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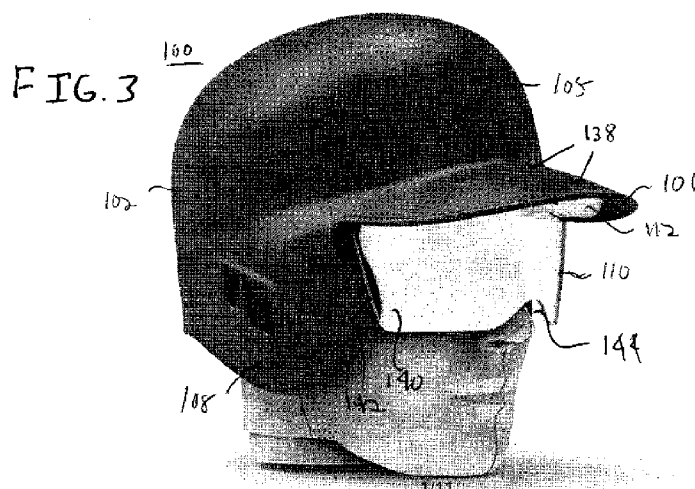
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(54) Title: BASEBALL HELMET WITH VISOR



(57) Abstract: A helmet including a shell defining an exterior surface and an interior volume of space and including a bill. A visor including an engagement structure that releasably engages the bill wherein the visor does not pivot relative to the bill when engaged with the bill.



BASEBALL HELMET WITH VISOR**FIELD OF THE INVENTION**

[0001] The present invention is directed to a helmet that includes a detachable visor.

BACKGROUND OF THE INVENTION

[0002] Baseball is a game commonly played outdoors. On those occasions when the sun is out, batters can experience the glare of the sun when trying to hit a pitched baseball.

Some baseball players have tried to counteract the glare of the sun while batting by wearing sunglasses. However, the frame of the glasses can partially obscure the baseball as it is travelling toward the batter.

[0003] It would be helpful to provide a way to counteract glare from the sun while batting at a pitched baseball and at the same time provide an unobstructed view of the pitched baseball.

SUMMARY OF THE INVENTION

[0004] One aspect of the present invention regards a helmet including a shell defining an exterior surface and an interior volume of space and including a bill. A support structure attached to an underside of the bill. A visor including an engagement structure that releasably engages the support structure.

[0005] A second aspect of present invention regards a helmet including a shell defining an exterior surface and an interior volume of space and including a bill. A visor including an engagement structure that releasably engages the bill, wherein the visor does not pivot relative to the bill when engaged with the bill.

[0006] A third aspect of the present invention regards a method of using a helmet that includes a releasable visor, the method including during an at bat, wearing on a head of a user a baseball helmet that has a bill to which a visor is releasably engaged. After the at bat, removing the visor, from the bill.

[0007] One or more aspects of the present invention provide the advantage of providing a clear view of a baseball for a batter when there is glare from the sun present.

[0008] One or more aspects of the present invention provide the advantage of easily attaching or removing a visor from a helmet.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The various features, advantages and other uses of the present apparatus will become more apparent by referring to the following detailed description and drawing in which:

[0010] FIG. 1 is a left side view of an embodiment of a baseball helmet that includes a visor in accordance with the present invention;

[0011] FIG. 2 is a right side view of the baseball helmet and visor of FIG. 1;

[0012] FIG. 3 is a right perspective view of the baseball helmet and visor of FIG. 1;

[0013] FIG. 4 is a left perspective view of the baseball helmet of FIG. 1 when a second embodiment of a visor is used;

[0014] FIG. 5 is a left, top perspective, exploded view of the visor shown in FIG. 1;

[0015] FIG. 6a is a left, rear perspective, exploded view of the visor shown in FIG. 1;

[0016] FIG. 6b schematically shows a cross-sectional view of visor grip of the visor of FIG. 1;

[0017] FIG. 7a is a left, exploded view of the visor shown in FIG. 1;

- [0018] FIG. 7b is a front schematic view of a bracket to be used with the helmet of FIG. 1;
- [0019] FIG. 8 is a front view of the visor shown in FIG. 1;
- [0020] FIG. 9 is a left, perspective, exploded view of a third embodiment of a visor to be used with the support structure and baseball helmet of FIG. 1;
- [0021] FIG. 10 is a left, top perspective view of the visor shown in FIG. 9;
- [0022] FIG. 11 is a left, side view of the visor shown in FIG. 9 when the support structure of FIG. 9 of the helmet is inserted;
- [0023] FIG. 12 is a left, rear perspective view of the visor and support structure of FIG. 11;
- [0024] FIG. 13 is a front view of the visor and support structure of FIG. 11;
- [0025] FIG. 14 is a top view of the visor and support structure of FIG. 11;
- [0026] FIG. 15 is a left, perspective view of the visor and support structure of FIG. 11 when the visor is tinted;
- [0027] FIG. 16 is a left, top perspective view of a second embodiment of a visor and support structure for attachment to a baseball helmet in accordance with the present invention;
- [0028] FIG. 17 is a left, top perspective view of a third embodiment of a visor and attachment mechanism to a baseball helmet in accordance with the present invention;
- [0029] FIG. 18 is a left perspective view of a fourth embodiment of a visor and attachment mechanism to a baseball helmet in accordance with the present invention;
- [0030] FIG. 19 is a right perspective view of a fifth embodiment of a visor and support structure for attachment to a baseball helmet in accordance with the present invention;
- [0031] FIG. 20 is an exploded view of the visor and support structure of FIG. 19 when the visor is clear;

[0032] FIG. 21 is a left, top perspective view of a sixth embodiment of a visor and support structure to a baseball helmet in accordance with the present invention;

[0033] FIG. 22 is a left perspective view of a seventh embodiment of a visor and an attachment mechanism to a baseball helmet in accordance with the present invention;

[0034] FIG. 23 is a left perspective view of an eighth embodiment of a visor and attachment mechanism to a baseball helmet in accordance with the present invention;

[0035] FIG. 24 is a left perspective view of an embodiment of a helmet that is attached to the visor via the attachment mechanism of FIG. 23;

[0036] FIG. 25 is a front view of the helmet, visor, and attachment mechanism of FIG. 24;

[0037] FIG. 26 is a left side view of the helmet, visor, and attachment mechanism of FIG. 24;

[0038] FIG. 27 is a right side view of the helmet, visor, and attachment mechanism of FIG. 24;

[0039] FIG. 28 is a left, front perspective view of a ninth embodiment of a visor and attachment mechanism to a baseball helmet in accordance with the present invention;

[0040] FIG. 29 is a top, left and front perspective view of the visor and attachment mechanism of FIG. 28; and

[0041] FIG. 30 is a top, left and rear perspective view of the visor and attachment mechanism of FIG. 28.

DETAILED DESCRIPTION

[0042] As shown in the exemplary drawing figures, a baseball helmet is shown, wherein like elements are denoted by like numerals.

[0043] FIGS. 1-3 and 5-8 show an embodiment of a baseball helmet 100. The baseball helmet 100 includes a shell 102 placed on the head 104 of a baseball player. The shell 102 defines an exterior surface 105 and an interior volume of space 107. As shown, the shell 102 includes a front bill 106 positioned at the front of the shell 102. As shown in FIG. 2, the shell 102 can include an earflap 108 typically positioned on the side of the helmet 100 that will face the pitcher when the batter wearing the helmet 100 is in the batter's box. Of course, the shell 102 can include two earflaps, one for each ear.

[0044] The shell 102 is preferably made of a durable material, such as carbon fiber, so as to offer protection to the batter should he be struck by the pitched baseball. It should be understood that the present invention is not constrained to use the helmet design shown. It is envisioned that most, if not all, types of baseball helmets can be used in conjunction with the present invention. In addition, it is envisioned that helmets of other sports, such as cricket, can be used as well.

[0045] The baseball helmet 100 includes a visor 110 attached to the front bill 106. The visor 110 is preferably made of a durable material, such as a polycarbonate that is injection molded. The material can be either clear/transparent or tinted to aid in reducing glare from the sun. The visor 110 has a height, H, of approximately 3.98 inches and a length, L, of approximately 6.45 inches. The radius of curvature chosen for the optical portion 111 of the visor 110 depends on the optical characteristics to be conveyed to the player wearing the visor 110. As shown in FIGS. 3 and 5-8, a central portion of the top of the visor 110 includes an integrally attached engagement structure, such as a visor grip 112 that has a heavier texture than the rest of the visor 110. The side ends 113 of the optical portion 111 of the visor 110 extends away from the rear 115 of visor grip 112 by a distance, D, of approximately 3.34 inches. The visor grip 112 is made of the same material as the rest of the visor 110. The

visor grip 112 has a length of approximately 1.25 inches and extends past the main, optical portion of the visor 110 by approximately 0.72 inches.

[0046] As shown in FIGS. 5 and 6a-b, the visor grip 112 defines a slot 113, wherein the interior of the side walls 114 of the visor grip 112 has a pair of identically triangularly shaped grooves 116. The side walls 114 are integrally attached to identically shaped horizontal top ledges 118 and a bottom horizontal surface 120. In addition, the ledges 118, side walls 114, and bottom surface 120 are integrally attached to a front wall 122 that is perpendicular to the bottom surface 120 and the side walls 114. The front wall 122 closes one end of the slot 113. The bottom surface 120 of the visor grip 112 has an indentation 124 that receives a magnet 126 that is adhesively attached to the bottom surface 120.

[0047] As shown in FIGS. 5-8, a support structure is attached to the underside of the bill 106. An example of such a support structure is bracket 128. As shown in FIG. 6a, bracket 128 has a pair of holes 130 drilled at two ends of the bracket 128. The holes are spaced from each other by approximately 0.75 inches. The bracket 128 includes a pair of equally shaped ramped surfaces 132. The surfaces 132 are shaped similar to grooves 116 of the visor grip 112. In the underside 134 of the bracket 128, a centrally located indentation is formed that entirely receives a magnet 136 that is attached to the underside 134 via an adhesive. The bracket 128 is made of a durable material, such as 6061 Aluminum (CNC). A schematic front view of the bracket 128 is shown in FIG. 7b.

[0048] Along a central line that bisects the front bill 106 of the helmet 100, a pair of holes are drilled in the front bill 106. The size of the pair of holes of the front bill 106 is similar to the size of the holes 130 of the bracket 128. The pair of holes of the front bill 106 are spaced from each other a distance that is the same as the separation distance between holes 130 of the bracket 128.

[0049] With the above description of the visor grip 112 and the bracket 128 in mind, attachment between the visor 110 and the front bill 106 is now discussed. In particular, the bracket 128 is entirely inserted into slot 113 of the visor grip 112 so that the surfaces 132 of the bracket 128 snugly engages the grooves 116 of the visor grip 112. In additions, an attractive force between magnets 126 and 136 is established. At this point, the holes 130 of the bracket 128 are aligned with the holes drilled in the front bill 106 and then button head cap screws (#10-24) 138 are inserted into the holes of the front bill 106 and engage the holes 130 of the bracket 128. Thus, the visor 110 is attached to the front bill 106 and is unable to pivot relative to the bill 106. When so attached and when a person places the helmet 100 on his or her head 104, the side ends 140 of the visor 110 curve around the face of the player so that the side edges 142 of the ends 140 extend past the eye socket and toward the rear portion of the helmet 100 as shown in FIGS. 1-3.

[0050] If the visor 110 has a bottom recess 144 as shown in FIGS. 1-3 and 5-8, the recess is preferably spaced above and positioned symmetrically with respect to a nose of a person wearing the helmet. The recess 144 is positioned so that the nose does not touch the visor 110. Note that the amount the recess 144 exposes the nose can vary as shown when comparing the recess of FIGS. 1-3 and 5-8 and the recess 144a of the visors 110a-b of FIGS. 9-15. Note that the visors 110a (FIGS. 9 and 15) and 110b (FIGS. 10-14) are identical in all aspects except visor 110a is tinted while visor 110b is clear. In addition, visors 110a and 110b each includes a visor grip 112 like that of FIGS. 1-3 and 5-8 and the visor grips 112 of the visors 110a-b engage a bracket 128 attached to the bill 106 of a shell 102 in the manner described with respect to the embodiment of FIGS. 1-3 and 5-8 so as to form part of baseball helmets.

[0051] Since the visor 110c does not have a bottom recess as shown in FIG. 4, the middle portion of the bottom of the visor 110c is preferably spaced in front of and aligned with the bottom of nose of a person wearing the helmet 100c. Note that the visor 110c includes a visor grip 112 like that of FIGS. 1-3 and 5-8 and the visor grip 112 of the visor 110c engages a bracket 128 attached to the bill 106 of a shell 102 in the manner described with respect to the embodiment of FIGS. 1-3 and 5-8 so as to form part of a baseball helmet.

[0052] The attached visors 110 and 110a-c of the helmets of FIGS. 1-3 and 5-8 can be removed from the front bill 106 by sliding the visor 110 until the bracket 128 is removed from the grooves 116 of the visor grip 112.

[0053] Note that other variations for the bracket 128 and the visor grip 112 of the embodiments of FIGS. 1-15 are possible. For example, the length of the bracket 128 and visor grip 112 can be lengthened as shown by the brackets 128a-b and visor grip 112a in FIGS. 16 and 17. The spacing of the holes 130 of the brackets 128 and 128a-b can be varied along with the holes drilled into the bill 106 in the helmet. Attachment between the brackets 128a-b and the bill 106 is performed in the same way that the bracket 128 is attached to the bill 106 via screws 138. Other shapes for the brackets 128 and 128a-b can be used, such as trapezoidal, and triangular shapes. Materials for the brackets 128 and 128a-b are durable, such as plastic, aluminum, carbon fiber and steel.

[0054] Another variation of the helmet of FIGS. 1-3 and 5-8 is shown in FIG. 18, wherein the bracket 128 is altered so that only a single hole is formed and so only a single hole in the front bill 106 is formed so as to be aligned with the single hole of the bracket 128. A single screw is inserted into the aligned holes so that the bracket 128 of FIG. 18 is attached to the underside of the front bill 106.

[0055] Another variation is shown in FIGS. 19-20, wherein the bracket 128 of FIGS. 1-3 and 5-8 is altered so that three holes are formed along a central, longitudinally axis of the bracket 128 as shown with the bracket 128c. Attachment of the bracket 128c to the front bill 106 of the shell 102 is similar to the attachment of the bracket 128 to the bill 106 of FIGS. 1-3 and 5-8. In particular, three holes in the front bill 106 are formed so as to be aligned with the three holes of the bracket 128c and three screws 138 are inserted into the aligned holes so that the bracket 128c of FIG. 18 is attached to the underside of the front bill 106. Note that different types of visor shapes are possible. For example, FIG. 19 shows a tinted visor 110d without a recess 144 being present. FIG. 20 shows a clear visor 110d without a recess.

[0056] Another variation is shown in FIG. 21, wherein the bracket 128c of FIGS. 19-20 is longer in the direction connecting the surfaces 126. Accordingly, the width of the visor grip 112 is increased to take into account the shape of the revised bracket 122. As shown in FIG. 21, the altered bracket 128d has three holes formed along a central, longitudinally axis of the bracket 128d. Consequently, three holes are formed in the front bill 106 of the shell 102 so as to be aligned with the three holes of the bracket 122. Three screws are inserted into the aligned holes so that the bracket 128d is attached to the underside of the front bill 106. Note that revised visor grip 112b generally has the same cross-sectional shape as the visor grip 112 shown in FIG. 6b, except the width of the visor grip 112b is wider to accommodate the increased width of the bracket 128c. Insertion of the revised bracket 128c into the revised visor grip 112b is performed in a manner similar to the bracket 128 and visor grip 112 of FIGS. 1-3 and 5-8.

[0057] In another version, additional securement between the visor grips and brackets of FIGS. 1-21 is accomplished by riveting the visor grip and the bracket, when the bracket is positioned within the slot of the visor grip.

[0058] In another version, the slots of the visor grips of FIGS. 1-21 are eliminated. An upper face of the visor grip has a male or female attachment that engages a corresponding female or male attachment that is attached to the bottom surface of the bill 106 of the shell 102. Examples of possible male/female attachments are: 1) a male and female button system, 2) buckle with male and female ends, and 3) a mechanical ratchet.

[0059] In another version, the one, two and three screws for the helmets of FIGS. 1-21 are not used. Instead, the upper face of the bracket 128, 128a-d has an adhesive applied thereto. Then the upper face and adhesive thereon are attached to the underside of the bill 106 of the shell 102. Next, the visor grip 112, 112a-b of the visor 110, 110a-d engages the bracket 128, 128-d in a manner similar to that described previously with respect to FIGS. 1-21. In a similar variation, the adhesive is replaced by a Velcro piece that is attached to the upper face of the bracket 122, which engages a Velcro piece attached to the underside of the bill 106.

[0060] In another version shown in FIG. 22, the visor grip 112, 112a-b is altered so as to have a top surface that is complementary to the shape of a central portion of the underside of the front bill 106. An adhesive is then applied to the top surface of the visor grip 112, 112a-b and then the top surface with adhesive is engaged with the central portion of the underside of the front bill 106.

[0061] Another variation is to not use magnets or an adhesive as in the embodiments of FIGS. 1-22. Such a variation is shown in FIGS. 23-27, wherein a visor 200 with clear or tinted eyepieces 202 is adapted for attachment to the front bill 106. The eyepieces 202 are made of a material similar to that of the visors of FIGS. 1-22. A clip 204 is integrally attached to the top, central portion of the frame 206 to which the eyepieces 202 are attached. The frame 206 has top and bottom sides 208, 210 that are integrally attached to one another via side pieces 212 and a centrally located vertical piece 214. The eyepieces 202 are attached to

the inner surface of the frame 206 via an adhesive or other types of connections. The clip 204 and frame 206 may be made of plastic or a metal, such as steel. The clip 204 is J-shaped, wherein a short portion or arm 216 of the clip 204 is attached to the top, central portion of the frame 206. The long portion or arm 218 of the clip 204 is biased toward the frame 206. In addition, the long portion 218 and short portion 216 define a gap 220. The front bill 106 is inserted between the long and short portions 216, 218 of the clip so that the short portion 216 clamps upward against an underside of the front bill 106 and the long portion 218 clamps downward against an upper side of the front bill 106. Thus, the clip 204 clamps the visor 200 to the front bill 106. Removal of the visor 200 is accomplished by pulling the clip 204 away from the front bill 106. Note that a screw can be used to engage the top arm 218 and the front bill 106 by being inserted through and engaging aligned holes of the top arm 218 and front bill 106.

[0062] An alternative visor 200a is shown in FIGS. 28-30, wherein the frame 206 and eyepieces 202 of the visor 200 of FIGS. 23-27 have been replaced by a single sheet of clear or tinted material 220 that is integrally attached to the clip 204. The material 220 is made of a material similar to that of the visors of FIGS. 1-22. Attachment of the visor 200a is achieved in the same manner as describe with respect to the embodiment of FIGS. 23-27.

[0063] For the embodiments of FIGS. 1-21 and 23-30, one possible way of using the described helmets and visors is to have the visor attached to the front bill 106 and wear the helmet while batting in the batting box. Once the at bat is completed, the visor can be removed from the front bill in the manner described previously.

[0064] As another possibility, a hinge could be attached to the underside of the bill 106. The visors of FIGS. 1-21 and 23-30, without the visor grips or clips, would be attached to the hinge so that the visors could pivot to a first position in front of the face of the user as

shown in FIGS. 1-21 and 23-30 and a second position where the visor does not block the face of the user.

[0065] While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiments but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, which scope is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures as is permitted under the law.

WE CLAIM:

1. A helmet comprising:
a shell defining an exterior surface and an interior volume of space and comprising
a bill;
a support structure attached to an underside of said bill;
a visor comprising an engagement structure that releasably engages said support structure.
2. The helmet of claim 1, wherein said support structure is attached to said bill by at least one screw.
3. The helmet of claim 1, wherein said support structure is attached to said bill by an adhesive.
4. The helmet of claim 1, wherein said engagement structure defines a slot into which said support structure is inserted.
5. The helmet of claim 1, wherein said support structure comprises a magnet that releasably engages said engagement structure.
6. The helmet of claim 1, wherein said engagement structure comprises a magnet that releasably engages said support structure.
7. The helmet of claim 6, wherein said support structure comprises a second magnet that releasably engages said magnet of said engagement structure.
8. The helmet of claim 1, wherein said visor is clear.
9. The helmet of claim 1, wherein said visor is tinted.
10. A helmet comprising:
a shell defining an exterior surface and an interior volume of space and comprising
a bill;

a visor comprising an engagement structure that releasably engages said bill, wherein said visor does not pivot relative to said bill when engaged with said bill.

11. The helmet of claim 10, wherein said engagement structure is a clip that clampingly engages said bill.

12. The helmet of claim 10, wherein said clip comprises:

a first arm that clamps down on a top surface of said bill; and

a second arm that clamps upward on a bottom surface of said bill.

13. The helmet of claim 10, further comprising a screw that engages said clip and said bill.

14. The helmet of claim 10, wherein said visor is clear.

15. The helmet of claim 10, wherein said visor is tinted.

16. A method of using a helmet that includes a releasable visor, the method comprising:

during an at bat, wearing on a head of a user a baseball helmet comprising a bill to which a visor is releasably engaged; and

after said at bat, removing said visor from said bill.

17. The method of claim 16, wherein said removing comprises discontinuing clamping of said visor to said bill.

18. The method of claim 16, wherein said removing comprises discontinuing a magnetic engagement between said visor and said bill.

19. The method of claim 16, wherein said removing comprises sliding the bill out of a space defined by a clip that is attached to said visor.

AMENDED CLAIMS**received by the International Bureau on 02 october 2017 (02-10-2017)**

1. A helmet comprising:
 - a hard shell defining an exterior surface and an interior volume of space and comprising a bill;
 - a support structure attached to an underside of said bill;
 - a visor comprising an engagement structure that is releasably attached to said support structure, wherein when said visor engages said support structure said visor does not pivot relative to said support structure.
2. The helmet of claim 1, wherein said support structure is attached to said bill by at least one screw.
3. The helmet of claim 1, wherein said support structure is attached to said bill by an adhesive.
4. The helmet of claim 1, wherein said engagement structure defines a slot into which said support structure is inserted.
5. The helmet of claim 1, wherein said support structure comprises a magnet that releasably engages said engagement structure.
6. The helmet of claim 1, wherein said engagement structure comprises a magnet that releasably engages said support structure.
7. The helmet of claim 6, wherein said support structure comprises a second magnet that releasably engages said magnet of said engagement structure.
8. The helmet of claim 1, wherein said visor is clear.
9. The helmet of claim 1, wherein said visor is tinted.
10. A helmet comprising:
 - a hard shell defining an exterior surface and an interior volume of space and comprising a bill;
 - a visor comprising an engagement structure that is releasably attached to said bill, wherein said visor does not pivot relative to said bill when engaged with said bill.
11. The helmet of claim 10, wherein said engagement structure is a clip that clampingly engages said bill.
12. The helmet of claim 11, wherein said clip comprises:
 - a first arm that clamps down on a top surface of said bill; and

AMENDED SHEET (ARTICLE 19)

a second arm that clamps upward on a bottom surface of said bill.

13. The helmet of claim 11, further comprising a screw that engages said clip and said bill.

14. The helmet of claim 10, wherein said visor is clear.

15. The helmet of claim 10, wherein said visor is tinted.

16. A method of using a helmet that includes a releasable visor, the method comprising:

during an at bat, wearing on a head of a user a baseball helmet made of a hard material and comprising a bill to which a visor is releasably attached, wherein when said visor is engaged with said bill, said visor does not pivot relative to said bill; and

after said at bat, removing said visor from said bill.

17. The method of claim 16, wherein said removing comprises discontinuing clamping of said visor to said bill.

18. The method of claim 16, wherein said removing comprises discontinuing a magnetic engagement between said visor and said bill.

19. The method of claim 16, wherein said removing comprises sliding the bill out of a space defined by a clip that is attached to said visor.

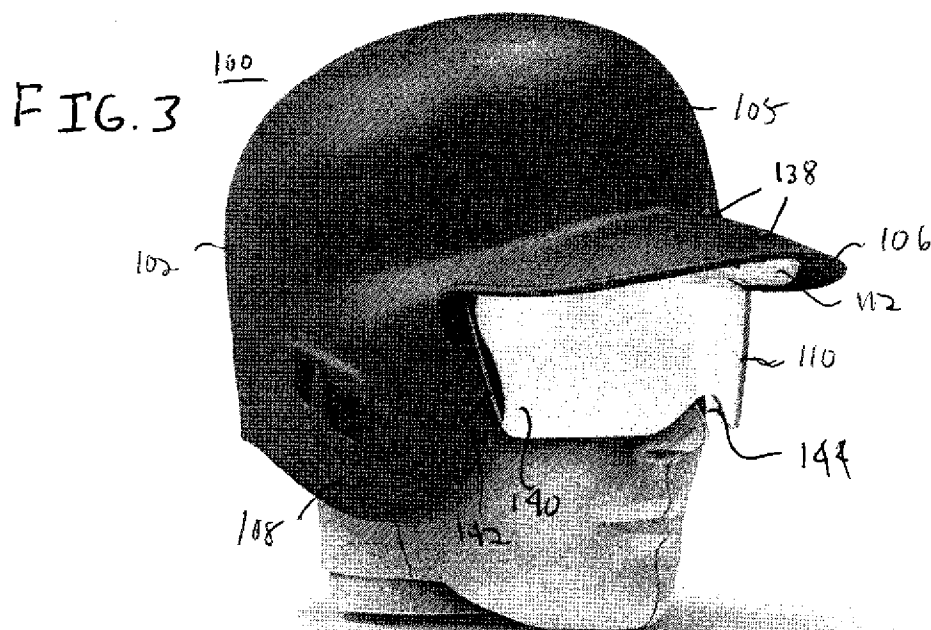
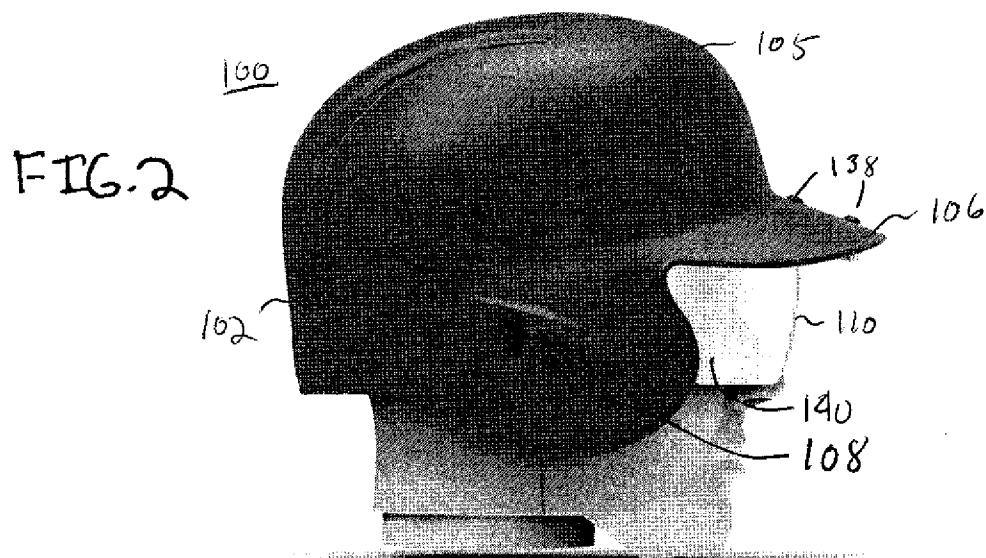
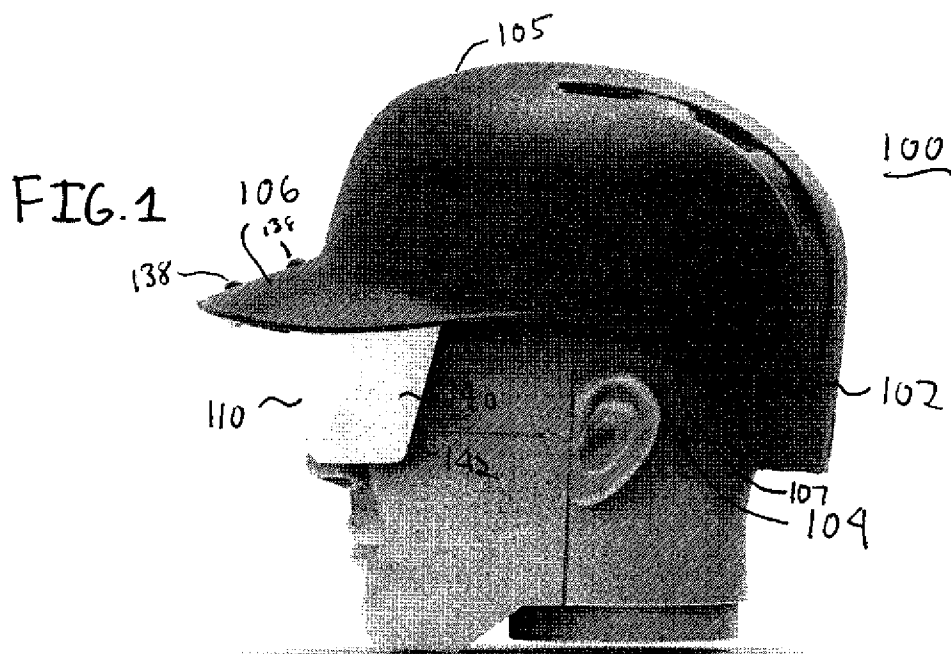


FIG. 4

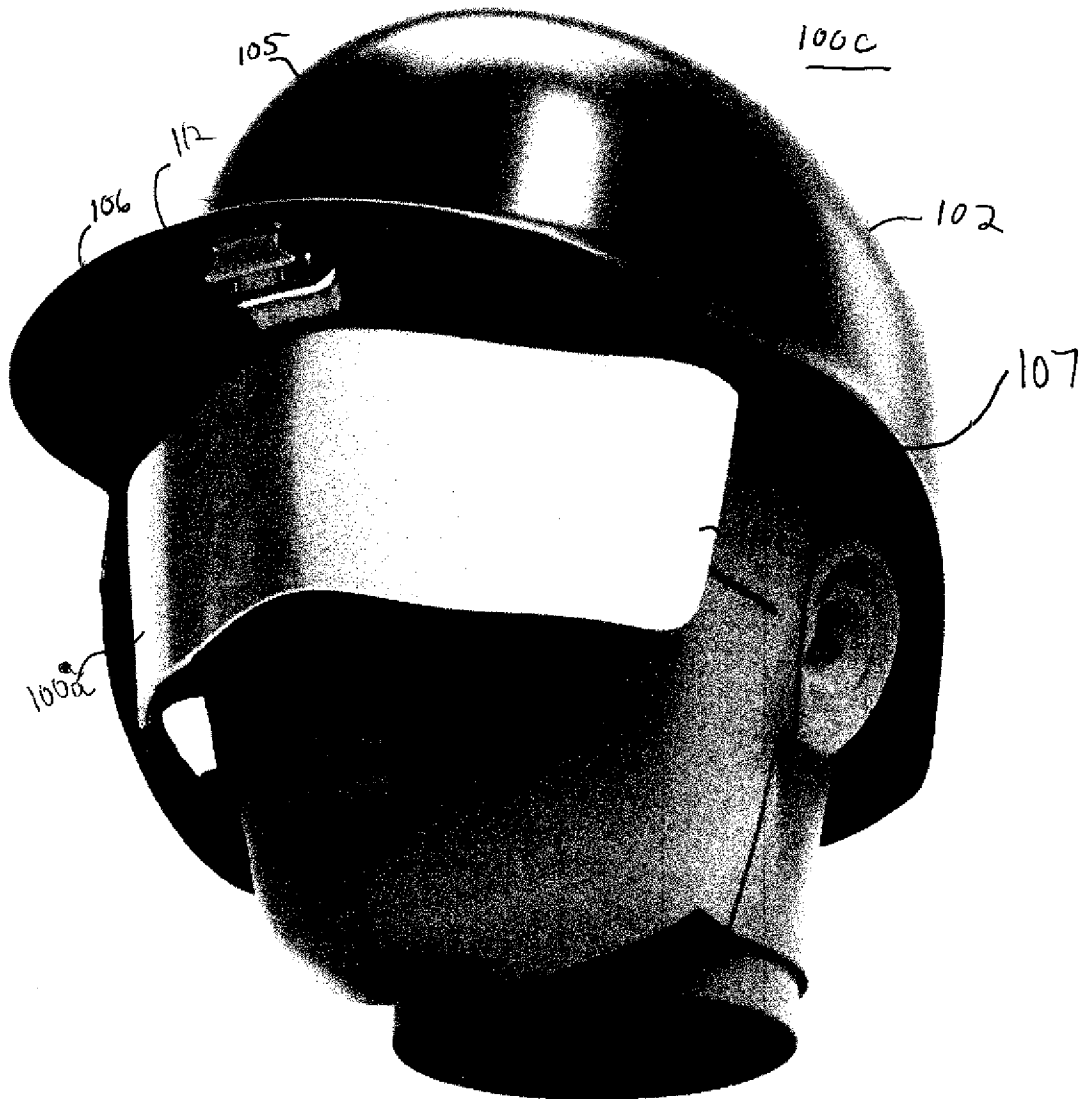


FIG. 5

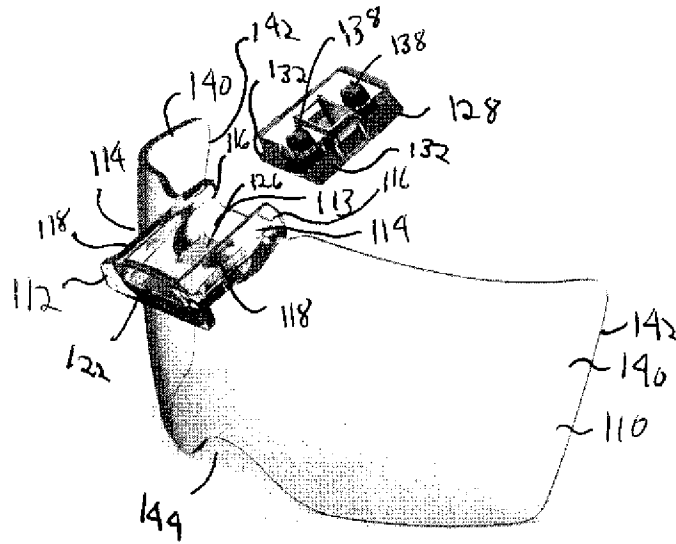


FIG. 6a

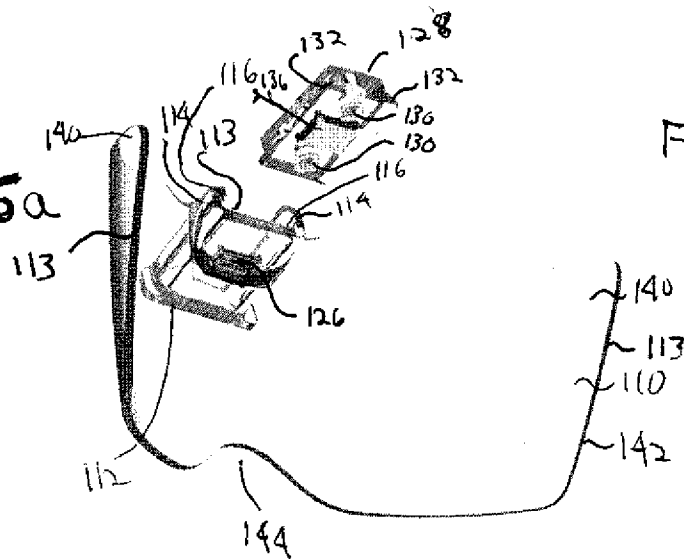


FIG. 6b

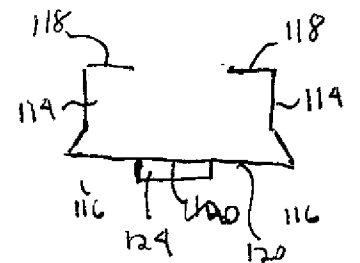


FIG. 7a

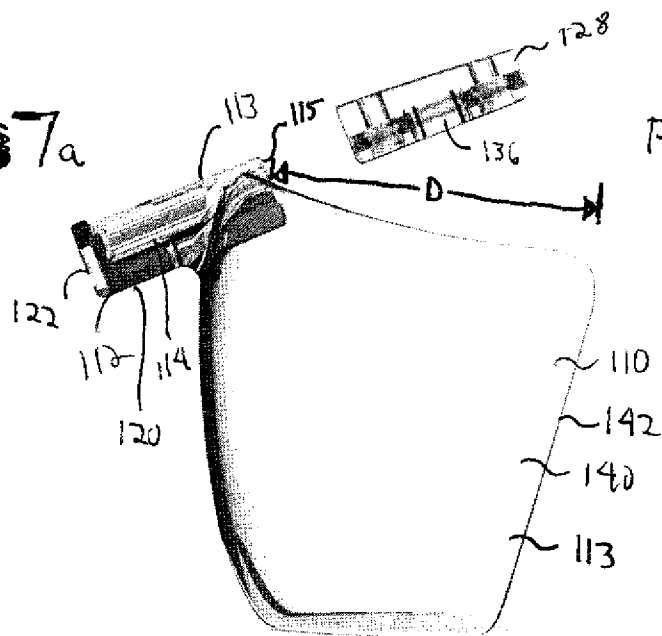


FIG. 7b



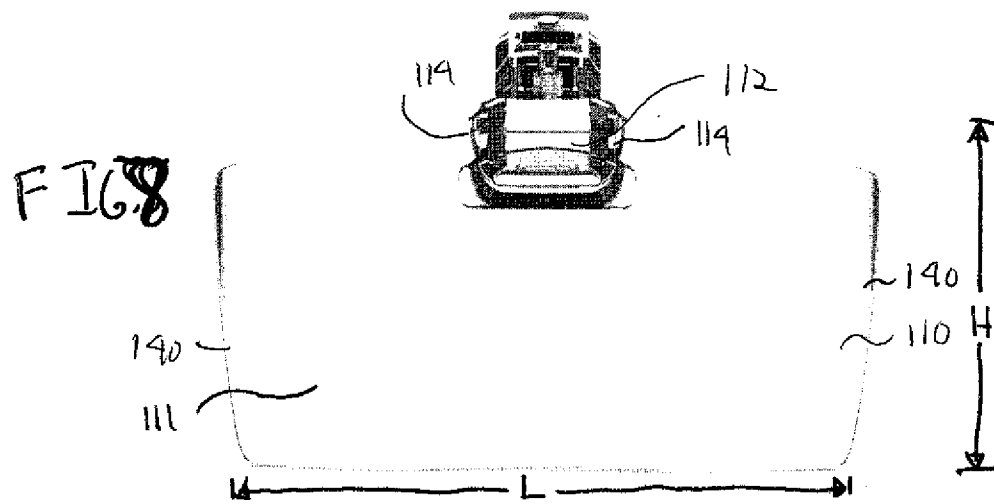
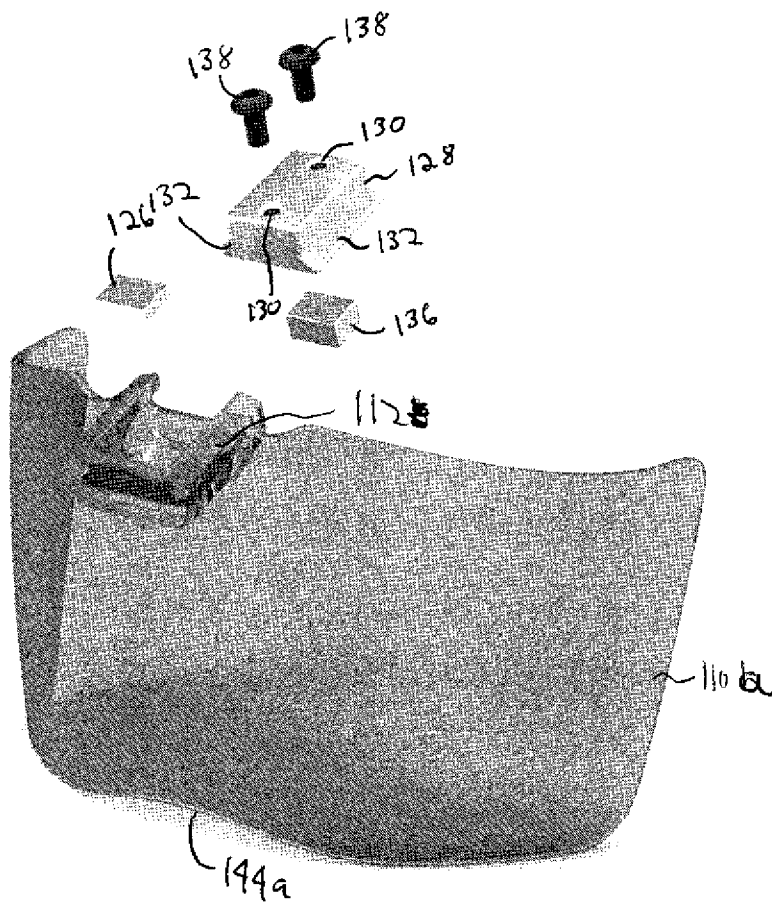
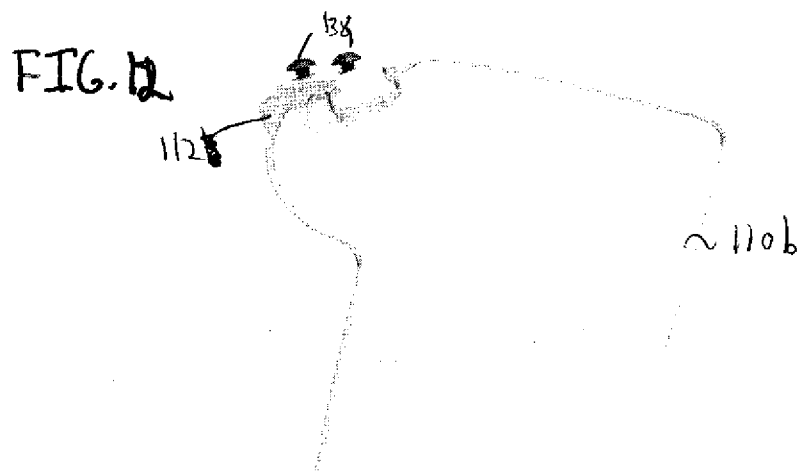
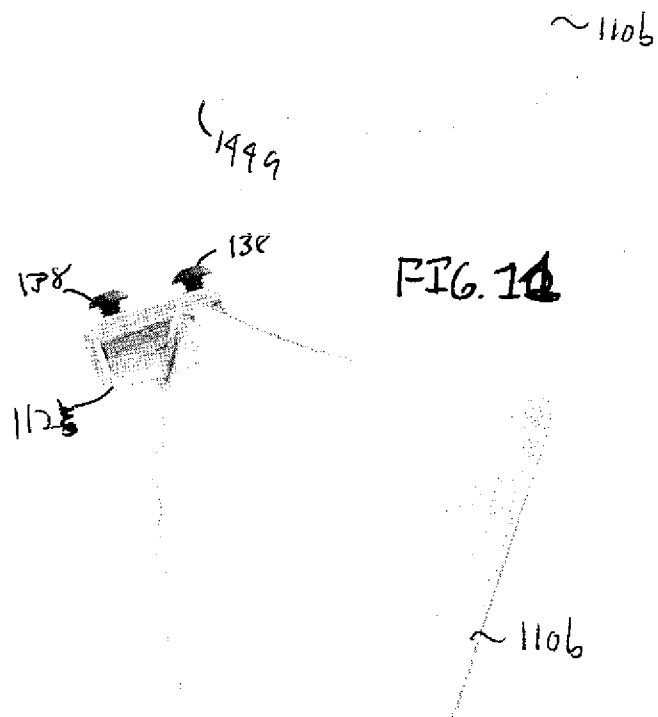
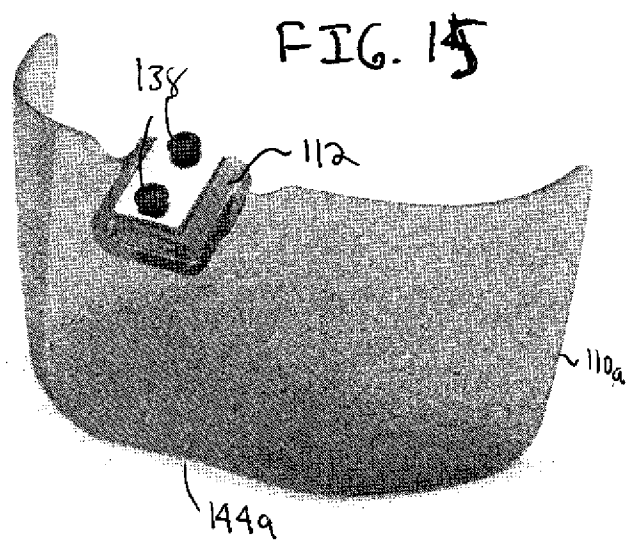
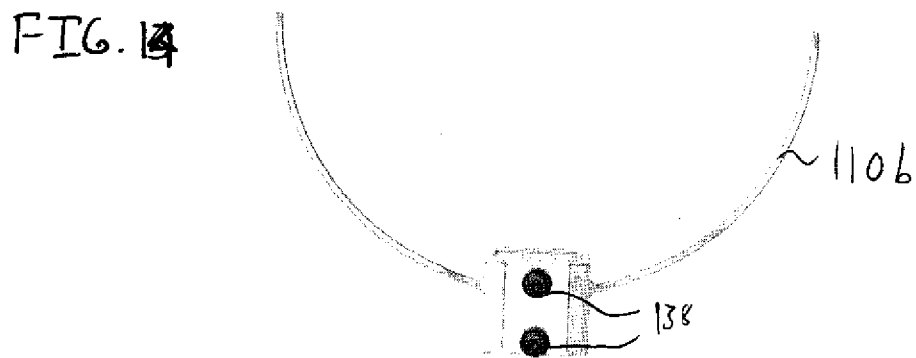
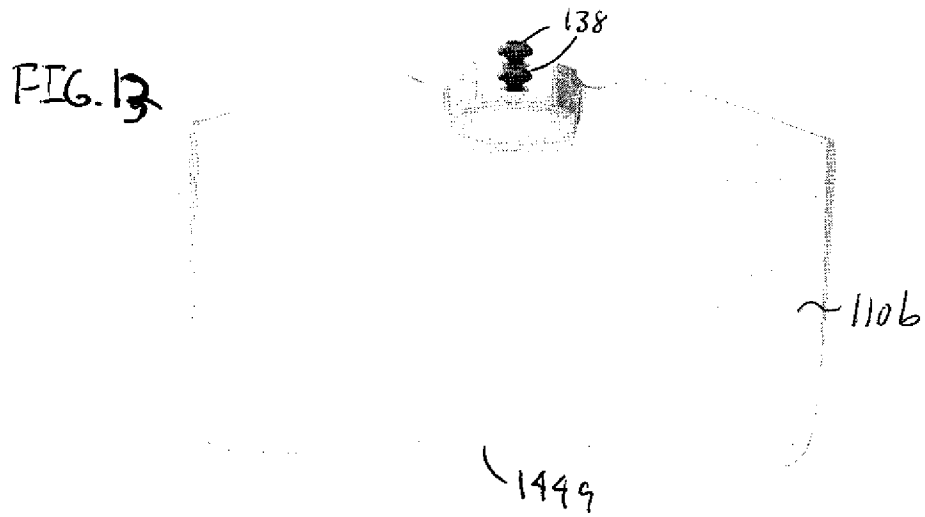
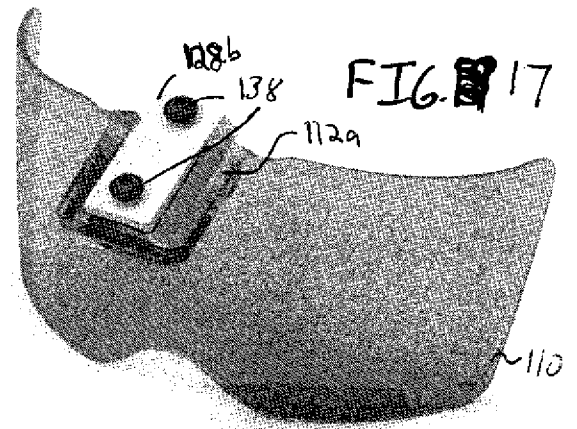
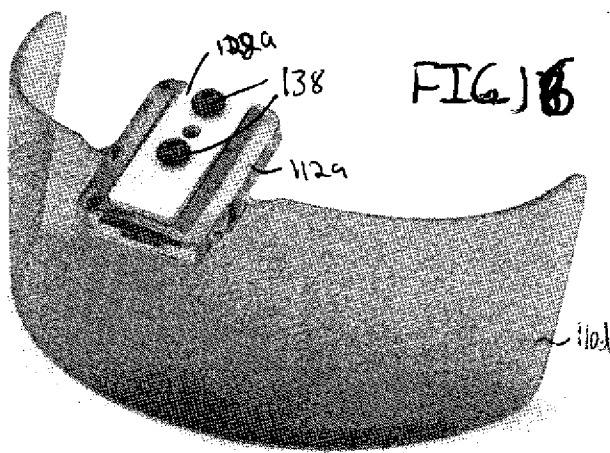


FIG. 9









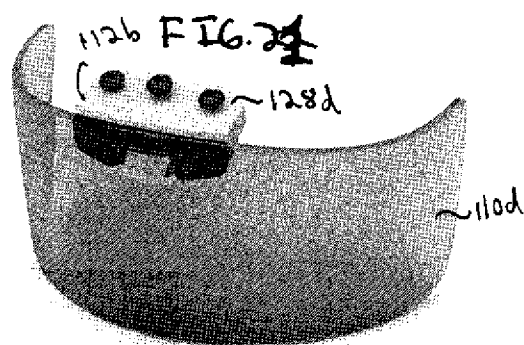
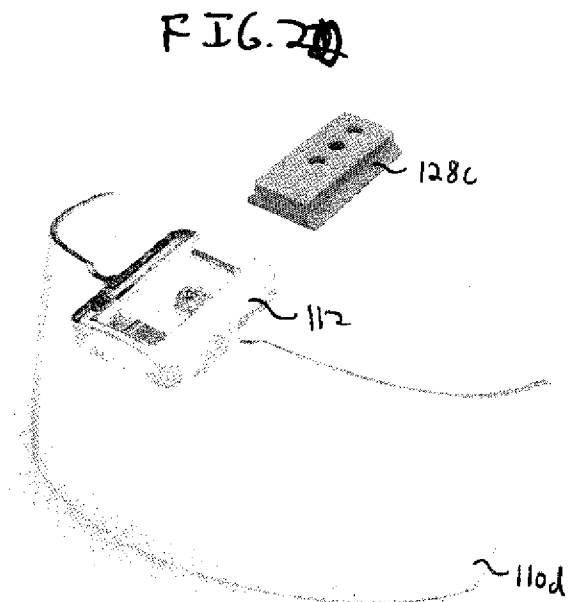
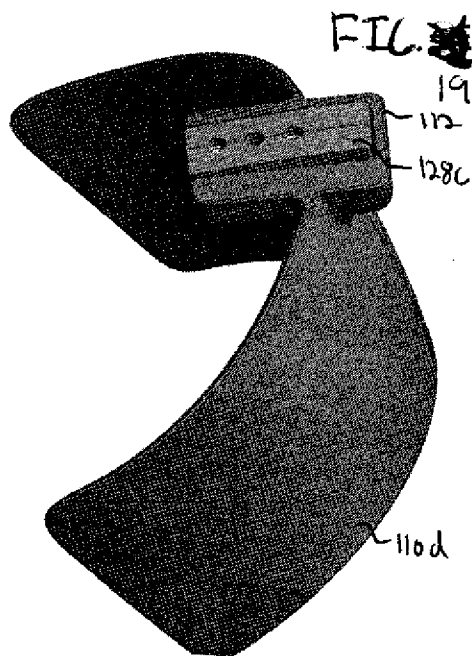
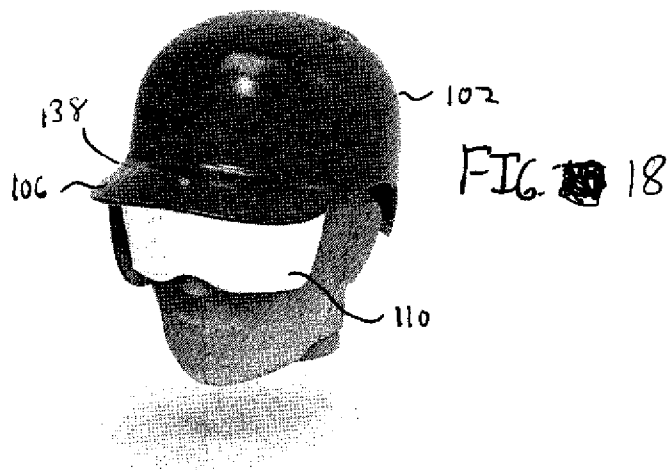


FIG. 22

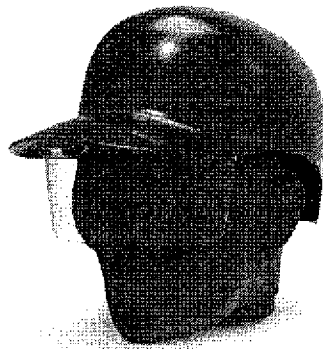


FIG. 23

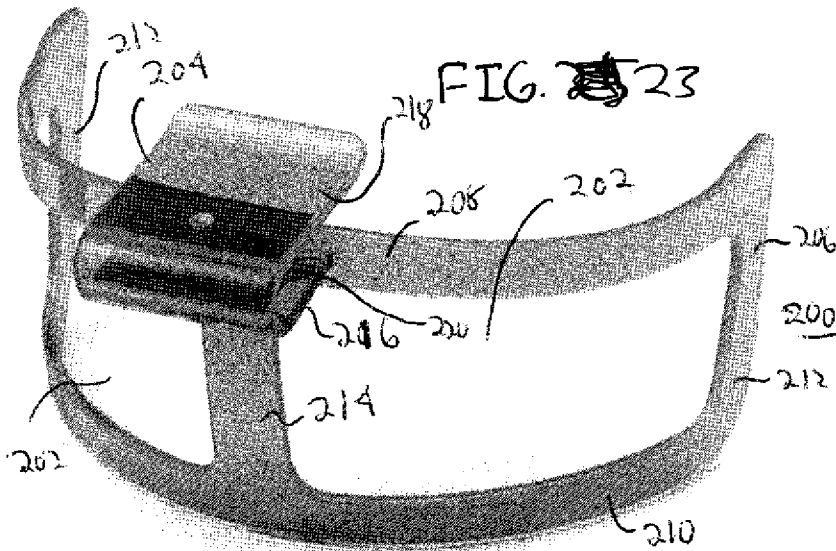


FIG. 24

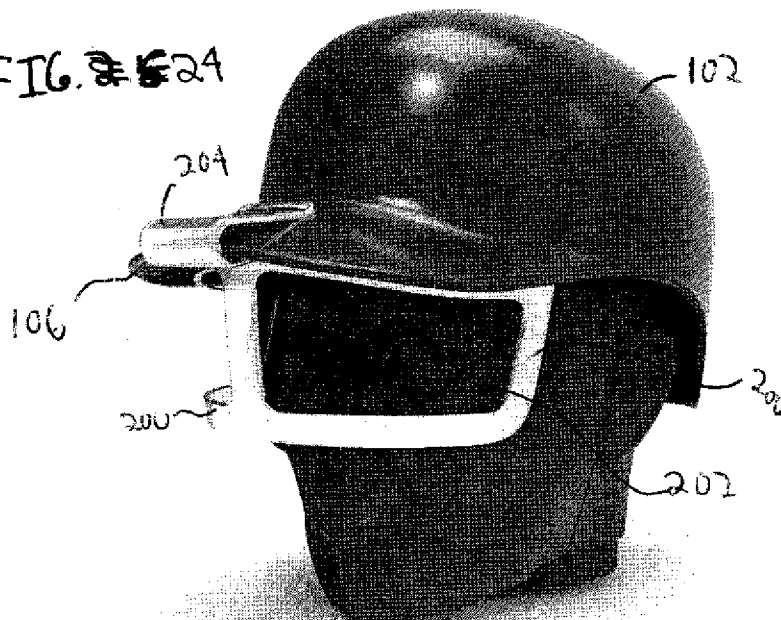


FIG. 2~~5~~⁵

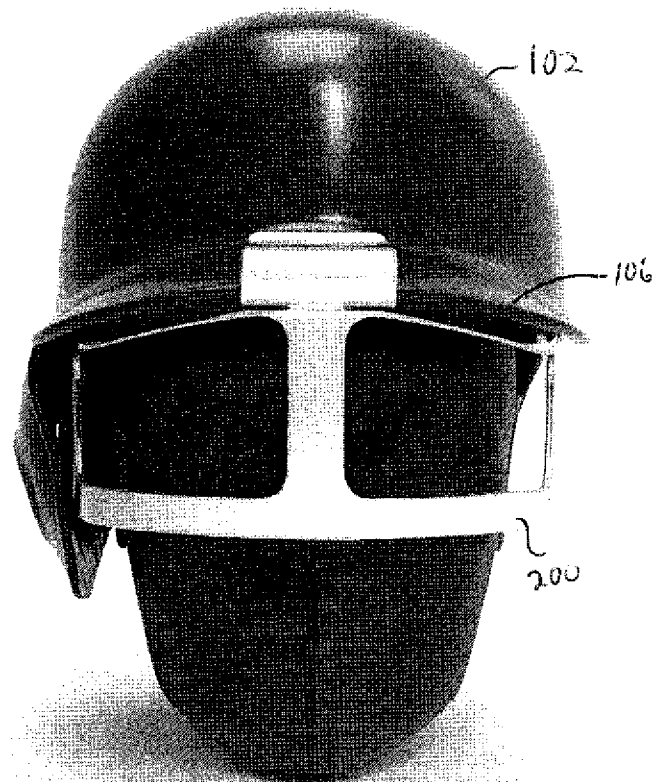


FIG. 2~~6~~⁶

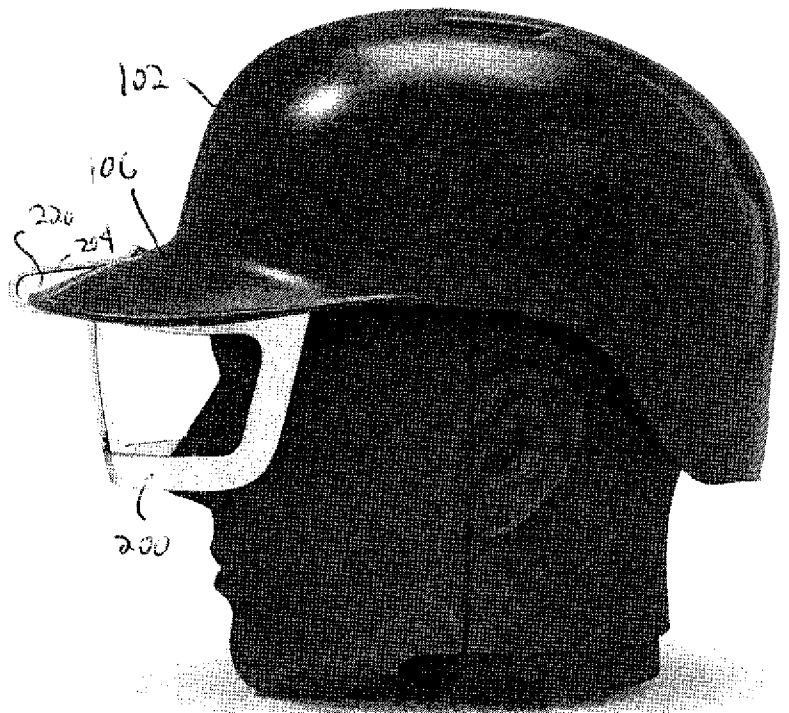


FIG. 2~~7~~⁷

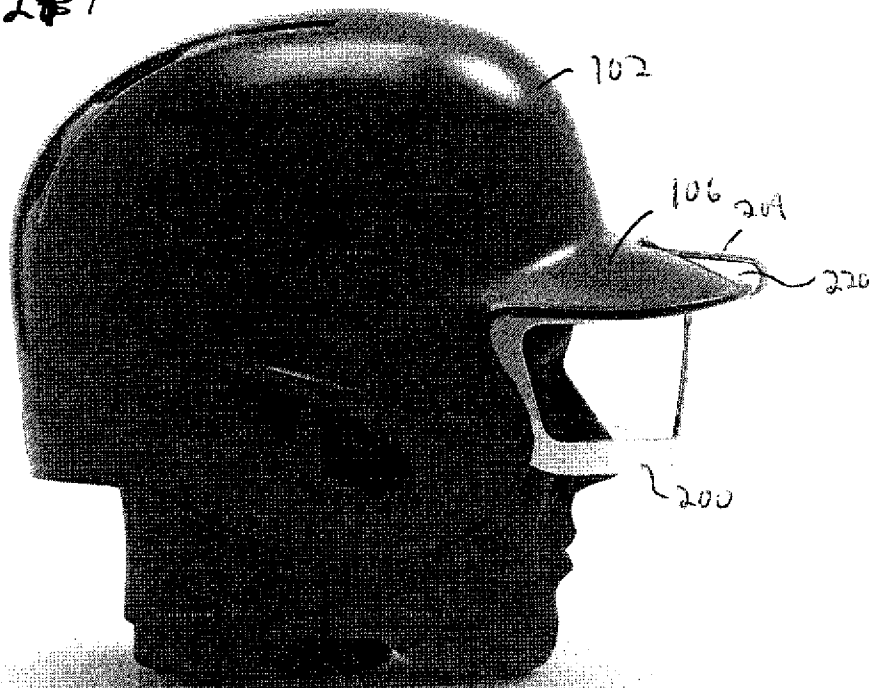


FIG. ~~30~~ 28

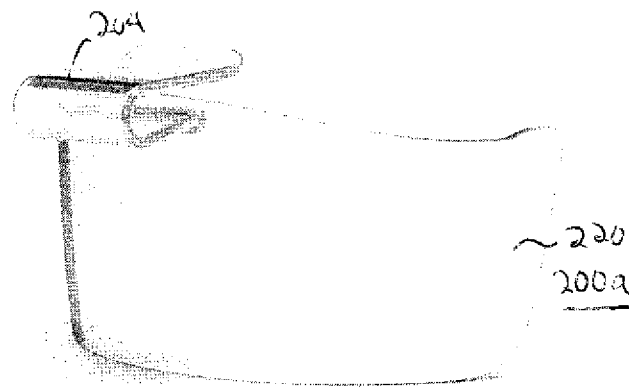


FIG. ~~29~~ 29

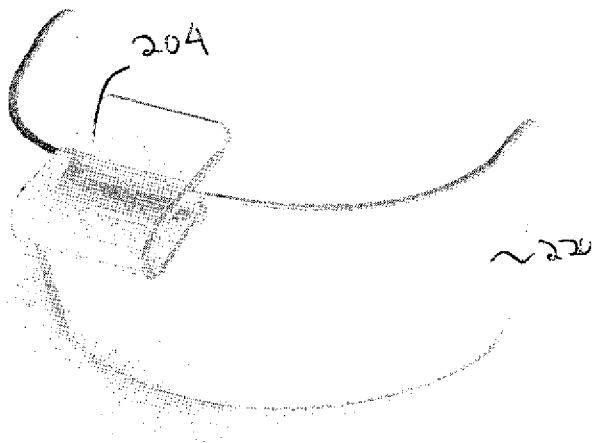
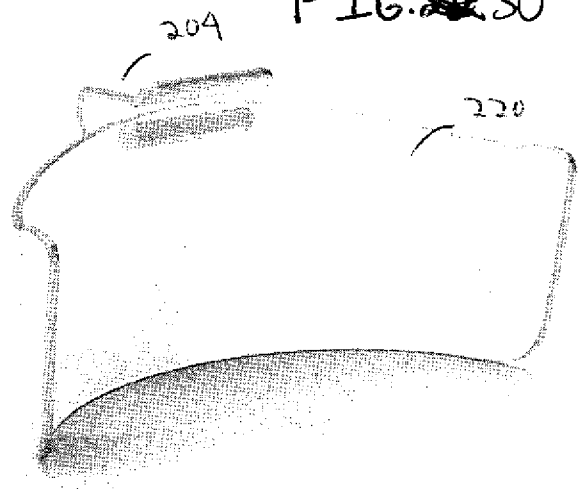


FIG. ~~30~~ 30



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2017/033470

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A42B 3/22; A42B 1/06; A42B 3/04; G02C 3/02 (2017.01)

CPC - A42B 3/22; A42B 1/247; A42B 3/185; A42B 3/221; A42B 3/222; A42B 3/223; A42B 3/226; A42B 3/227; A63B 69/0002; G02C 3/02 (2017.05)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

USPC - 2/6.3; 2/15; 2/422; 2/425; 351/155; 351/158 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---	US 5,533,207 A (DIAZ) 09 July 1996 (09.07.1996) entire document	1, 2, 4, 8, 9 ---
Y		3, 5-7
X ---	US 2008/0000016 A1 (KELLOGG) 03 January 2008 (03.01.2008) entire document	16, 17 ---
Y		18
Y	US 2007/0256214 A1 (MCGOWAN et al) 08 November 2007 (08.11.2007) entire document	3
Y	US 2007/0033775 A1 (HSIAO) 15 February 2007 (15.02.2007) entire document	5-7, 18
Y	US 2007/0192933 A1 (KAM) 23 August 2007 (23.08.2007) entire document	10-15
Y	US 5,720,689 A (MILLER) 22 June 1993 (22.06.1993) entire document	10-15
Y	US 5,412,812 A (GATCHALIAN) 09 May 1995 (09.05.1995) entire document	13
A	US 2009/0013439 A1 (THOMAN) 15 January 2009 (15.01.2009) entire document	1-19
A	US 2,560,669 A (VACA) 17 July 1951 (17.07.1951) entire document	1-19
A	US 5,692,234 A (YUEN) 02 December 1997 (02.12.1997) entire document	1-19

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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Date of the actual completion of the international search

19 July 2017

Date of mailing of the international search report

01 AUG 2017

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