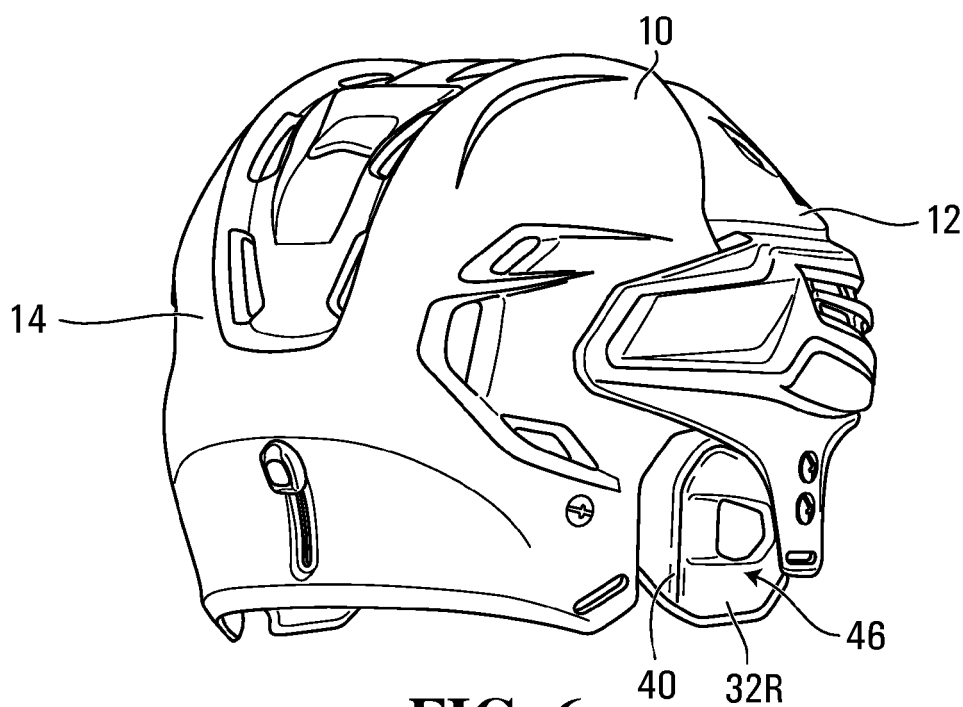
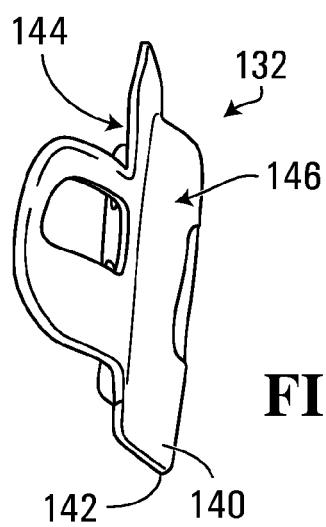
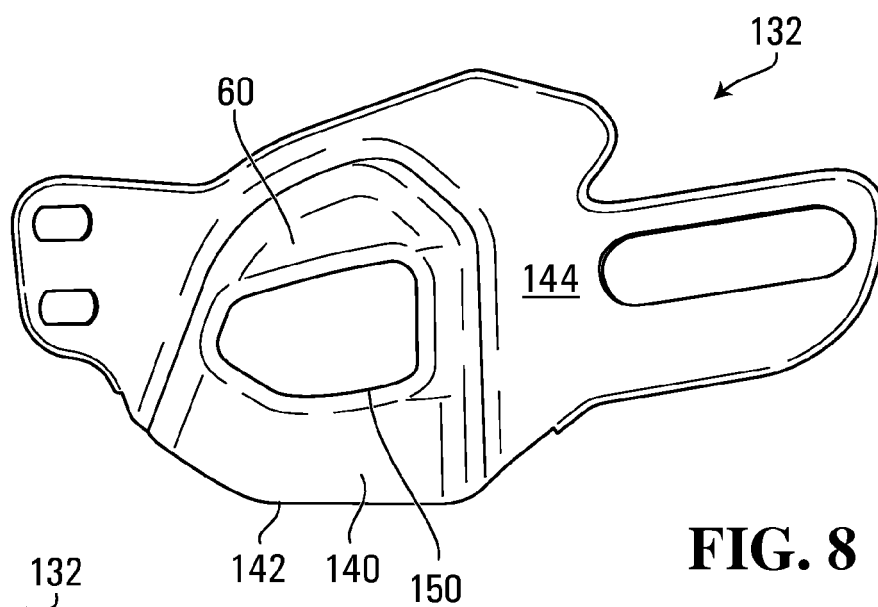
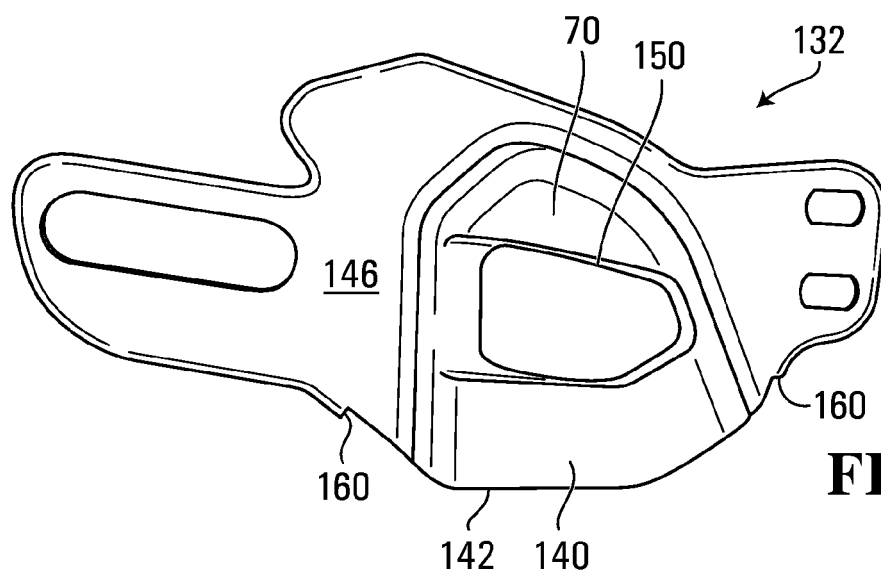
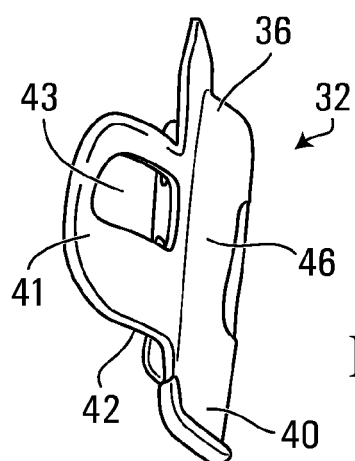
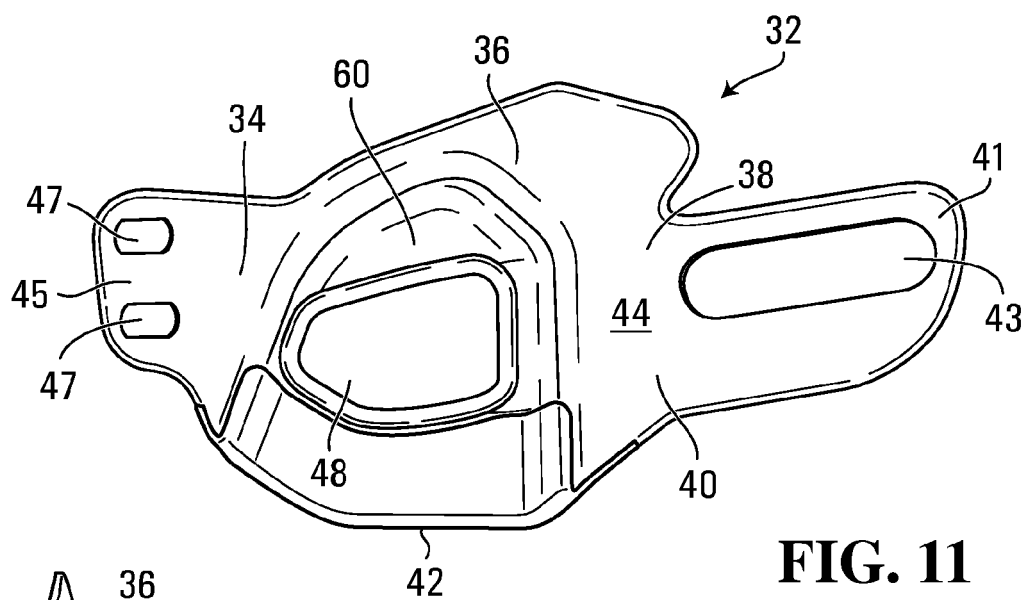
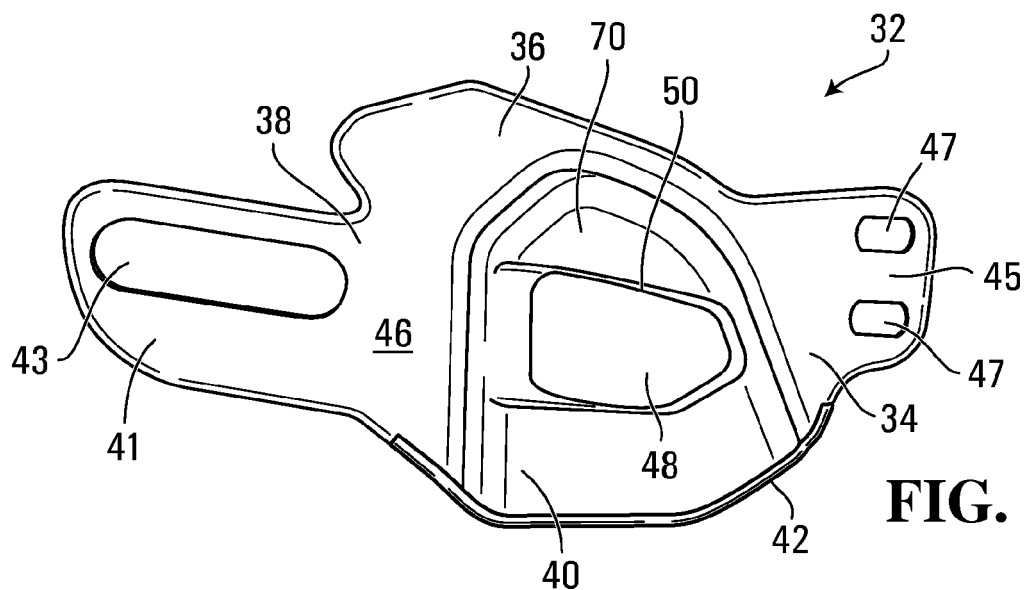


FIG. 6







EUROPEAN SEARCH REPORT

Application Number
EP 12 17 7923

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2006/212998 A1 (GATH RICKY J [AU]) 28 September 2006 (2006-09-28) * paragraphs [0051], [0057] - [0060], [0064] - [0066]; figures 1,8 * -----	1-9, 11-14, 17,19,20	INV. A42B3/16
A	US 2009/188022 A1 (DUROCHER JACQUES [CA] ET AL) 30 July 2009 (2009-07-30) * paragraphs [0025], [0030] - [0041]; figures 3,5 * -----	1-11	
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A	US 2009/049586 A1 (WIRTHENSTAETTER PETER [DE]) 26 February 2009 (2009-02-26) * paragraphs [0027] - [0030]; figure 1 * -----	1,20	
			TECHNICAL FIELDS SEARCHED (IPC)
			A42B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 1 November 2012	Examiner D'Souza, Jennifer
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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