

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Steven Baldi
U.S. Patent No.: 10,617,167 B2 Attorney Docket No.: 51690-0004IP1
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Title: VENTILATED MODULAR DUAL SHELLLED HELMET
SYSTEM

DECLARATION OF DR. MARK HORSTEMEYER

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I, Dr. Mark Horstemeyer, of Lynchburg, Virginia, declare that:

I. QUALIFICATIONS AND BACKGROUND INFORMATION

1. I am currently the President and Founder of Predictive Design Technologies. My curriculum vitae is provided in EX-1004.

2. My education includes a BS in Mechanical Engineering at West Virginia University, a MS in Mechanical Engineering at Ohio State University, and a PhD in Mechanical Engineering at Georgia Institute of Technology. I have studied materials behavior, penetration mechanics, multiscale modeling, Integrated Computational Materials Engineering (ICME), and computational solid mechanics for nuclear bombs, the space shuttles, cars, and sports helmets. In addition, I have been involved in reconstruction of accidents arising from materials fracture, cars crashing, the World Trade Center, and the Columbia Space Shuttle accident. Throughout my career I have received a variety of awards and I am a Fellow of the following societies: the American Society of Mechanical Engineers (ASME), the American Society of Metals (ASM), the Society for Automotive Engineers (SAE), and the American Association for the Advancement of Science (AAAS). Furthermore, I am a member of the European Union National Academy of Sciences. I have published over 500 different articles, books, and technical reports. My citation impact factor is over 60 with a total number of citations over 16,000.

3. In writing this Declaration, I have considered the following: my own knowledge and experience, including my work experience in the fields of football helmet design, computational finite element analysis, materials behavior, penetration mechanics, and multiscale modeling of the brain. I have had over 200 graduate students and post-doctoral fellows who studied under me researching these topics.

4. In addition, I have analyzed the following publications and materials, in addition to other materials I cite in my declaration:

- U.S. Patent No. 10,617,167 B2 (EX-1001), and its accompanying prosecution history (EX-1002);
- U.S. Patent No. 2,625,683 to Roth (“Roth,” EX-1005);
- U.S. Publication No. 2012/0017358 to Princip (“Princip,” EX-1006);
- Certified English Translation of Akamatsu Japanese Patent Application Publication No. 2005-273119 to Akamatsu (“Akamatsu”, EX-1008);
- U.S. Patent Application Publication No. US 2006/0005291 to Bedford (“Bedford,” EX-1009);
- U.S. Patent No. 9,408,423 to Guerra (“Guerra,” EX-1010);
- U.S. Patent No. 5,204,998 to Liu (“Liu,” EX-1011);

- U.S. Patent No. 5,231,703 to Garneau (“Garneau,” EX-1012);
- U.S. Patent No. 5,327,585 to Karlan (“Karlan,” EX-1013);
- U.S. Patent No. 5,539,934 to Ponder (“Ponder,” EX-1014);
- U.S. Patent No. 10,729,203 to Krishnan (“Krishnan,” EX-1015);
- “Bicycle Helmet Cooling” (<http://www.helmets.org/cooling.htm>);
archived at Wayback Machine (<https://web.archive.org>) >
<http://www.helmets.org/cooling.htm> > citing a capture date of July 5,
2016. (EX-1016)

II. OVERVIEW OF CONCLUSIONS FORMED

5. This Declaration explains the conclusions that I have formed based on my analysis. To summarize those conclusions:

- Based upon my knowledge and experience and my review of the prior art publications listed above, I believe that Claims 7 and 10 of U.S. Patent No. 10,617,167 are anticipated by Roth. Alternatively, I believe Claims 7 and 10 are rendered obvious by Roth.
- Based upon my knowledge and experience and my review of the prior art publications listed above, I believe that Claims 7, 10, and 11 of U.S. Patent No. 10,617,167 are also anticipated by Princip.
- Based upon my knowledge and experience and my review of the prior art publications listed above, I believe that Claims 1-6, 8-9, and 18 of

U.S. Patent No. 10,617,167 are rendered obvious by Princip-Akamatsu.

- Based upon my knowledge and experience and my review of the prior art publications listed above, I believe that Claims 3, 4, and 18 of U.S. Patent No. 10,617,167 are anticipated by Bedford.
- Based upon my knowledge and experience and my review of the prior art publications listed above, I believe that Claims 7 and 10 are rendered obvious by Liu.

III. LEGAL PRINCIPLES

A. Terminology

6. I have been informed by Counsel and understand that the best indicator of claim meaning is its usage in the context of the patent specification as understood by one of ordinary skill. I further understand that the words of the claims should be given their plain meaning unless that meaning is inconsistent with the patent specification or the patent's history of examination before the Patent Office.

7. Counsel has also informed me, and I understand that, the words of the claims should be interpreted as they would have been interpreted by one of ordinary skill as of the earliest possible priority date of U.S. Patent No. 10,617,167. That date was November 22, 2016 (the "Critical Date").

B. Legal Standard for Anticipation

8. I have been informed by Counsel and understand that documents and materials that qualify as prior art can render a patent claim unpatentable as anticipated. I am informed by Counsel and understand that all prior art references are to be looked at from the viewpoint of a person of ordinary skill in the art.

9. I am informed by Counsel and understand that a challenged claim is unpatentable as “anticipated” under 35 U.S.C. § 102 if it is determined that all the limitations of the claim are described in a single prior art reference. I am informed by Counsel and understand that, to anticipate a claim, a prior art reference must disclose, either expressly or inherently, each and every limitation of that claim and enable one of ordinary skill in the art to make and use the invention.

10. I have been informed by Counsel and understand that in an *inter partes* review, “the petitioner shall have the burden of proving a proposition of unpatentability,” including a proposition of anticipation, “by a preponderance of the evidence.” 35 U.S.C. §316(e).

C. Obviousness

11. I have been informed that a patent claim is invalid as “obvious” under 35 U.S.C. § 103 in light of one or more prior art references if it would have been obvious to a POSITA, taking into account (1) the scope and content of the prior art, (2) the differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) any so called “secondary considerations” of non-obviousness,

which include: (i) “long felt need” for the claimed invention, (ii) commercial success attributable to the claimed invention, (iii) unexpected results of the claimed invention, and (iv) “copying” of the claimed invention by others. For purposes of my analysis above and because I know of no indication from the patent owner or others to the contrary, I have applied a date of November 22, 2016 as the date for my obviousness analyses, although in many cases the same analysis would hold true even at an earlier time than November 22, 2016.

12. I have been informed that a claim can be obvious in light of a single prior art reference or multiple prior art references. To be obvious in light of a single prior art reference or multiple prior art references, there must be a reason to modify the single prior art reference, or combine two or more references, in order to achieve the claimed invention. This reason may come from a teaching, suggestion, or motivation to combine, or may come from the reference or references themselves, the knowledge or “common sense” of one skilled in the art, or from the nature of the problem to be solved, and may be explicit or implicit from the prior art as a whole. I have been informed that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. I also understand it is improper to rely on hindsight in making the obviousness determination.

D. Level of Ordinary Skill in the Art

13. In my opinion, a person of ordinary skill in the art (“POSITA”) as of U.S. Patent No. 10,617,167’s Critical Date would have had Bachelor of Science degree (or equivalent degree) in Mechanical Engineering, Material Science, or another academic discipline emphasizing the design/development of helmets, in combination with at least one to two years of work experience with helmet design or development. Superior education could compensate for a deficiency in work experience, and vice-versa.

14. In my opinion, this appropriately captures the skill level of a POSITA. In fact, based on my knowledge, skill, and experience, I have a good understanding of the capabilities of the POSITA. Indeed, I have taught, participated in organizations, and worked closely with many such persons over the course of my career. For example, from my industry experience, I am familiar with what an engineer would have known and found predictable in the art. From teaching and supervising my post-graduate students, I also have an understanding of the knowledge that a person with this academic experience possesses. Furthermore, I possess those capabilities myself.

IV. BACKGROUND KNOWLEDGE OF A POSITA BEFORE THE CRITICAL DATE

15. The technology in U.S. Patent No. 10,617,167 generally relates to a modular helmet including vented inner and outer shells, which shells are radially

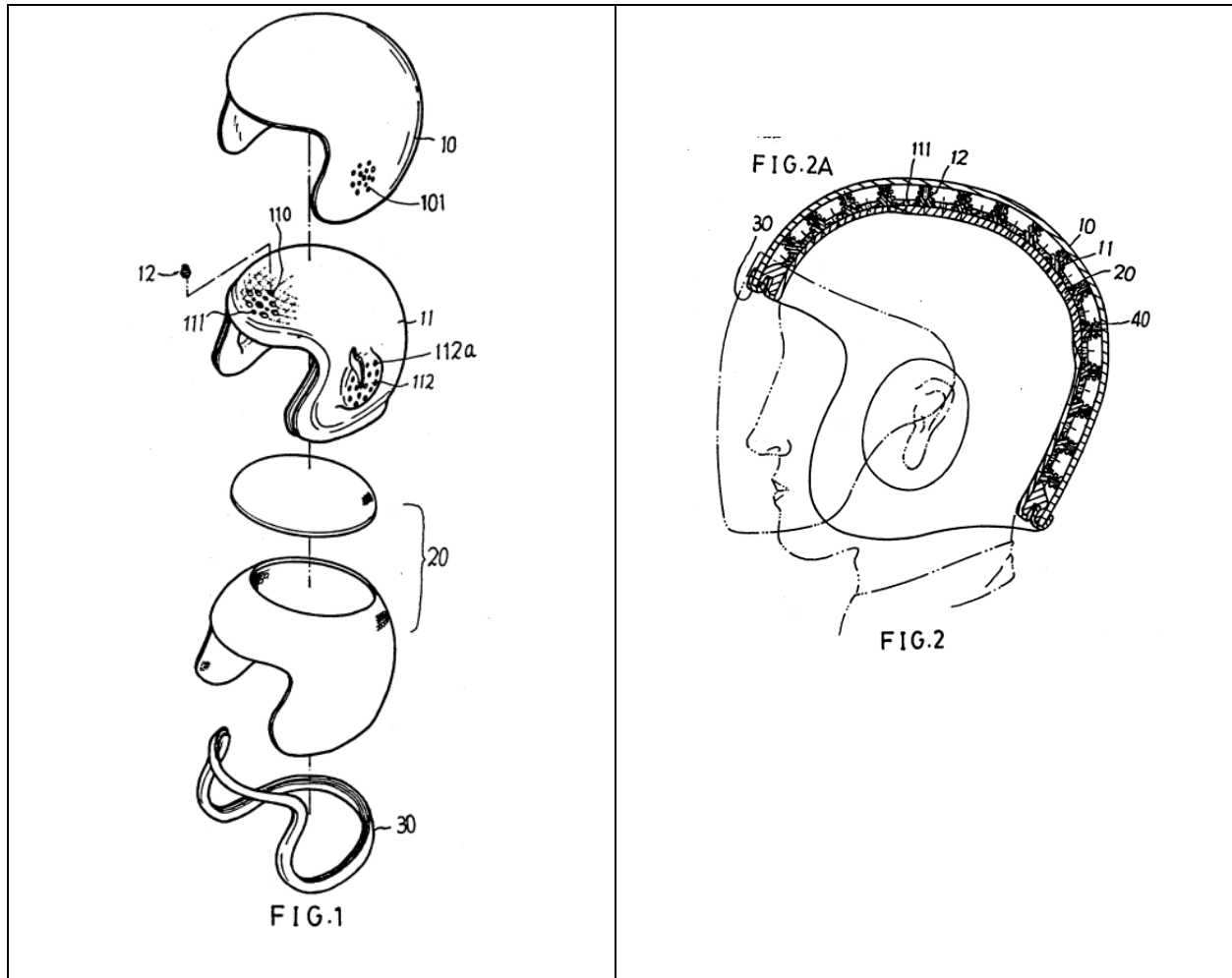
spaced apart to create between them a “climatic zone” that may optionally include cushioning and/or cooling packs.

16. Prior to the Critical Date, there existed numerous products, publications, and patents that implemented or described the functionality claimed in U.S. Patent No. 10,617,167. Thus, the modular helmet described and claimed in U.S. Patent No. 10,617,167 was well-known in the prior art. Further, to the extent there was any problem to be solved in U.S. Patent No. 10,617,167, it had already been solved in the prior art systems before the priority date of U.S. Patent No. 10,617,167.

17. In addition to the references I discuss below that anticipate or render obvious U.S. Patent No. 10,617,167, the following exemplary references demonstrate the prevalence of these functionality disclosed and claimed in U.S. Patent No. 10,617,167.

18. More than two decades before U.S. Patent No. 10,617,167’s Critical Date, U.S. Patent No. 5,204,998 to Liu (“Liu”), filed on May 20, 1992, disclosed “[a] safety helmet” with “an outer shell juxtapositionally secured with an inner shell defining an air chamber between the two shells, a plurality of cushioning bellows retained between the two shells....” EX-1011, Abstract, Figs. 1-2, 1:30-42, 1:56-2:2, Claim 1. That is, Liu discloses a protective helmet with a radially spaced inner and outer shells with cushioning between. *Id.* Still further, the inner and outer shell

both have vents (perforations) for ventilation. *Id.*, Fig. 1, 2:3-7, 2:33-37, Claims 1-3.



19. Liu's disclosures were not unique. U.S. Patent No. 5,231,703 to Garneau ("Garneau"), filed February 3, 1992, also disclosed a protective helmet with radially spaced inner and outer shells with cushioning between. EX-1012, Abstract ("A safety helmet compris[ing] hard internal and external shells and a shock-absorbent insert."), Figs. 3-7, 1:64-2:9, 2:59-62. Garneau also disclosed inner and

outer shell vents (*id.*, 1:67-2:9, 3:63-4:13, Figs. 1-11), further noting that, “[o]bviusly, additional ventilation openings could be provided.” *Id.*, 4:1-2.

20. These features further became well-known and conventional in the art before the Critical Date, as recognized by U.S. Patent No. 9,408,423 to Guerra (“Guerra”), filed in 2014, which recognized that “[p]rior art helmets have generally comprised ...multiple layers including absorbing elements there between.” EX-1010, 1:16-19, 4:25-26 (“Furthermore, vent holes can be defined in the outer and/or inner shells.”).

21. Using cooling packs in helmets was likewise long-known and conventional in the art before the Critical Date. For example, in 1993, U.S. Patent No. 5,327,585 to Karlan (“Karlan”) criticized the prior art cooling packs as “not adaptable to [helmets] in a universal manner,” and, to that end, described a cooling pack that was “readily adaptable for use in hats, caps and helmets...” EX-1013, 1:24-28, 2:12-17. Likewise, in 1995, U.S. Patent No. 5,539,934 to Ponder (“Ponder”) recognized, as to protective helmets, that “[c]ooling bladders have been used in the past” to cool wearers’ heads. EX-1014, 1:25-27.

22. Accordingly, before the Critical Date, it was well known and standard in the relevant art for protective helmets to include vented, radially spaced inner and outer shells with cushioning and cooling packs disposed in the radial spacing between the inner and outer shells.

V. THE '167 PATENT (EX-1001)

A. Overview

23. U.S. Patent No. 10,617,167 Patent relates to a modular helmet with multiple modules, including at least an **inner shell**¹ and **outer shell**, as shown below.

EX-1001, Abstract.

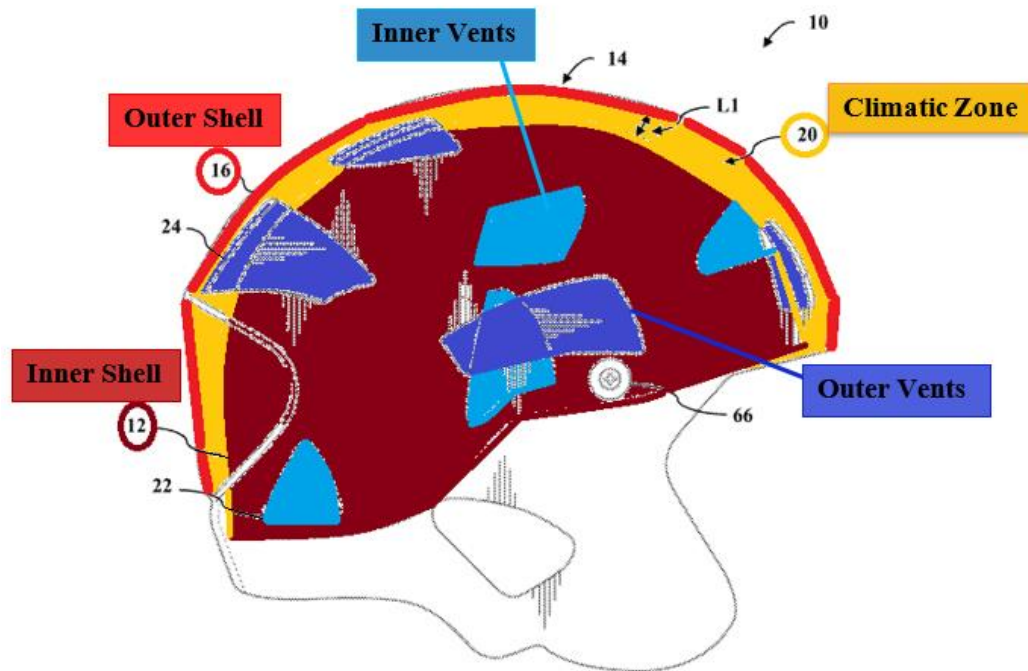


FIG. 1

¹ Emphasis added throughout unless otherwise noted.

24. The inner shell and the outer shell may be “made out of a flexible material, a semi rigid material, or a rigid material. The flexible material may be easily displaced and act more as a membrane...The material used for the [shells] may include but is not limited to any material having the desired physical properties[, for example:] polymers, plastics, thermoplastics, PVC, vinyl, nylon, or other similar materials. The materials used for the [shells] may include materials that have a smooth outer surface and a high level of mar-resistance.” EX-1001, 4:34-5:19.

25. “The outer shell is spaced a distance radially outward from the inner shell to define a climatic zone between [the shells].” EX-1001, 6:6-7. “[T]he climatic zone 20 is defined between the inner shell and the outer shell.” *Id.*, 6:6-7; 6:10-27 (“The length of the climatic zone L1 may vary depending on the goals of the user. For example, FIGS. 1 and 2 show the [helmet] *without any additional components* positioned within climatic zone 20. The length L1 is variable to maximize air movement within the climatic zone 20 that may enhance evaporation. *When the climatic zone 20 does not include the cooling assembly 18*, the climatic zone 20 passively allows an arid layer of air to form between the inner shell 12 and the outer shell 16. As shown by the arrows with broken lines in FIGS. 3 and 4, a flow 40 of air may move freely through the [helmet]. The ambient air may move

straight from the outer vents []² to the oriented corresponding inner vent 22, or the ambient air may move from at least one outer vent 28 to an off-set inner vent 22. The dryer atmosphere created by the *empty climatic zone 20* with the arid layer of air provides a driving force to allow for the evaporation of perspiration from the athletes head.”), *see* Figs. 1-4 (showing empty climatic zone).

26. The climatic zone, however, is not always empty, and can include a plurality of **cushions** coupled to the outer shell. *See id.*, 7:59-8:41, Figs. 10-11. “The thickness, number of cushions, and position of the cushions may vary.” *Id.*, 8:15-16. The cushions can generally be any material with conventional cushion quality of compressing under pressure to absorb impact/force/energy. *Id.*, 8:28-41 (“The plurality of cushions 52 may include an absorptive material. The absorptive material may be any known elastic or viscoelastic material such as, but not limited

² The ’167 Patent specification consistently labels the outer vents as “28.” The specification appears to make at least one labeling error, calling the outer vent “24” (EX-1001, 5:24-26) and further mistakenly labels the outer vents in the figures as “24” instead of what a POSITA would understand is the clearly intended label, “28.” *See* EX-1001, Figures 1-4, 8, 9, 12-15.

to, gels, open cell foam, close cell foam, vinyl nitrile, Styrofoam™, rubber, neoprene, foamed polymers, polyurethane foam, latex foam, micro cellular urethane foam (MCUF) or a viscoelastic foam, or any other elastic viscoelastic material having a force absorbing spring-like response. The absorptive material may be a material that can undergo a large elastic deformation in a quick period of time and has a rather slow elastic response but may eventually return to the original shape. The distribution of forces applied to the plurality of cushions 52 under a flexible shell may be more locally realized.”).

27. The climatic zone may further include a “cooling assembly,” described as including “a **plurality of cooling packets** that are coupled to the outer shell” or the “inner shell.” *Id.*, Abstract, 1:65-67, 2:51-52, Fig. 6, 6:29-7:4. “The positioning of the cooling packets 42 on the outer shell 16 may vary. The cooling packets 42 may be oriented coaxially with the inner vents 22 or one or more cooling packets 42 may be off-set from the inner vents 22 along the x-axis. The cooling packets 42 may also contain a solid, a gas, a liquid, or any substance that serves to lower the temperature of the surrounding environment of the cooling assembly.” *Id.*, 6:58-65.

28. The inner shell may have a “**plurality of inner vents**” (*id.*, 2:4) and the outer shell may have a “**plurality of outer vents.**” *Id.*, 2:7-9. These vents can couple the climatic zone to the air adjacent the user’s head and/or to the ambient air, respectively. *Id.*, 2:1-13, 5:20-52, 6:6-28.

29. The inner and outer shells may be **removably coupled** together via an “**attachment mechanism**” (*id.*, 9:1-9) such as a “traditional screw attachment or a quick release attachment” (*id.*, 9:41-43), although the attachment mechanism “may exist in a variety of configurations, including but not limited to a rigid configuration, a flexible configuration, or a combination of both.” *Id.*, 9:10-13. “This allows the outer shell 16 to be removed and the configuration of placing the cooling packets 42 and/or the plurality of cushions 52 in any desired position within the climatic zone 20.” *Id.*, 9:6-9.

30. U.S. Patent No. 10,617,167 also describes a “fastening assembly for use with a helmet assembly,” which fastening assembly (and associated claims) are not at issue in this Petition.

B. U.S. Patent No. 10,617,167’s Prosecution History

31. U.S. Patent No. 10,617,167 issued on April 14, 2020 from U.S. Patent Application No. 15/820,256 (“the ’256 application”), filed on November 21, 2017 with 18 claims. EX-1001, Face.

32. The only substantive Office Action: (i) allowed original Claims 8-12 without comment; (ii) rejected original Claims 1 and 7 as single-reference obvious in view of U.S. 4,133,055 (“Zebur”), with Claims 2-6 objected to as depending from rejected Claim 1; and (iii) rejected original Claims 13 and 14 as single-reference obvious in view of U.S. Patent No. 2,625,683 to Roth (“Roth”), with Claims 15-20

objected to as depending from rejected Claim 13. EX-1002, 177-183. The examiner did not apply Zebur's teachings to the fastening assembly claims, and likewise did not apply Roth's teachings to the modular helmet claims. *Id.*

33. In response, the applicant: (i) cancelled original Claims 1, 13, and 20; (ii) amended original Claims 2-7, 14-15, generally making them independent/depend from new independent claims to overcome the objections; and (iii) added a claim. *Id.*, 193-199.

C. Claim Interpretation

34. I have been informed by Counsel and understand that the best indicator of claim meaning is its usage in the context of the patent specification as understood by one of ordinary skill. I further understand that the words of the claims should be given their plain meaning unless that meaning is inconsistent with the patent specification or the patent's history of examination before the Patent Office. Counsel has also informed me, and I understand that, the words of the claims should be interpreted as they would have been interpreted by one of ordinary skill as of the Critical Date.

35. Alternatively, as to the term "attachment mechanism," should the Board determine that this term is a means plus function term, then its function is to removably couple the inner and outer shells, and the disclosed structure is as follows: "[a]s illustrated in FIGS. 16 and 17, the attachment mechanism 66 may exist in a

variety of configurations, including but not limited to a rigid configuration, a flexible configuration, or a combination of both.” EX-1001, 9:10-9:44. This alternative construction does not change the analysis of the prior art at issue here, because the prior art contains an attachment mechanism that accomplishes the same function, and uses the same or equivalent structure disclosed in U.S. Patent No. 10,617,167. *See* Sects. VII.B.iii and VIII.C.viii, VIII.C.ix.

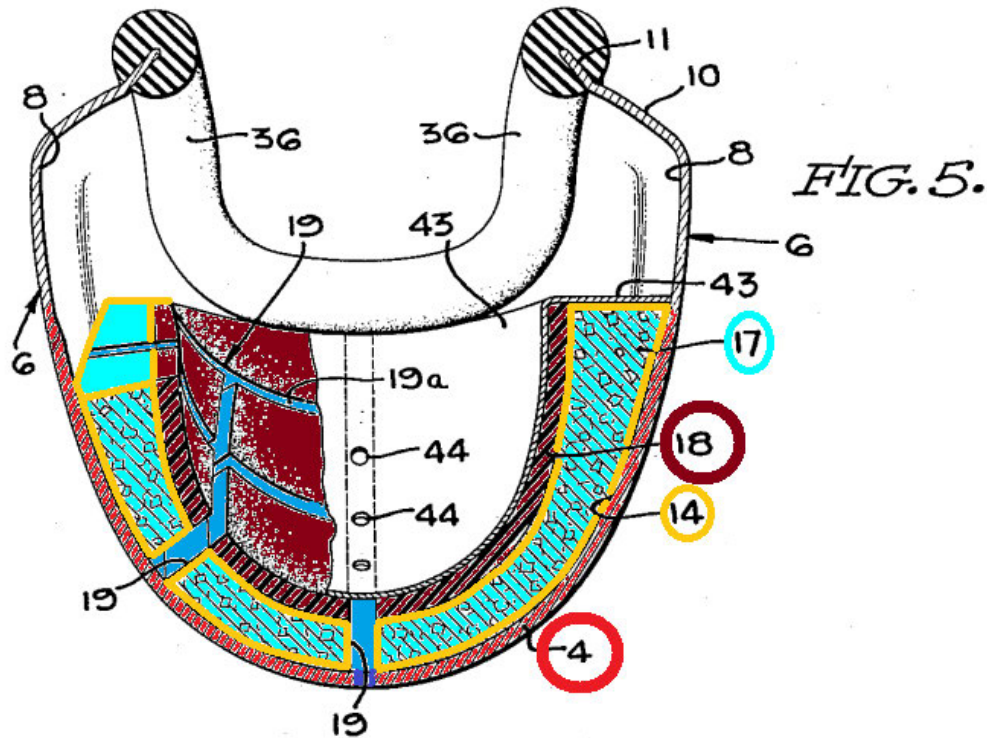
VI. GROUNDS 1A and 1B: CLAIMS 7, 10 ANTICIPATED BY ROTH; CLAIMS 7, 10 RENDERED OBVIOUS BY ROTH

A. Roth (EX-1005)

i. Protective Modular Helmet

36. Roth, titled “Crash Helmet,” was filed in 1947—almost 70 years before U.S. Patent No. 10,617,167’s filing. Like U.S. Patent No. 10,617,167, it describes a modular helmet that both protects a wearer’s head via the “new concept” of a padding layer (“energy absorbing layer”) between two shells (EX-1005, 2:3-44) and also “effectively ventilat[es] the interior to prevent overheating...when wearing the helmet.” *Id.*, 1:1-5, 1:46-50, 2:3-44.

37. To that end, Roth discloses a “helmet” that includes a “rigid **outer shell**, a **layer just within the outer shell, of energy-absorbing material**; and preferably includes **a second, or inner layer** of resilient material.” *Id.*, 1:51-55.



38. As shown above, the outer shell is **spaced a distance radially outward** from the inner shell (*id.*, Figs. 3-6, 5:44-56) such that the energy absorbing layer is located between. *Id.*, 1:51-55, 5:57-58 (“In this **space 14** we place an energy-absorbing, or impact-absorbing, material.”).

39. The **energy absorbing layer 17** is not restricted to a particular form, but rather generally has the conventional cushion quality of compressing under

pressure to absorb impact/force.³ EX-1005, 5:56-6:43; 2:10-31. For example, a POSITA would have understood that when Roth explains this layer as “a material which has a resistance to crushing which increases relatively little while the materials is crushed to one-half or less of its original thickness under and impact.” EX-1005, 5:60-64. In this example, Roth’s described crushing of one-half of its length constitutes an energy absorption/dissipation. In one embodiment, Roth describes an energy absorbing layer that is a “thick protective wall” created by combining “small pieces of energy absorbent material” (*i.e.*, cushioning material) with a solidifying “binder” and molding this “cementitious material” along the outer shell contour 4. *Id.*, 6:8-74.

40. This energy absorbing layer can be broken up into a **plurality of cushions**, described as cushioning “blocks” or “pieces” separated by ventilation channels/grooves 19. *See id.*, Figs. 3-8, 13, Claim 2, 6:7-36 (“However, cellular cellulose-acetate is preferably employed in pieces, which should be as large as possible, and they should substantially cover the entire interior surface of the outer

³ Roth’s claims call the “energy absorbing layer” 17 the “**outer layer** inside and adjacent to the outer shell.” *See* EX-1005, Claims 1-6.

shell 4 except in the space required for earphones, and except for channels provided for ventilation.”), 7:3-15 (“[I]f relatively large blocks of energy-absorbent material are employed, we space them apart to form a ventilating channel system. If we use small dice of energy-absorbent material in a binder, we prefer to cut a system of grooves 19 through the inner layer of rubber and the protective wall 17.”). These cushions are **coupled to** the outer shell. *Id.*, 6:13-21 (“The pieces of cellular cellulose-acetate may be formed so that they fit and may be attached to the interior of the outer shell 4 by any convenient means such as a suitable cement...”).

41. The modular helmet’s inner shell is **inner layer 18** applied to the energy absorbing layer 17. EX-1005, 1:51-55 (“The helmet of the present invention comprises a rigid outer shell, a layer just within the outer shell, of energy-absorbing material; and preferably includes a **second, or inner layer of resilient material.**”), 6:69-75 (“This assembly, consisting of the outer shell and a relatively thick protective wall 17, should have an **inner liner or cushioning layer 18** applied to the same (see Figs. 5 and 6), which layer may be of any resilient or cushioning material such as foam, or sponge, rubber.”), Claim 1 (claiming a helmet comprising “an outer shell, an outer layer inside and adjacent the outer shell of energy-absorbing substantially inelastic material capable on impact of deforming and offering a resistance to such deformation, absorbing and dissipating a considerable impact force, and **an inner layer** lining the said outer layer composed of a material having

considerable resiliency...”). The inner layer 18 is made of resilient material and is formed along the wall of inner shell 3 (used to create space 14). *See id.*, 5:44-56, Figs. 3, 5.

ii. Ventilation

42. Roth describes that the inner layer may have a plurality of **inner layer vents**. *Id.*, 7:3-15 (“For ventilation purposes, to keep the interior of the helmet cool, and to provide channels for wires connected to the ear phones, if relatively large blocks of energy-absorbent material are employed, we space them apart to form a ventilating channel system. If we use small dice of energy-absorbent material in a binder, we prefer to cut a system of grooves 19 through the inner layer of rubber and the protective wall 17.”); Figs. 5-7 (showing ventilation channels through inner shell), Claims 7-8.

43. Roth further describes that the outer shell may have a plurality of **outer shell vents**. Roth describes a plurality of screw and bolt assemblies to space the inner and outer shells, which assemblies pierce the outer shell. EX-1005, 5:44-55, Figs. 3-4. Roth describes that these assemblies’ outer shell bolts may be uncapped to create outer shell vents. *Id.*, 8:37-42 (“If desired, the opening at which the bolt 12 is applied, can be left in the outer shell unplugged, and this opening can be located in line with *one of the ventilating channels as illustrated in Fig. 5. This will give an outlet for some of the air that is circulated through the helmet.*”).

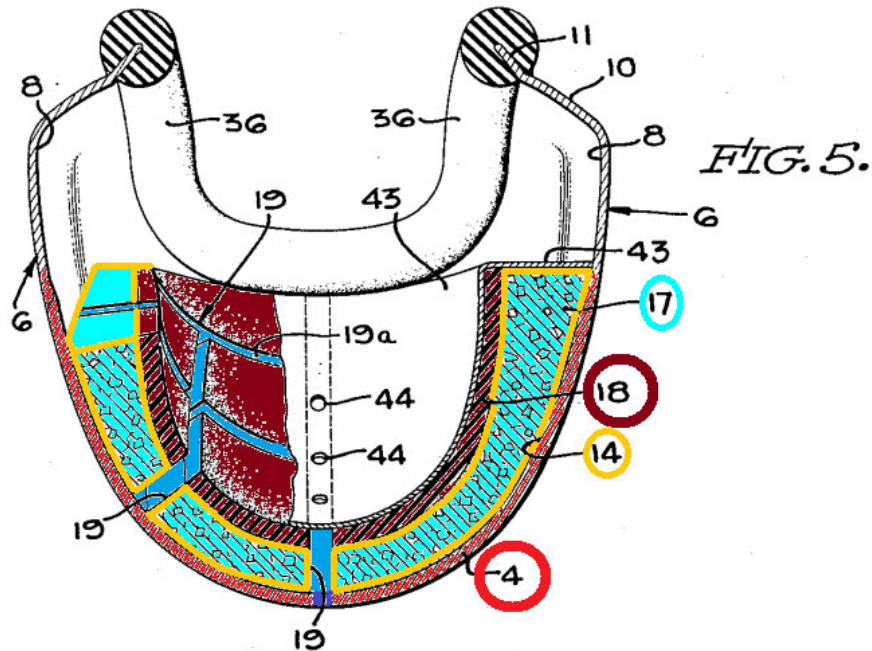
44. Roth also discloses another vent opening in the outer shell, to which a ventilating hose can be connected for supplying cool air to the helmet interior. *Id.*, 3:68-72 (“This view also illustrates the electric cord connection through the outer shell of the helmet, and the connection for the ventilating hose through which cool air is supplied to the ventilating ducts in the interior of the helmet.”).

B. Claim Analysis

i. Claim 7

(a) [7pre] “*A modular helmet comprising:*”

45. If the preamble is limiting, Roth describes a modular helmet. As in the ’167 Patent, Roth describes a “helmet” that includes multiple modules, including “a rigid **outer shell**, a layer just within the outer shell, of **energy-absorbing material**; and preferably includes **a second, or inner layer of resilient material**.” EX-1005, 1:51-55, 4:49-56; *see* EX-1001, *e.g.*, 2:1-4 (“The modular helmet includes an inner shell adapted to be positioned onto a user’s head, an outer shell, and a cushion assembly.”), 1:58-2:23.



(b) [7a] “an inner shell adapted to be positioned onto a user’s head, the inner shell includes a plurality of inner vents;”

46. Roth discloses **an inner shell**. Consistent with the descriptions of the “inner shell” in the ’167 Patent, the **inner layer 18** in Roth’s modular helmet corresponds to the “inner shell.” EX-1005, 1:51-55, 6:69-75 (“This assembly, consisting of the outer shell and a relatively thick protective wall 17, should **have an inner liner or cushioning layer 18** applied to the same (see Figs. 5 and 6), which layer may be of any resilient or cushioning material such as foam, or sponge, rubber.”), Claim 1; *see* EX-1001, 4:34-54 (the “inner shell” can be made out of “a flexible material, a semi rigid material, or a rigid material” and “the flexible material may be easily displaced and act more as a membrane to distribute the applied

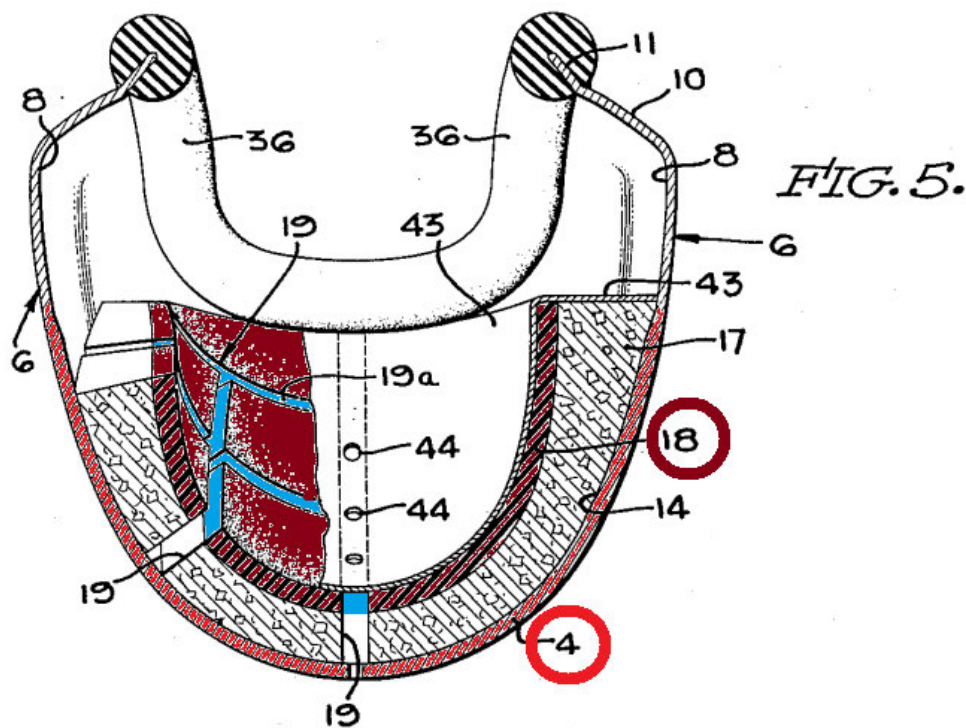
forces”). **Inner layer 18** is made of resilient material and is formed along the wall of inner shell 3 (used to create space 14). *See id.*, 5:44-56, Claim 1, Figs. 3, 5-6.

47. Roth’s inner shell is **adapted to be positioned onto a user’s head**. *See id.*, Figs. 3-6, 8 (showing inner layer inside cavity conforming to wearer’s head), 1:51-55, 4:49-56 (“In accordance with our method we also employ an outer shell which may be formed in any well known desired manner. For our purposes we would employ an outer shell 4, which is of considerably larger dimension than the inner shell 3, but which has the same general form in cross-section in corresponding planes, together with other features hereinafter described.”), 1:35-36, 4:20-25, 5:44-56, 6:69-75, Claim 1 (claiming a helmet with “an outer shell, an outer layer inside and adjacent the outer shell of energy-absorbing substantially inelastic material...and an inner layer lining the said outer layer composed of a material having considerable resiliency, said helmet having a cavity within the same constructed so as to fit substantially to the shape and size of” wearer’s head.)

48. Roth’s **inner layer 18** (inner shell) includes **a plurality of inner vents**. As shown below, **inner layer 18** has multiple **openings** (*e.g.*, formed by cutting grooves/channels in the inner layer 18) that define a **plurality of ventilation channels**. *Id.*, 7:3-15 (“For ventilation purposes, to keep the interior of the helmet cool, and to provide channels for wires connected to the ear phones, if relatively large blocks of energy-absorbent material are employed, we space them apart to

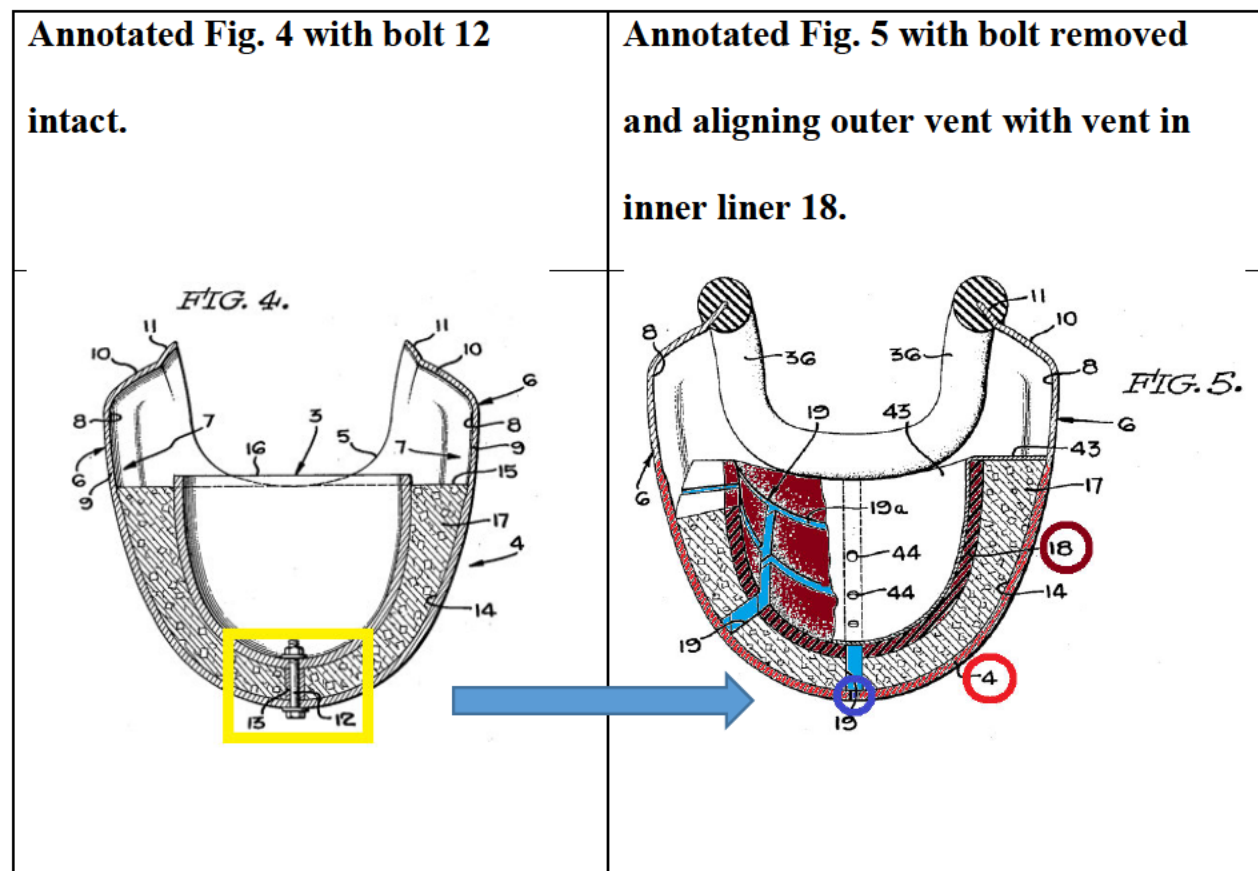
form a ventilating channel system. If we use small dice of energy-absorbent material in a binder, we prefer to cut a system of grooves 19 through the inner layer of rubber and the protective wall 17.”), Figs. 5-7 (showing ventilation channels 19 through inner shell 18), Claims 7-8; 5:45-56, 8:37-42.

49. The vent channels’ interconnectivity for air flow does not negate their plurality. Just as the interconnection of pipes for water flow does not convert the multiple joined pipes into a single pipe, nor does the interconnection of vent channels or grooves for air flow convert the joined vent channels or grooves into a single vent channel or groove.



50. As another example, one or more additional openings formed in the inner layer 18, which are initially used to couple the inner layer 18 and outer shell 4,

can be used for helmet ventilation. As shown below, the outer and inner shells are preferably separated as shown in Figures 3-4 “by means of one or more screws or bolts 12” such that “the walls of the two shells [are] spaced apart a desired amount to provide a wall space, or molding space.” EX-1005, 5:45-56. Roth further describes that these bolt/screw combinations create outer shell vents through which air is circulated. *Id.*, 8:37-42 (“If desired, the opening at which the bolt 12 is applied, can be left in the outer shell unplugged, and this opening can be located in line with one of the ventilating channels as illustrated in Fig. 5. This will give an outlet for some of the air that is circulated through the helmet.”).



- (c) [7b] *“an outer shell coupled to the inner shell, the outer shell spaced a distance radially from the inner shell to define a climatic zone between the inner shell and the outer shell, the outer shell includes a plurality of outer vents configured to couple the climatic zone in flow communication with ambient air; and”*

51. Roth’s helmet includes an **outer shell**. EX-1005, 1:51-55 (“The helmet of the present invention comprises *a rigid outer shell*, a layer just within the outer shell, of energy-absorbing material; and preferably includes: a second, or inner layer of resilient material), 4:49-51, Claims 1, 16, Figs. 2-8, 12; *see* EX-1001, 4:55-5:7 (’167 Patent similarly explaining that the outer shell can be made out of a “rigid material”).

52. Roth’s outer shell 4 is attached to the inner layer 18 (inner shell) in a couple of ways, each independently demonstrating that the **outer shell is coupled to the inner shell**.

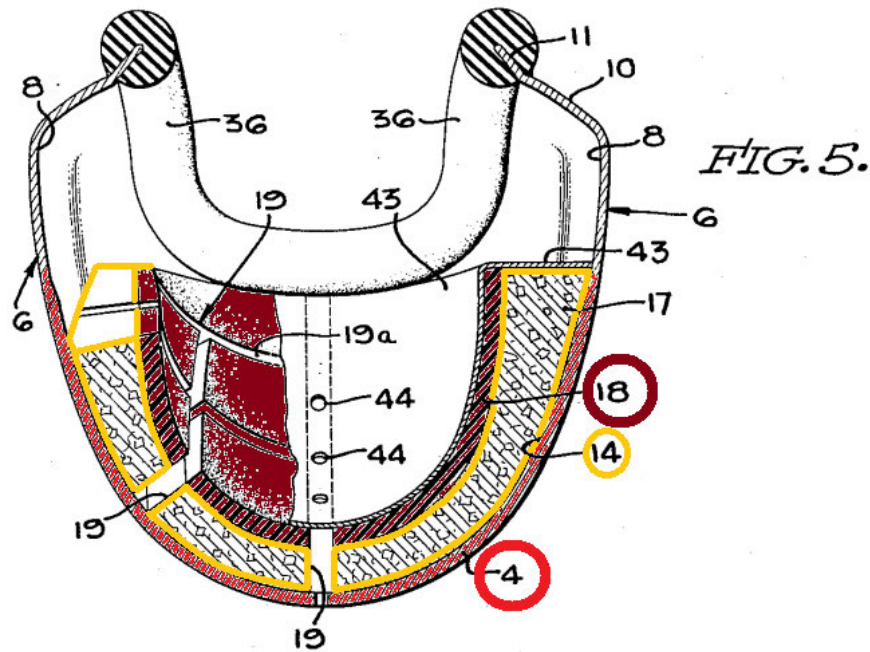
53. First, the inner layer 18 and outer shell 4 can be coupled, e.g., as shown in Figures 3 and 4 using screws and bolts, with the bolts being surrounded by a short sleeve that holds the walls of the inner and outer shells spaced apart. EX-1005, 5:45-56 (“The two shells, namely, the inner shell 3 and the outer shell 4, are then set up as indicated in Fig. 4, the inner shell 3 being held approximately in a central position within the outer shell. This may be accomplished in any suitable manner, but preferably by means of one or more screws or bolts 12 applied as indicated in Fig.

4. The body of this bolt is surrounded by a short sleeve 13, which operates as a spacer or distance piece for holding the walls of the two shells spaced apart a desired amount to provide a wall space, or molding space is, as indicated in Fig. 3.”).

54. Second, Roth’s inner layer 18 (inner shell) is coupled to the cushioning layer 17, which in turn is coupled to the outer shell 4. EX-1005, 6:74-7:2 (The inner layer 18 “may be, secured to the inner face of the protective wall 17 suitable manner, for example, by cementing the two contacting faces together.”); 6:13-18 (describing cementing or otherwise attaching the cushioning layer to the outer layer); *see* Figs. 2-3. The ’167 Patent does not limit the outer and inner shell coupling to direct coupling and a POSITA would understand the ’167 Patent to disclose both indirect and direct coupling.

55. The **outer shell** is spaced a distance radially from the **inner shell** to **define a climatic zone between the two**. *See* EX-1005, Figs. 3-6 (showing outer shell 4 spaced radially from inner shell 3/inner layer 18 to create space 14 in between); 5:44-56 (“The two shells, namely, the inner shell 3 and the outer shell 4, are then set up as indicated in Fig. 4, the inner shell 3 being held approximately in a central position within the outer shell. This may be accomplished in any suitable manner, but preferably by means of one or more screws or bolts 2 applied as indicated in Fig. 4. The body of this bolt is surrounded by a short sleeve 3, which operates as a spacer or distance piece for holding the walls of the two shells spaced

apart a desired amount to provide a wall space, or molding space is, as indicated in Fig. 3.); *see* EX-1001, 6:6-7 (explaining that “the climatic zone 20 is defined between the inner shell and the outer shell.”), Abstract (“The outer shell is spaced a distance radially outward from the inner shell to define a climatic zone between the inner shell and the outer shell.”), Figs. 1-2, Figs. 18-26, 4:7-20, 9:58-62.



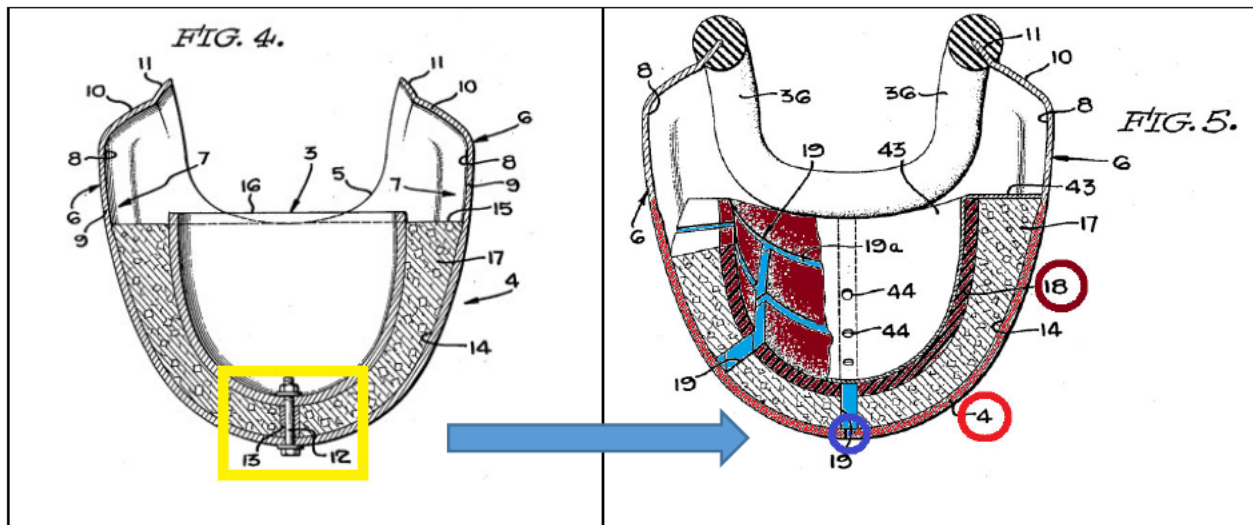
56. As described below, Roth discloses that the **outer shell** includes a plurality of **outer vents** configured to couple the **climatic zone** in flow communication with ambient air.

57. As shown below, the outer and inner shells are preferably separated as shown in Figures 3-4 “by means of *one or more* screws or bolts 12” such that “the walls of the two shells [are] spaced apart a desired amount to provide a wall space,

or molding space.” EX-1005, 5:45-56. Thus, while Figure 4 (reproduced below) shows one such bolt/screw combination, a POSITA would have understood that Roth describes using more such combinations. A POSITA would further understand that Roth’s modular helmet could include two or more such combinations without impacting the structural integrity of the coupled inner and outer shells, but not so many such combinations as to impact the structural integrity of the coupled inner and outer shells.

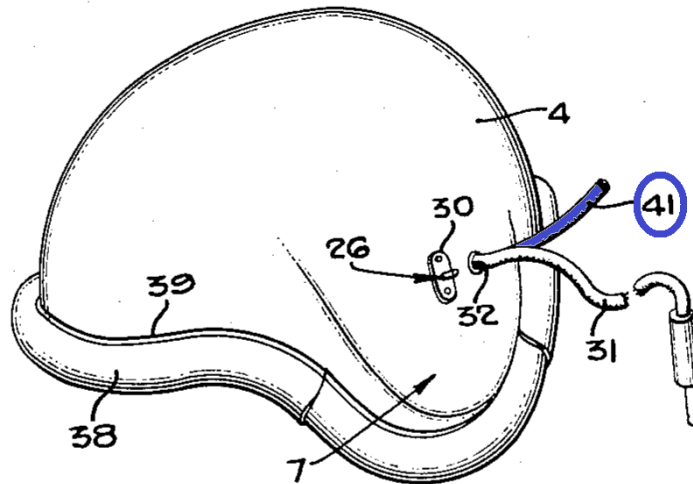
58. Roth further describes that these bolt/screw combinations create outer shell vents through which air is circulated, as shown in the annotated Figure 4 below. EX-1005, 8:37-42 (“If desired, the **opening at which the bolt 12 is applied, can be left in the outer shell unplugged**, and this opening can be located *in line with one of the ventilating channels* as illustrated in Fig. 5. This will give an *outlet for some of the air that is circulated through the helmet.*”). A POSITA would have thus understood that these outer shell vent openings couple the climatic zone (the space between the outer shell and the inner layer) in flow communication with ambient air.

Annotated Fig. 4 with bolt 12 intact.	Annotated Fig. 5 with bolt removed and aligning outer vent with vent in inner liner 18.
----------------------------------------------	------------------------------------------------------------------------------------------------



59. Roth also describes an additional vent opening in the outer shell with a “connection for [a] ventilating hose through which cool air is supplied to the ventilating ducts in the interior of the helmet.” EX-1005, 3:68-72, 8:11-17 (“When the helmet is being worn, if the weather is warm, the helmet can be ventilated by cool air delivered to it through a small flexible air hose 41 (see Figs. 10 and 12), the end of which is secured to a bushing 42. The inner end of this bushing should be located in line with one of the grooves of the groove system 19.”). This vent opening and the flexible air hose 41 connected thereto are shown in Figure 12, which is reproduced and annotated below.

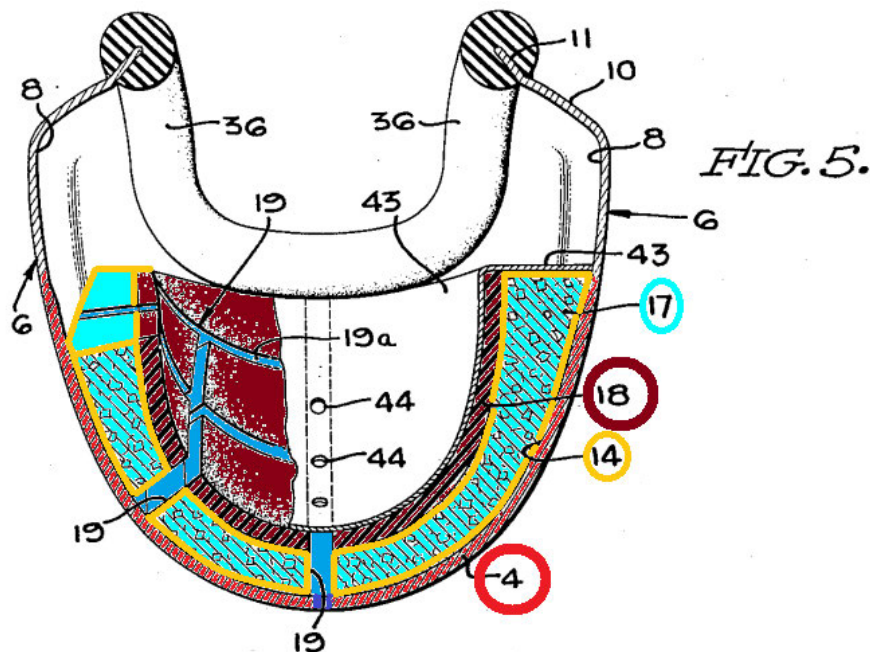
FIG. 12.



60. A POSITA would have understood or found obvious that this vent opening can receive ambient air (*e.g.*, through the flexible hose 41) and this air is supplied to the helmet interior via the grooves 19 defined in the climatic zone between the outer shell 4 and inner layer 18. *See* EX-1005, 3:68-72, 8:11-17 (simply noting that cool air is supplied via the flexible hose 41 and through the vent opening to the helmet interior via grooves between the outer shell and inner layer—*i.e.*, via the climatic zone), Fig. 12 (showing flexible hose 41 having one end connected to the opening in the outer shell 4, while the other end is left open and not connected to any other device). The open end of the flexible hose 41 would enable ambient air to pass through the flexible hose 41 and enter the helmet via the outer shell opening to which the flexible hose 41 is connected. A POSITA would have thus understood that this outer shell vent opening also couples the climatic zone (the space between the outer shell and the inner layer) by means of convection with ambient air.

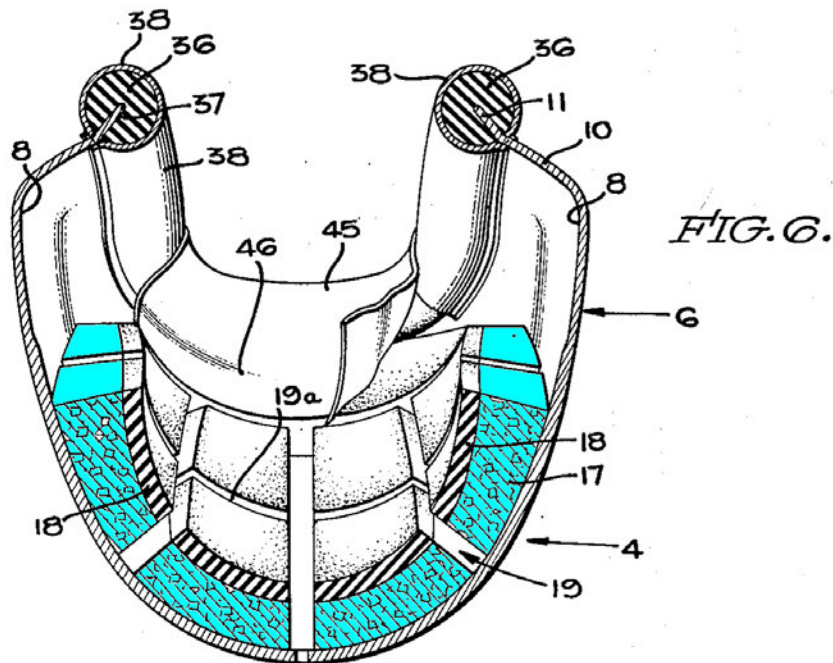
- (d) [7c] “a cushion assembly positioned within the climatic zone between the inner shell and the outer shell, the cushion assembly including a plurality of cushions that are coupled to the outer shell.”

61. Roth discloses a **cushion assembly** positioned within the **climatic zone** between the **inner shell** and the **outer shell**. As shown below, Roth’s helmet includes a “layer of energy-absorbing material” positioned in the climatic zone (see [7b], *supra*) between the **inner liner 18** and the **outer shell 4**. EX-1005, Fig. 5 (annotations added); 1:51-55 (“The helmet of the present invention comprises a rigid outer shell, a layer just within the outer shell, of energy-absorbing material; and preferably includes a second, or inner layer of resilient material.”), Claim 16, 5:56-57 (“In this space we place an energy-absorbing, or impact-absorbing, material.”), 2:10-31.



62. The '167 Patent describes that the cushions in the cushion assembly can be made of any material with characteristic of a cushion—that is, compressing under pressure and decompressing when that pressure is released. *See* EX-1001, 7:59-8:41. Similarly, Roth discloses that the energy absorbing layer 17 (cushion assembly) generally has the conventional cushion quality of compressing under pressure to absorb impact/force. EX-1005, 5:57-6:74; 2:10-30.

63. Roth's energy absorbing layer 17 includes a **plurality of cushions** that are created by dividing the energy absorbing layer 17 into separate pieces or blocks, thereby defining ventilation channels between the pieces/blocks of the energy absorbing layer 17. EX-1005, Claim 2, 6:7-36 ("However, cellular cellulose-acetate is preferably employed in pieces, which should be as large as possible, and they should substantially cover the entire interior surface of the outer shell 4 except in the space required for earphones, and except for channels provided for ventilation."), 7:3-15 ("[I]f relatively large blocks of energy-absorbent material are employed, we space them apart to form a ventilating channel system. If we use small dice of energy-absorbent material in a binder, we prefer to cut a system of grooves 19 through the inner layer of rubber and the protective wall 17."), *see* Figs. 3-8. Annotated Figure 6, below, shows the energy absorbing layer 17 separated into separate cushions via the ventilation grooves 19.



64. These cushions are **coupled to the outer shell**. EX-1005, 6:13-21
 (“*The pieces of cellular cellulose-acetate* may be formed so that they fit and *may be attached to the interior of the outer shell 4* by any convenient means such as a suitable cement....”).

65. Accordingly, Roth anticipates claim 7 or at least renders it obvious.

ii. Claim 10

- (a) [10] “*The modular helmet of claim 7, wherein the plurality of inner vents includes a first amount of inner vents and the plurality of outer vents includes a second amount of outer vents that is a different than the first amount of inner vents.*”

66. Roth discloses that the number of inner vents may differ from the number of outer vents. As discussed at [7a]-[7b], *supra*, Roth discloses a plurality

of differently-constructed inner layer and outer shell vents. EX-1005, 7:3-15, 8:37-42, Figs. 3-7. Roth does not require or even disclose the same number of inner layer and outer shell vents. Thus, a POSITA would have understood that these descriptions disclose that the number of inner and outer vents need not be equal and can, of course, differ.

67. Alternatively, a POSITA would have found it obvious to so-modify the Roth modular helmet with a reasonable expectation of success. As discussed above, one of Roth's objectives "is to provide a helmet [] with means for effectively ventilating its interior to prevent overheating" of the wearer's head." EX-1005, 1:46-50. To that end, Roth's modular helmet has both inner layer and outer shell vents. *Id.*, 7:3-15, Figs. 5-7, 5:44-55, Figs. 3-4, 8:37-42. Against this objective, and the express disclosure of multiple (not shown) outer vents, it would have been obvious to a POSITA that inner layer and outer shell vent arrangements could include a number of inner vents differing from the number of outer vents. Indeed, while Roth discloses that there are inner and outer vents, it does not state that they must be the same number. Rather, Roth states one goal is to effectively ventilate the helmet's interior. And, to that end, it would have been obvious to a POSITA to use a differing number of inner and outer vents. Indeed, before the Critical Date, it was well known for modular helmets to include a different number of inner shell vents versus the outer shell vents. EX-1012, 4:52-54 ("A second difference between the

two internal shells is that shell 114 has preferably a much larger number of ventilation openings 140 formed therethrough.”); EX-1006, Figs 11 and 12, Figs. 1 and 3; EX-1011, Fig. 1, 2:3-7, 2:33-37, Claims 1-3.

68. Accordingly, Roth anticipates Claim 10 or at least renders it obvious.

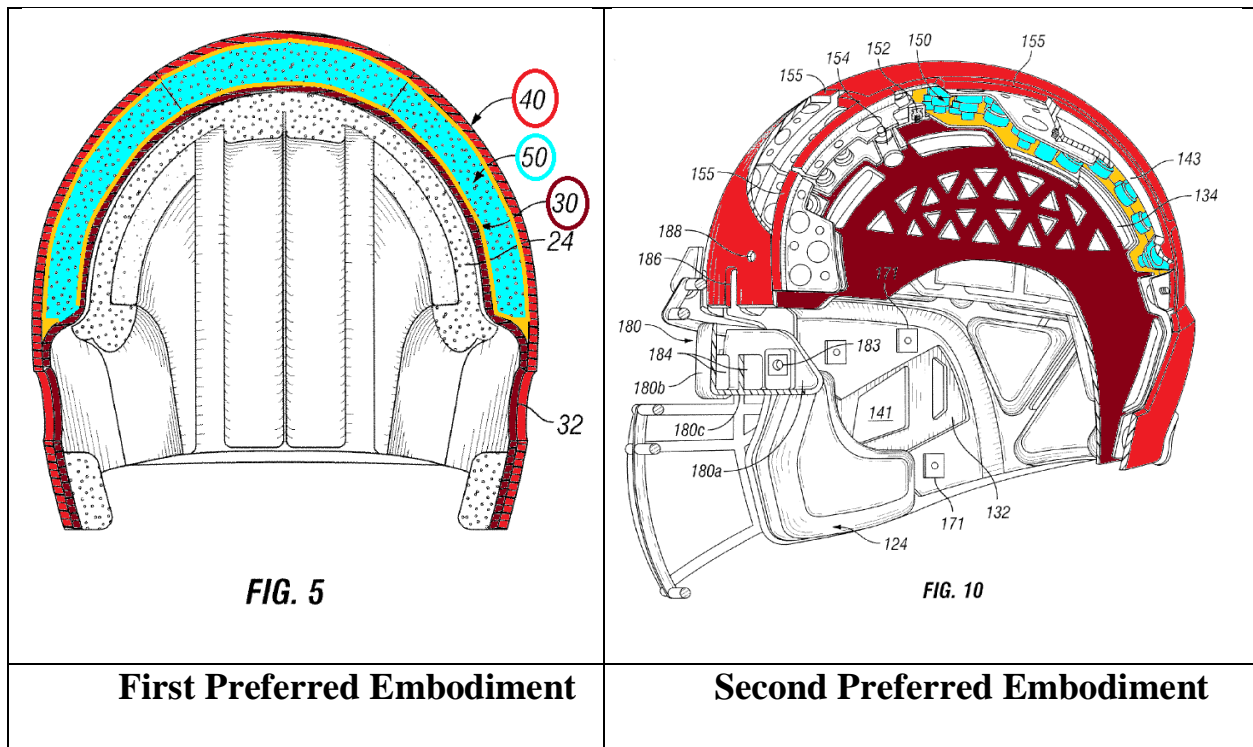
VII. GROUND 2: CLAIMS 7, 10, AND 11 ARE ANTICIPATED BY PRINCIP

A. Princip (EX-1006)

i. Protective Modular Helmet

69. Princip is titled “Protective Helmet” and, like the ’167 Patent, it describes a “protective helmet having an **inner shell** and an **outer shell** assembly,” which shells are removably attached to one another. EX-1006, Abstract, ¶37, Fig. 6, ¶51, ¶56, ¶58.

70. Princip discloses two preferred embodiments. *See* Figs. 1-6, ¶¶37-46 (first preferred embodiment), Figs. 8-15, ¶¶48-57 (second preferred embodiment). These embodiments generally share the primary features described herein. *See id.*, ¶¶49-50.



71. As shown in Figures 5 and 10 above, the inner and outer shells are **radially spaced apart** with a **padding layer in between**. *Id.*, Abstract, ¶32, ¶35, ¶49, ¶¶51-52. Princip calls this padding layer the “external energy absorbing layer” or “external padding layer.” *Id.* The external padding layer’s padding can be arranged and customized to suit the wearers’ needs, including a plurality of pads. *Id.*, ¶53, ¶51, ¶35. For example, “[t]he external energy absorbing layer 150 may include a cell system comprising a layer of mini air or gel cells sandwiched between the inner shell 130 and the outer shell assembly 140. The air cell padding may be formed in one or more perforated pads or blankets. The padding may be individual pads or a plurality of interconnected pads.” *Id.*, ¶51, ¶35. Still further, in a “multi-panel outer shell assembly,” the external energy absorbing layer may comprise

“multiple individual energy absorbing layer segments corresponding substantially to the shape and size of the multiple shell panels 42. For example, the front shell panel would have an energy absorbing layer segment substantially corresponding to the size and shape of the front shell panel. In this embodiment, the energy absorbing characteristics and properties of each shell panel as well as each energy absorbing layer segment can be designed and customized for the desired properties, for individual players, and/or for different player positions.” *Id.*, ¶41.

72. The external padding layer is **coupled to** the outer shell. *Id.*, ¶35 (“The padding layer 50 also includes one or more outer fastening points 54 for affixing the outer shell assembly 40 to the energy absorbing layer 50.”), ¶37, ¶51 (“The external padding layer 150 preferably include a plurality of inner shell attachment points 152 and outer shell attachment points 154.”), ¶58, ¶56.

ii. Ventilation

73. Princip further describes air ventilation through the “plurality of air vents,” which “allow for maximum air flow and to circulate the inside helmet air through the air vents.” *Id.*, ¶42; Claim 18. The **inner and outer shells have vents for air ventilation**. *Id.*, ¶42 (“As shown in FIG. 2, the helmet 20 includes a plurality of air vents 22 located through the front, top, and back of the helmet 20 to allow for maximum air flow and to circulate the inside helmet air through the air vents.”), Figs. 1-3, Fig. 7, ¶50 (“The inner shell 130 has a plurality of vent openings 134

therethrough for purposes of air ventilation.”), Fig. 12, ¶¶54-55 (The outer shell likewise “includes vent openings 143 that align with the larger vent openings 134 of the inner shell 130.”), ¶51 (“Preferably, both the internal padding layer 124 and the external padding layer 150 include open spaces over the large vent openings 134 for purposes of ventilation.”), ¶52.

B. Claim Analysis

i. Claim 7

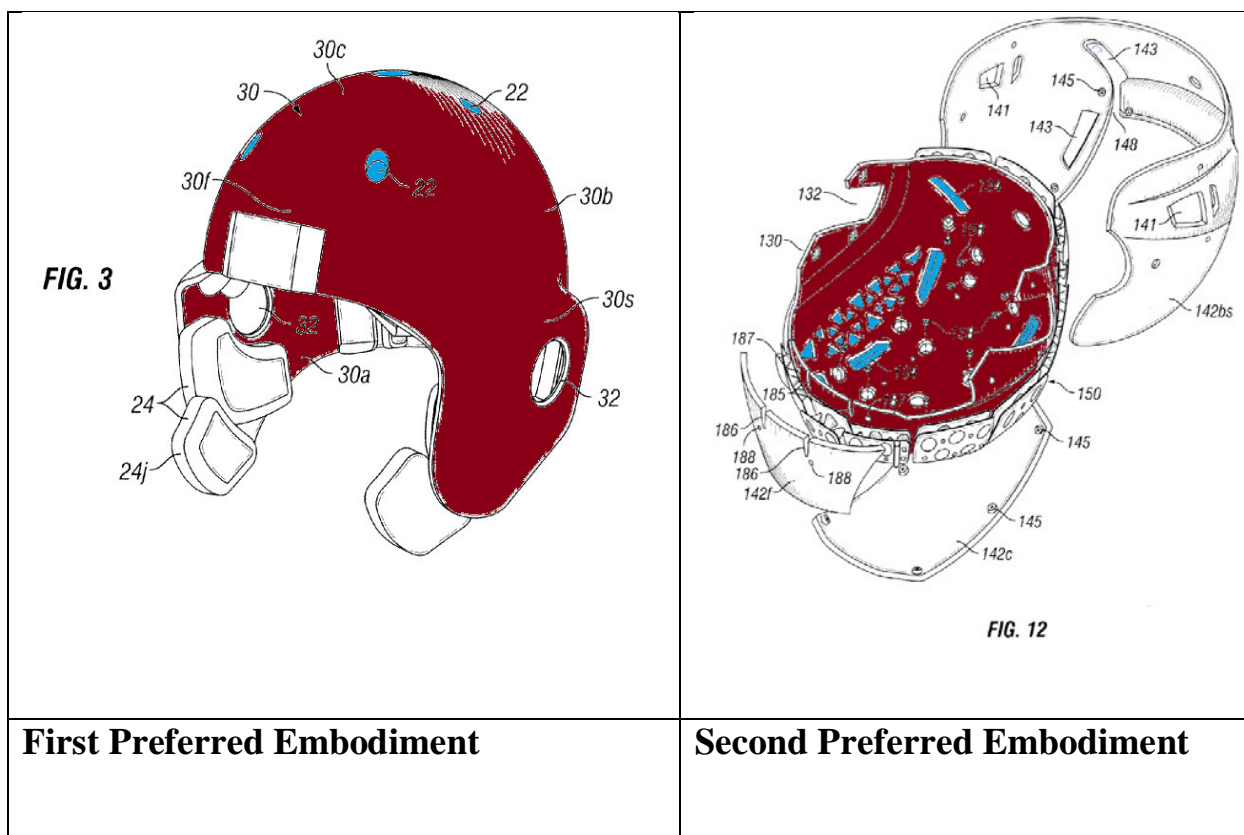
(a) *[7pre] “A modular helmet comprising:”*

74. Princip describes a modular helmet. Like the ’167 Patent, Princip describes a “protective helmet” with multiple modules, including “an inner shell,” “an outer shell assembly,” and “an energy absorbing layer.” EX-1006, Abstract, ¶32 (“The helmet 20 has an inner shell 30 and an outer shell assembly 40.”), ¶49 (“The protective helmet 120 includes inner shell 130, outer shell assembly 140, one or more internal pads or layers of internal padding 124 attached to the inner shell 130, and an external energy absorbing layer 150 positioned between the inner shell 130 and outer shell assembly 140.”); *see*, EX-1001, *e.g.*, 2:1-4, 1:58-2:23.

(b) *[7a] “an inner shell adapted to be positioned onto a user's head, the inner shell includes a plurality of inner vents;”*

75. Princip’s protective helmet includes an **inner shell**, which is shown, *e.g.*, in Fig. 3 (depicting helmet 20) and Fig. 12 (depicting helmet 120) below. EX-

1006, Abstract (“A protective helmet having an inner shell and an outer shell assembly.”), ¶32 (“The helmet 20 has an inner shell 30 and an outer shell assembly 40.”), ¶49 (“The protective helmet 120 includes inner shell 130, outer shell assembly 140, one or more internal pads or layers of internal padding 124 attached to the inner shell 130, and an external energy absorbing layer 150 positioned between the inner shell 130 and outer shell assembly 140.”), ¶50.

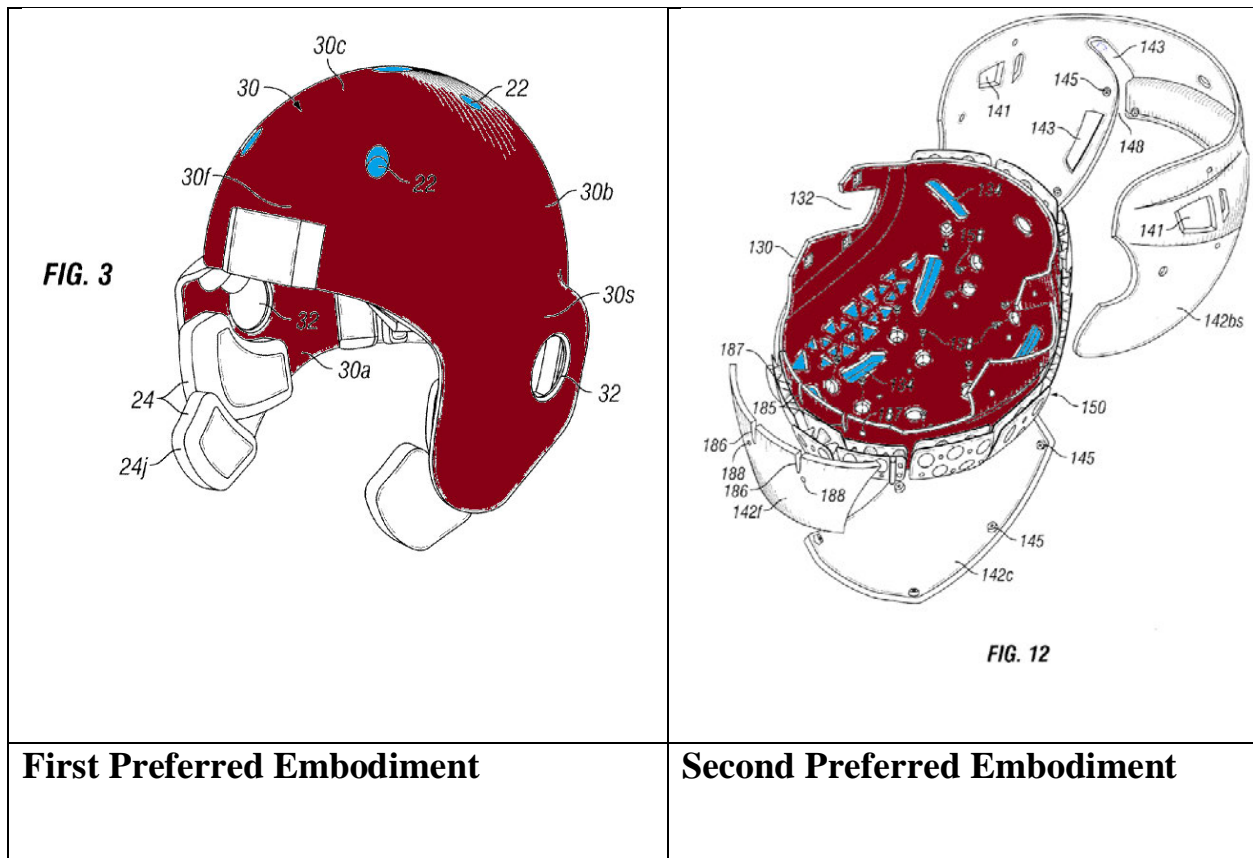


76. Additionally, similar to the '167 Patent, Princip's inner shell is made of “a rigid material of the type known to those skilled in the art as, for example, a rigid

plastic such as a polycarbonate, a rigid thermoplastic or a thermosetting resin, a composite fiber or possibly a liquid metal.” EX-1006, ¶33; EX-1001, 4:34-45.

77. The inner shell is **adapted to be positioned onto a user’s head**. *See* EX-1006, Figs. 3-5, 10-12 (showing inner layer inside cavity conforming to wearer’s head), ¶13 (“The protective helmet of the preferred embodiment of the present invention absorbs impacts with the outer shell assembly and external energy absorbing layer while gradually increasing the load to the inner shell and internal padding and then finally the wearer’s head); *see also id.* ¶34 (disclosing that internal padding is removable and contacts inner surface of inner shell).

78. Princip’s inner shell includes **a plurality of inner vents**. Figure 3, reproduced below, shows air vents 22 on the inner shell in one embodiment. EX-1006, ¶18, ¶42 (“As shown in FIG. 2, the helmet 20 includes a plurality of air vents 22 located through the front, top, and back of the helmet 20 to allow for maximum air flow and to circulate the inside helmet air through the air vents.”). Figure 12, reproduced below, shows another embodiment with vent openings 134 on the inner shell 130. *Id.*, ¶50 (“The inner shell 130 has a plurality of vent openings 134 therethrough for purposes of air ventilation.”), ¶51 (“Preferably, both the internal padding layer 124 and the external padding layer 150 include open spaces over the large vent openings 134 for purposes of ventilation.”), Figs. 1-3, 7-12; Claim 18.

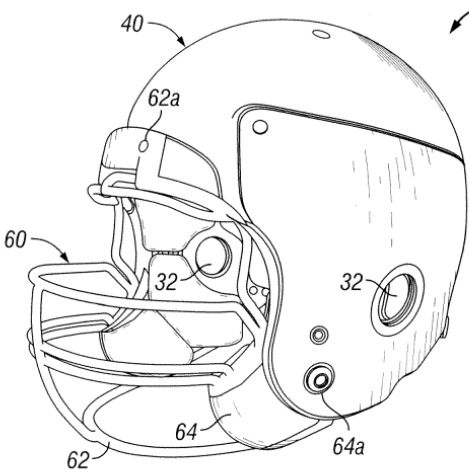
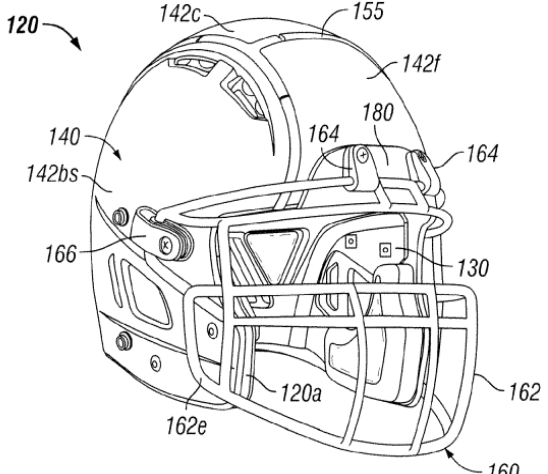


(c) [7b] “an outer shell coupled to the inner shell, the outer shell spaced a distance radially from the inner shell to define a climatic zone between the inner shell and the outer shell, the outer shell includes a plurality of outer vents configured to couple the climatic zone in flow communication with ambient air; and”

79. Princip’s protective helmet includes an **outer shell** called “the outer shell assembly.” EX-1006, Abstract (“A protective helmet having an inner shell and an outer shell assembly.”), ¶32 (“The helmet 20 has an inner shell 30 and an outer shell assembly 40.”), ¶36, ¶38, ¶49 (“The protective helmet 120 includes inner shell 130, outer shell assembly 140, one or more internal pads or layers of internal padding

124 attached to the inner shell 130, and an external energy absorbing layer 150 positioned between the inner shell 130 and outer shell assembly 140.”), ¶54.

80. The outer shell assembly of the first preferred embodiment (helmet 20) can include a single shell panel or multiple shell panels (EX-1006, ¶36), while the outer shell assembly of the second preferred embodiment (helmet 120) includes three outer shell panels. *Id.*, ¶54. When the helmet is provided with multiple panels, they are attached to the inner shell and/or to the padding layer between the inner shell and each panel, to form the overall outer shell assembly as shown in Figs. 1 and 8, reproduced below. *See, e.g.*, EX-1006, Abstract, ¶¶38-39, ¶41, ¶56.

 <p style="text-align: center;">FIG. 1</p>	 <p style="text-align: center;">FIG. 8</p>
<p>First Preferred Embodiment (with five panels) (EX-1006, ¶38)</p>	<p>Second Preferred Embodiment (showing panels 142c, 142f, and 142bs of the outer shell assembly)</p>

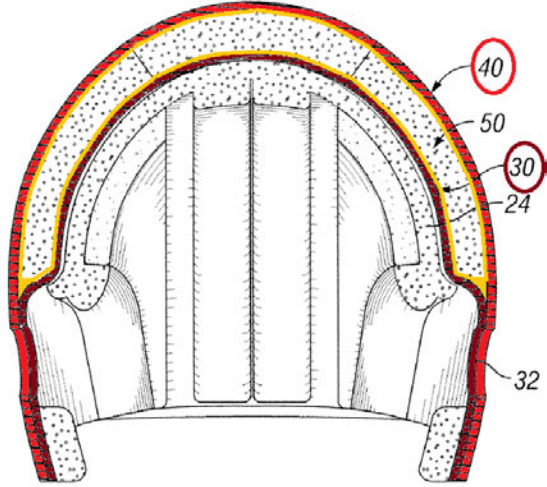
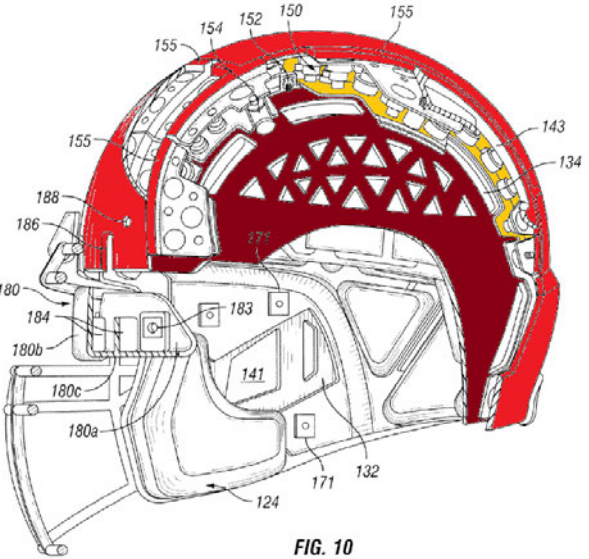
81. Princip also discloses another embodiment (referred to as helmet 120'), which is similar to helmet 120 of the second preferred embodiment and differs in that its outer shell assembly includes a "one piece outer shell." EX-1006, ¶64, Fig. 16-17.

82. Additionally, similar to the outer shell described in the '167 Patent, Princip's outer shell panel(s) are made of "a rigid material of the type known to those skilled in the art as, for example, a rigid plastic such as a polycarbonate, a rigid thermoplastic or a thermosetting resin, a composite fiber or possibly a liquid metal." EX-1006, ¶36; *see* EX-1001, 4:55-65.

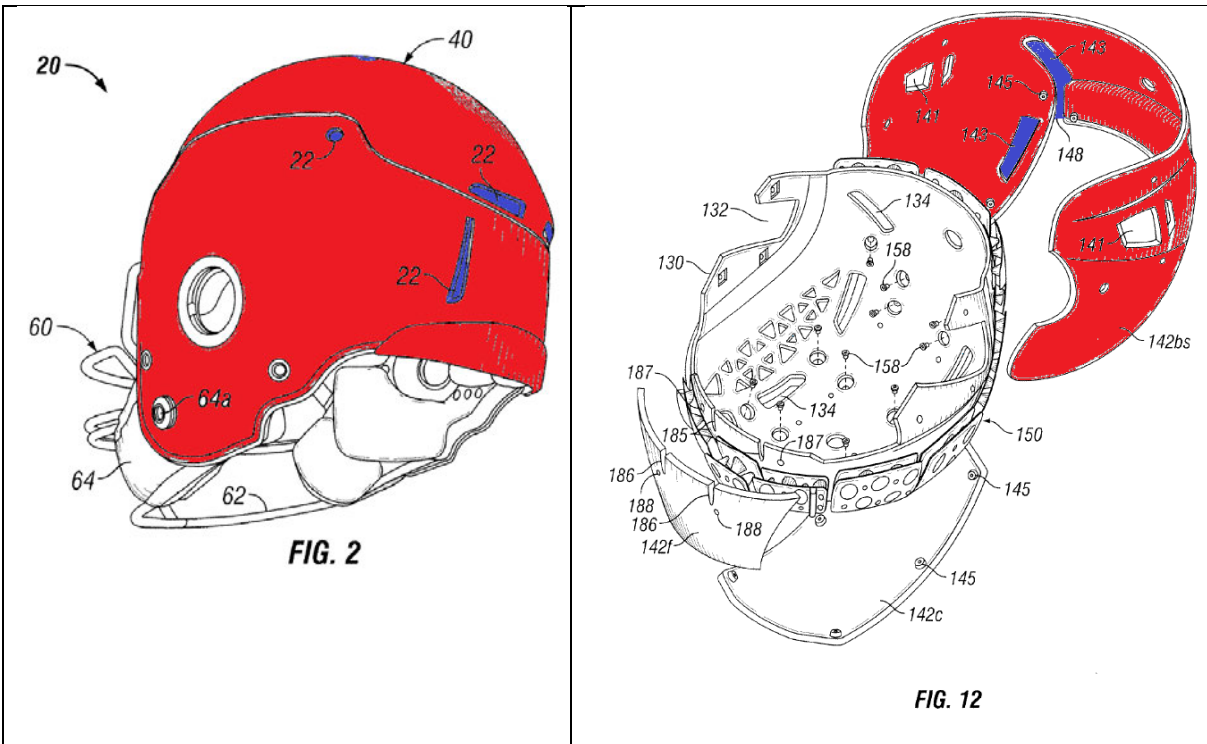
83. Princip discloses that the outer shell is **coupled to** the inner shell. For example, the outer shell assembly can be directly attached to the inner shell. EX-1006, ¶37 ("In the preferred embodiment of FIGS. 1-6, the outer shell assembly 40 is attached to the external energy absorbing layer 50 and is only attached to the inner shell 30 at, or around the ear holes as shown in FIG. 5"), ¶58 ("In the preferred embodiment of FIGS. 8-12, the outer shell assembly 140 is attached to the external energy absorbing layer 150 and is only attached to the inner shell 130 at, or around the ear holes 141. A plurality of screws 170 (FIG. 9) and nuts 171 (FIG. 10) fasten the outer shell assembly 140 to the inner shell 130."). Alternatively, the outer shell

assembly can be “indirectly attached to the inner shell [] via the external energy absorbing layer....” EX-1006, ¶37, ¶58.

84. As in the '167 Patent, Princip's **outer shell** is spaced a distance radially outward from the **inner shell** to define **a climatic zone** between the two. Figures 5 and 10, annotated below, show this climatic zone. *See* EX-1006, Abstract, Figs. 4, 6, 11-13, 15, ¶35, ¶49, ¶¶51-52; EX-1001, 6:6-7 (explaining that “the climatic zone 20 is defined between the inner shell and the outer shell”), Abstract (“The outer shell is spaced a distance radially outward from the inner shell to define a climatic zone between the inner shell and the outer shell.”), Figs. 1-2, 6:10-27; 4:7-20, 9:58-62.

 <p style="text-align: center;">FIG. 5</p>	 <p style="text-align: center;">FIG. 10</p>
<p>First Preferred Embodiment</p>	<p>Second Preferred Embodiment</p>

85. Princip further describes that the **outer shell** includes a **plurality of outer vents**. Figure 2, reproduced below, shows “a plurality of air vents 22” in the outer shell in the first preferred embodiment. EX-1006, ¶42. Figure 12, reproduced below, shows the second preferred embodiment with a plurality of vent openings 143 in the outer shell. *Id.*, ¶¶54-55 (“[The outer shell assembly] also includes vent openings 143 that align with the larger vent openings 134 of the inner shell 130.”); Claim 18.



86. These outer vents are **configured to couple the climatic zone in flow communication with ambient air**. For example, in the first preferred

embodiment shown in Fig. 2, “the helmet 20 includes a plurality of air vents 22 located through the front, top, and back of the helmet 20 to allow for *maximum airflow* and to *circulate the inside helmet air through the air vents*.” EX-1006, ¶42, Figs. 1-3. Ventilation is similarly achieved in the second preferred embodiment (helmet 120), by having the “vent openings 143 “align[ed] with the larger vent openings 134 of the inner shell 130” and “both the internal padding layer 124 and the external padding layer 150 includ[ing] open spaces over the large vent openings 134.” EX-1006, ¶¶54-55, ¶51, Figs. 8-12, Claim 18.

87. Further, air occupies the residual space between/around this padding in the climatic zone (described at 7[c], *infra*),⁴ as shown below in annotated Figures 6 and 13, which show two of many possible padding arrangements within Princip’s climatic zone.⁵ EX-1006, ¶52 (“Air also preferably fills the remaining space between the two opposing sheets 190 and 191.”).

⁴ EX-1006, Abstract, ¶32, ¶49. The padding layer can be configured a plethora of ways to suit the wearer’s needs. *Id.*, ¶53, ¶51, ¶35, ¶53.

⁵ See 7[c], *infra*; EX-1006, ¶35, ¶¶52-53.

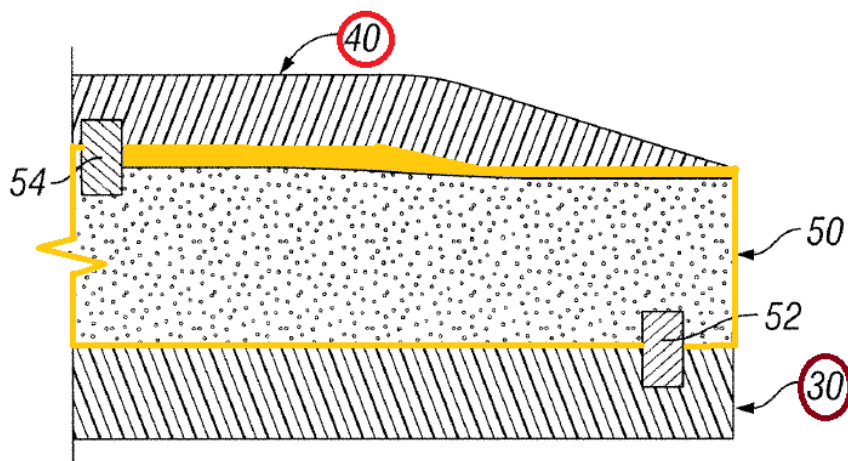


FIG. 6

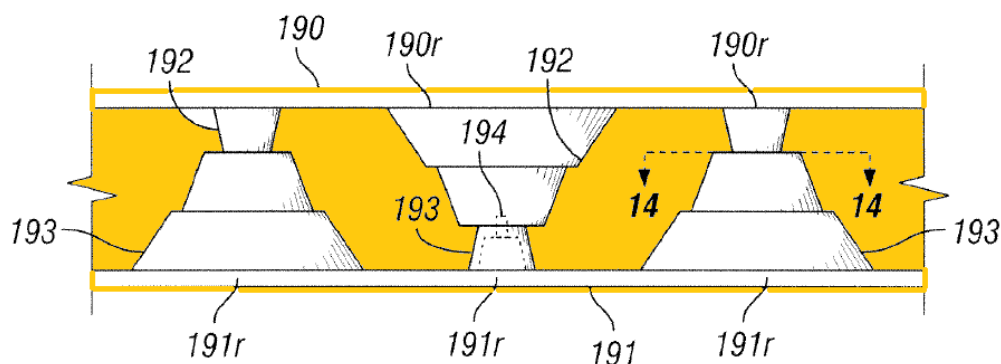


FIG. 13

88. From these disclosures, a POSITA would have understood that Princip's helmet enables circulation of air between the helmet interior and the ambient air, through the climatic zone and the outer vents. Accordingly, a POSITA would have understood that Princip's outer vents are configured to couple the climatic zone in flow communication with ambient air.

- (d) [7c] *"a cushion assembly positioned within the climatic zone between the inner shell and the outer*

shell, the cushion assembly including a plurality of cushions that are coupled to the outer shell.”

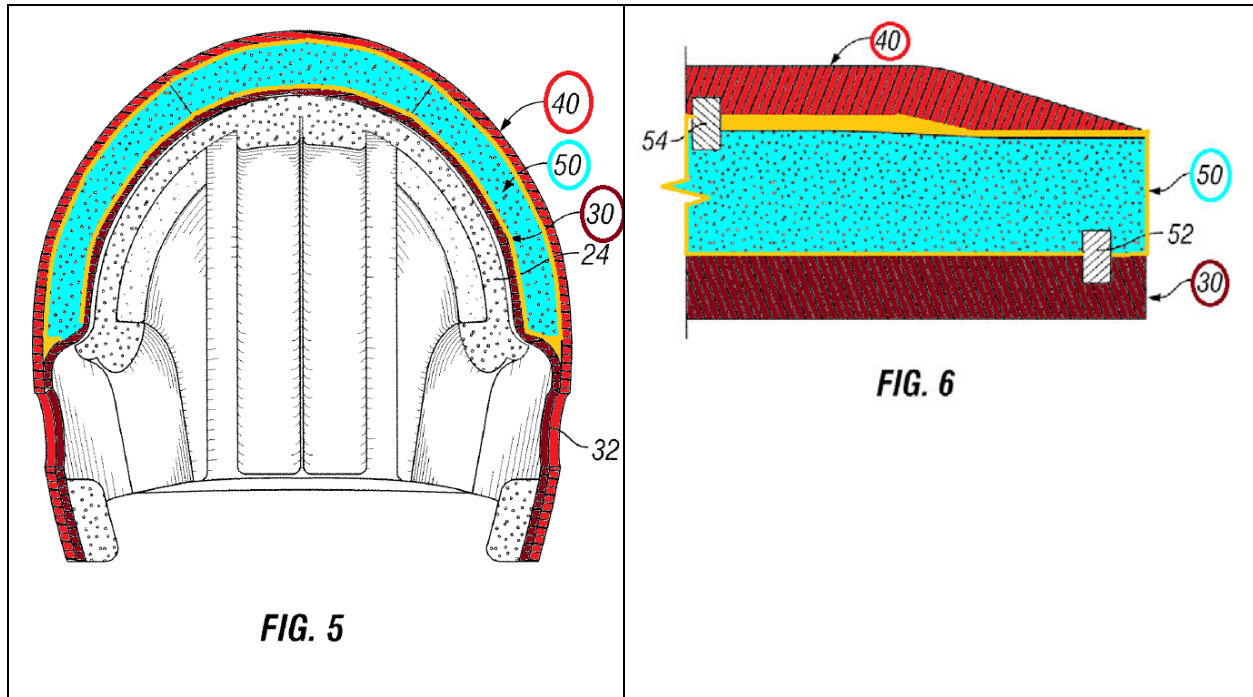
89. Princip discloses a **cushion assembly** positioned within the **climatic zone** between the **inner shell** and the **outer shell**, which Princip calls the “**energy absorbing layer**” or “**external padding layer**.” EX-1006, Abstract (“A protective helmet having an inner shell and an outer shell assembly. . . . [A]n energy absorbing layer is positioned between the inner shell and the outer shell assembly.”), ¶32, ¶49.

90. As described below, Princip’s external absorbing/padding layer is similar to the cushion assembly in the ’167 Patent, which is described as having varying number of cushions of varying dimensions and being made up of “absorptive material” and.” EX-1001, 7:59-8:41.

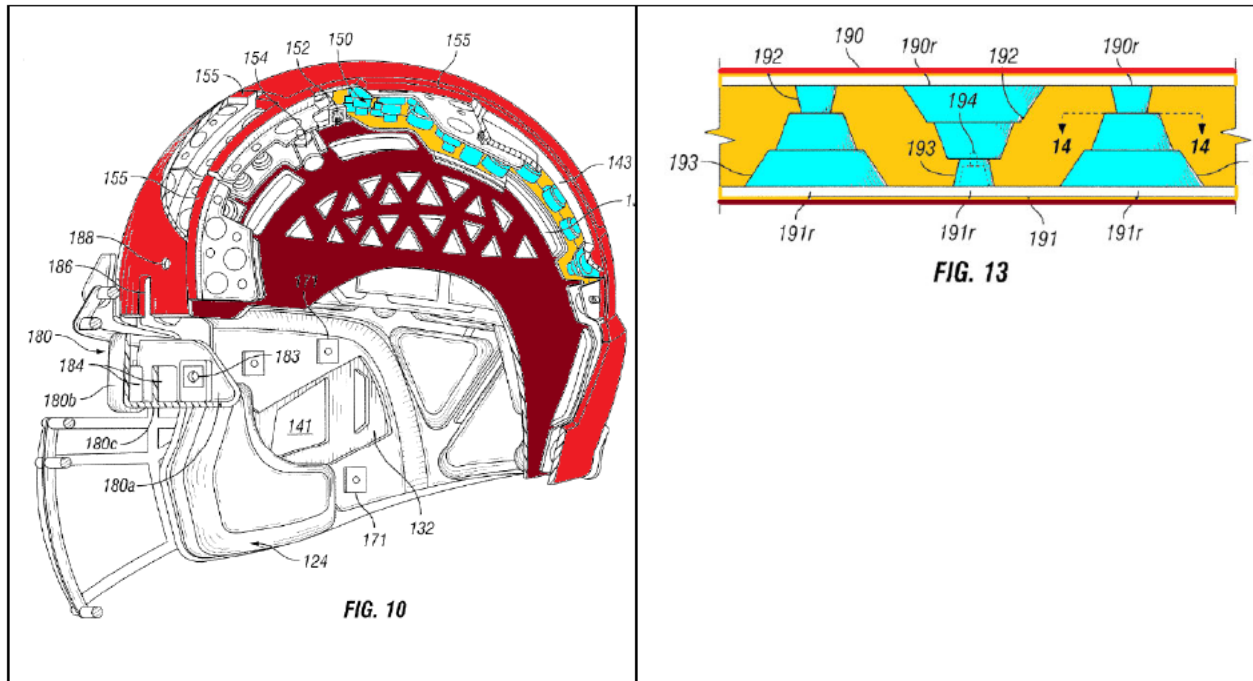
91. For example, Princip’s energy absorbing/padding layer comprises padding (EX-1006, ¶12), which can be configured in a plethora of ways to suit the wearer’s needs. *Id.*, ¶¶51-53, ¶35. These arrangements include a plurality of cushions/pads. *Id.*, ¶41 (“[T]he external energy absorbing layer 50 comprises multiple individual energy absorbing layer segments corresponding substantially to the shape and size of the multiple shell panels 42.”), ¶51.

92. Moreover, annotated Figs. 5 and 6 show one possible padding arrangement within the climatic zone, showing an **energy absorbing layer** that

“reduces or dampens the mount of jarring impact transmitted from the outer shell assembly 40 to the inner shell 30.” EX-1006, ¶35.



93. Similarly, annotated Figs. 10 and 13 show a more detailed padding arrangement within the climatic zone, comprising **opposing, alternately arranged pads** (called “indentations”) that “partially collapse upon a threshold amount of applied force and return to their original position upon removal of force.” EX-1006, ¶¶51-53.



94. Princip's cushions are **coupled to the outer shell**. EX-1006, ¶35 (“The padding layer 50 also includes one or more outer fastening points 54 for affixing the outer shell assembly 40 to the energy absorbing layer 50.”), ¶37, ¶51 (“The external padding layer 150 preferably include a plurality of inner shell attachment points 152 and outer shell attachment points 154.”), ¶58, ¶56.

95. Accordingly, Princip anticipates Claim 7.

ii. Claim 10

- (a) [10] “The modular helmet of claim 7, wherein the plurality of inner vents includes a first amount of inner vents and the plurality of outer vents includes a second amount of outer vents that is a different than the first amount of inner vents.”

96. Princip further discloses that the number of **inner vents** can differ from the number of **outer vents**. For example, Figures 11 and 12 show a first amount of inner vents 134. Figure 12 further shows a second amount of outer vents 143 that differs from the amount of inner vents 134. *See also* EX-1006, Figures 1 and 3 (showing greater number of inner than outer shell vents 22 in first preferred embodiment), Claim 18.

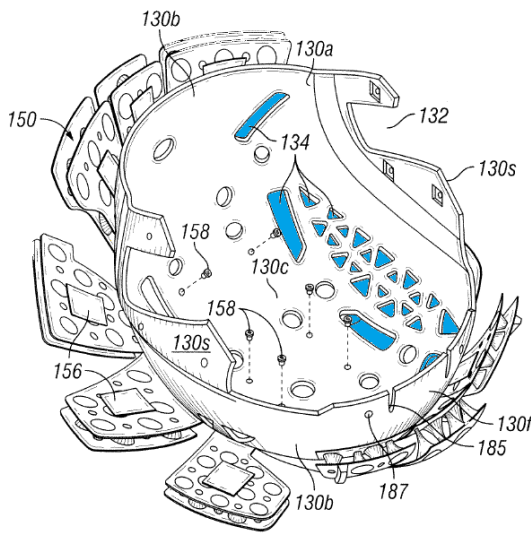


FIG. 11

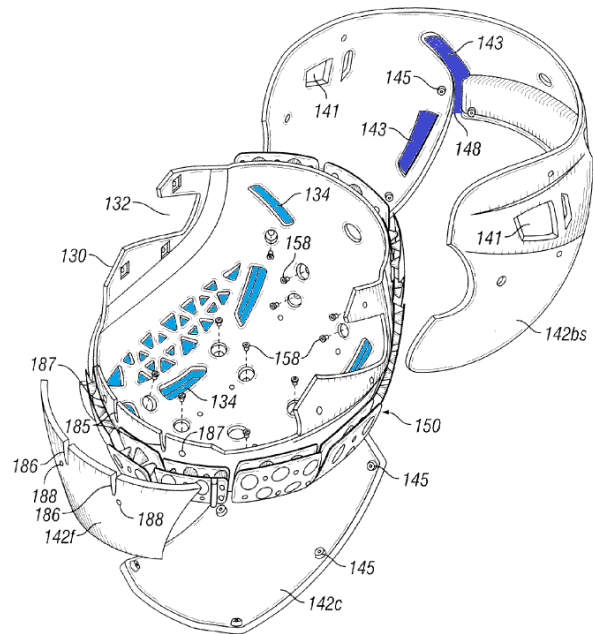


FIG. 12

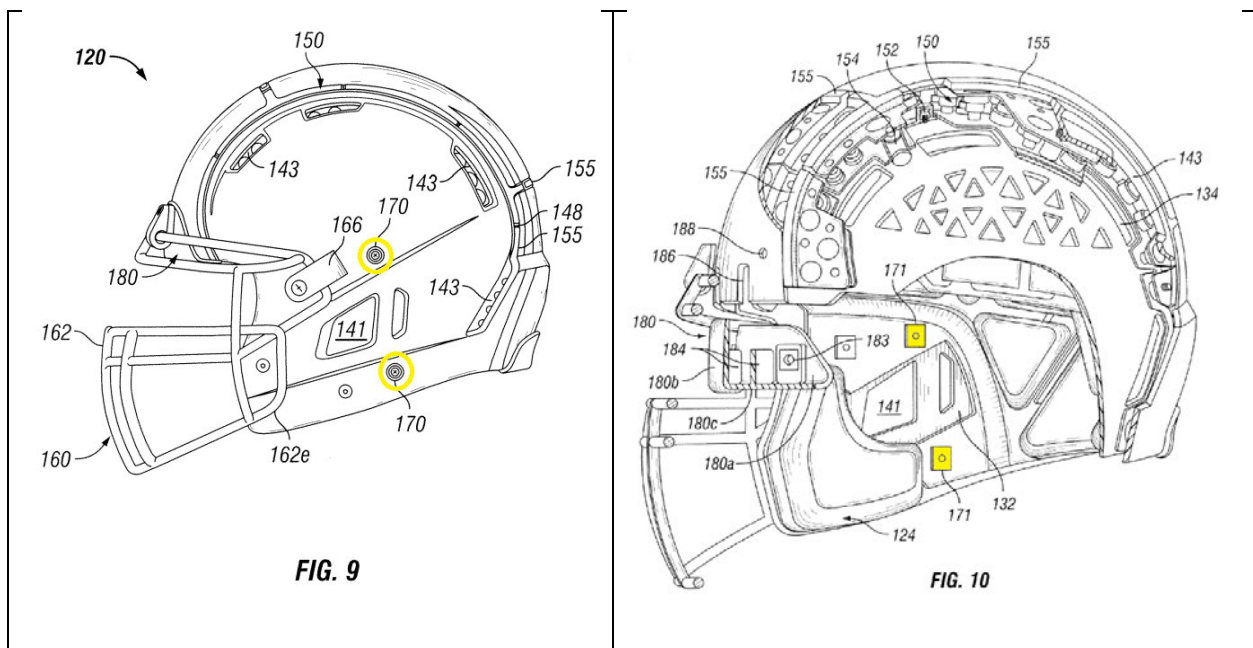
97. Accordingly, Princip anticipates Claim 10.

iii. Claim 11

- (a) [11] “The modular helmet of claim 7, further including an attachment mechanism coupled to the inner shell and the outer shell, wherein the outer shell is removably coupled to the inner shell.”

98. The '167 Patent explains that “the attachment mechanism [] may exist in a variety of configurations, including but not limited to a rigid configuration, a flexible configuration, or a combination of both,” including without limitation: a fastener, a plurality of flexible gaskets, and a rigid sleeve; a combination of both a rigid attachment surrounded by a flexible material; traditional screw attachment or a quick release attachment. EX-1001, 9:10-51.

99. Princip discloses **an attachment mechanism coupled to** the inner and outer shells (that is the same as or equivalent to the above-described structures included in the '167 Patent). For example, Princip discloses that a “plurality of screws 170 (FIG. 9) and nuts 171 (FIG. 10) fasten the outer shell assembly 140 to the inner shell 130.” EX-1006, ¶37, Fig. 6, ¶51, ¶56, ¶58.



100. A POSITA would have understood that the screws and nuts can be removed, such that the outer and inner shells can be separated from each other. Accordingly, Princip's screws and nuts (the attachment mechanism) that couple the inner and outer shells enable **the outer shell to be removably coupled to the inner shell.**

101. Accordingly, Princip anticipates Claim 11.

VIII. GROUND 3: Claims 1-6, 8-9, and 18 are Obvious over Princip and Akamatsu

A. Akamatsu

102. Akamatsu, titled "Head-Cooling Cooling Material, Helmet and Hat with Cooling Material," relates to "**head-cooling cooling material for insertion inside a helmet or hat to cool a head....**" EX-1008, ¶1. Akamatsu discloses that by 2004 it was well-known to POSITAs to insert cooling materials into helmets to cool wearers' heads. *Id.*, ¶¶3-9. Akamatsu focuses on a long-lasting cooling pack. *Id.*, ¶¶3-9, ¶19, ¶22.

103. To that end, Akamatsu describes "a head-cooling cooling material that uses normal paraffin as a cooling medium." *Id.*, ¶1. More specifically, "[t]he cooling medium...is a normal paraffin aqueous solution in gel form." *Id.*, ¶10. As of the Critical Date, this type of cooling medium was well known, common, and inexpensive. "This cooling material is in a relatively flat shape, and sturdy and

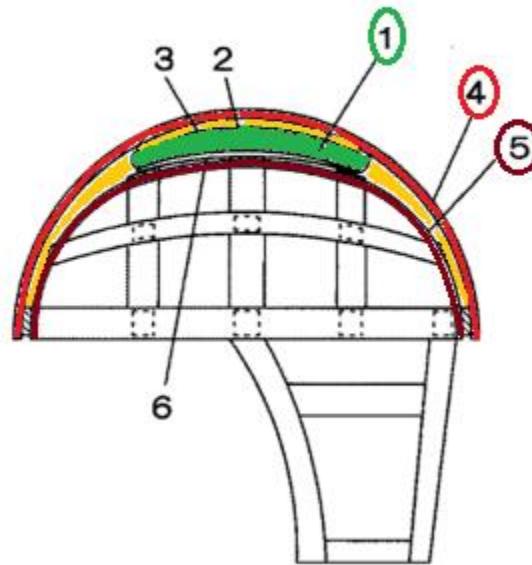
highly flexible... .” *Id.*, ¶16. This cooling medium is “enclosed in a water-resistant bag.” *Id.*, Claim 1, ¶10. Akamatsu refers to the cooling medium and the bag enclosing the cooling medium as “the cooling material” (*i.e.*, a cooling pack). *Id.*, ¶27, Fig. 1.

104. Akamatsu describes placing this cooling material in the space between the helmet’s **outer layer 4** and **inner layer 5**. *Id.*, Fig. 2; Claim 3 (“A helmet, characterized by a receiving part for receiving the head-cooling cooling material of claim 1 or claim 2 being provided at a suitable site on the inner surface of the helmet body.”); ¶26⁶ (“After this cooling material 1...is put inside a freezer and chilled, it is...inserted into a bag-shaped receiving part 6 anchored along the vicinity of the crown portion inside a helmet 4, in the air space between the inside surface of the helmet 4 and a hat body 5 made of cloth tape that is fitted to the inside of the helmet 4.”). Akamatsu describes that so-placing the cooling material in this radial space

⁶ Akamatsu has two, consecutive paragraphs 26, the second of which is the “simple explanation of the drawings,” figures 1-3. *See* EX-1008. If I cite to this second consecutive paragraph 26, I will do so as ¶26*.

allows “cool air from the cooling material [to] spread[] through the space between the inside of the helmet 4 and the head, allowing the head to be cooled.” *Id.*, ¶26.

[Selected Drawing] Fig. 2



105. Akamatsu describes that either (i) the cooling material itself can be anchored to the inside of the helmet (EX-1008, Claim 2, ¶¶18-19), or (ii) the cooling material may be inserted into a “receiving part” that is anchored to the inside of the helmet. *Id.*, Claims 3-4, ¶21. In the first case, the cooling material can be anchored to the inside of the helmet via a locking mechanism such as “double-sided tape, hooks, cords, hook and loop fasteners, etc.” *Id.*, ¶19. In the second case, the receiving parts can be “formed with cloth or netting or with a synthetic resin sheet and [can be] anchored or attached in a removable manner to the inside surface of a helmet or hat.” *Id.*, ¶21.

106. After being used, the “cooling material...can be removed from the helmet or hat and re-chilled [inside a freezer]. In short, it can be continually used any number of times.” *Id.*, ¶17. The cooling material may be positioned at any “suitable sites inside the helmets or hats,” such as the crown. *Id.*, ¶21, ¶25, Claim 3.

B. Princip-Akamatsu Combination

107. Princip discloses all elements of Claim 7’s modular helmet. *See* Section VII.B(i), *supra*. Princip does not disclose cooling packets in the radial space between the inner and outer shells defining the climatic zone. However, a POSITA would have found it obvious to implement Akamatsu’s cooling teachings within Princip’s modular helmet, such that the climatic zone would further include a plurality of cooling packets. As described below, a POSITA would have been motivated to combine these teachings in view of the references’ similar techniques, structures, and goals to improve wearer’s comfort and protection.

i. Similar Goals, Well-Known Solutions

108. Consistent with the well-known techniques for providing helmet ventilation, Princip discloses ventilation and air flow using its vents and spacing between the inner shell, outer shell, and energy absorbing layer. EX-1006, Figs. 1-3, 7, ¶42, ¶¶50-55, Claim 18; *see* EX-1005, 1:47-50, 7:3-15, 8:11-42, Claims 7-8, Figs. 5-8 & 12; EX-1011, Fig. 1, 2:3-7, 2:33-37, Claims 1-3; EX-1012, 1:67-2:9, 3:63-4:13, Figs. 1-11; EX-1009, ¶27, ¶41, ¶68; EX-1010, 4:25-26.

109. However, it was well-known in the art, before the Critical Date, that providing such vents and spacing for air flow in helmets alone may not sufficiently cool a wearer's head, particularly in high temperature environments. *See* EX-1015, 1:36-41, 2:40-67 (based on studies conducted in early-2000 timeframe available at EX-1016). Outer vents and inner vents can be insufficient if the outside temperature is greater than the body temperature of the helmet wearer. Outer and inner vent effectiveness is further impacted by the wearer's actions (*i.e.*, speed, helmet angle). Indeed, Akamatsu recognizes that conventional helmets had "poor ventilation" leading to potentially "dangerous conditions" related to overheating. EX-1008, ¶2.

110. A POSITA would have thus been motivated to seek out helmet cooling techniques for implementation within Princip's helmet, to achieve sufficient head cooling. Before the Critical Date, it was well-known to use cooling materials within helmets to cool a wearer's head. EX-1008, ¶¶3-8; *see also* EX-1013, 1:24-28, 2:12-17; EX-1009, ¶¶37-39, ¶¶52-53, ¶57, ¶64, Claims 19-21, Figs. 1-4; EX-1014, 1:25-27. It was also well-known that cooling packs should be "flat," not "bulky" (EX-1013, 1:24-28, 2:13-18); and, should be long-lasting and simple to replace, not "time consuming" or "messy." EX-1014, 1:25-30. Indeed, Akamatsu discloses head cooling via flat, long-lasting, simple cooling packs in the radial space between the inner and outer shells of its modular helmet. *Id.*, Fig. 2, Abstract, Claims 1-4, ¶1, ¶¶16-17. Accordingly, a POSITA would have been motivated to implement well-

known head cooling solutions, such as those taught by Akamatsu, for implementation within Princip's helmet.

111. The references' similar structure and goals would have further motivated implementation of Akamatsu's cooling techniques within Princip's helmet. Princip and Akamatsu describe similar modular helmets with materials between the helmet's inner and outer shells: cushioning layers in Princip and cooling packs in Akamatsu. EX-1006, *e.g.*, Abstract, ¶32, ¶35, ¶49, ¶¶51-52; EX-1008, *e.g.*, Fig. 2, Claim 3, ¶26. Additionally, both Princip and Akamatsu also concern keeping helmet wearers' safe, including by keeping heads both cooled and protected from impacts. EX-1006, ¶¶9-12, ¶42, ¶¶50-51; EX-1008, ¶2 (“[T]he temperature inside a helmet or hat needs to be lowered to keep the head comfortable” to protect wearer from potential negative health effects of overheating.).

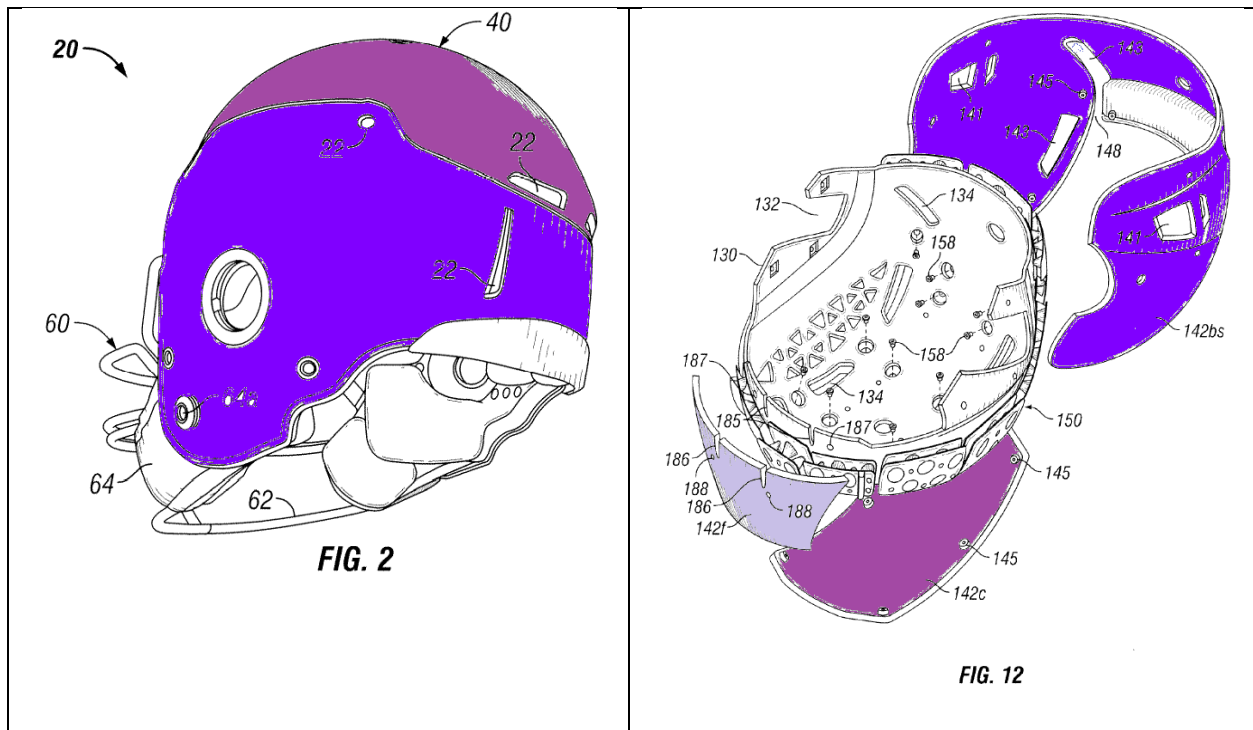
112. Thus, the Princip and Akamatsu references' similar modular structure and head protection goals would have motivated providing cooling packs along with cushioning layers within the radial space defined between Princip's inner and outer shells. Accordingly, implementing Akamatsu's cooling packets within the radial space in Princip's helmet would have amounted to the use of known techniques to improve similar devices in the same way.

ii. Similar and Complementary Structures

113. These similar modular helmet disclosures provide still further motivation with considered with (i) Akamatsu's adaptable cooling pack and (ii) Princip's robust customization.

114. Akamatsu discloses a versatile cooling pack between a protective helmet's inner and outer shells, as it is long-lasting, reusable, and durable (*i.e.*, relatively flat, flexible, and sturdy) and can be placed at any suitable location along the wearer's head. EX-1008, ¶16, ¶26.

115. Princip discloses highly customizable padding between a protective helmet's inner and outer shells. EX-1006, ¶53, ¶51, ¶35. And in a multi-panel outer shell assembly, each outer shell segment/panel itself can further be so-customized—*i.e.*, each outer shell panel can have a different padding, thickness, and spacing configuration between the inner and outer shells. *Id.*, ¶40 (“Individual panels 42 can be designed, modified or customized for different players or player positions such as a football lineman, receiver, or quarterback.”), ¶41, *see* Figs. 2, 12 below, showing various outer shell panels. In this way, ***“the energy absorbing characteristics and properties of each shell panel as well as each energy absorbing layer segment can be designed and customized for the desired properties, for individual players, and/or for different player positions.”*** *Id.*, ¶41.



116. The references' similar modular helmet arrangements, Princip's customization disclosures, and Akamatsu's adaptable cooling pack disclosures would have motivated a POSITA to combine Akamatsu's cooling packs with Princip's modular helmet. In the resulting combination, the cooling packs could be placed at any suitable location along the wearer's head that achieves sufficient head cooling (as contemplated by Akamatsu) and the wearer's needs (as contemplated by Princip). EX-1008, ¶16, ¶26; EX-1006, ¶35, ¶40, ¶41, ¶51, ¶53, Figs. 2, 12. Locations "most in need of being cooled" include "the forehead and temples." EX-1013, 1:25-26.

117. Therefore, a POSITA would have found it obvious to customize one or more of Princip's outer-shell panels to include two or more Akamatsu's flat, long-

lasting cooling packs in-line with one or more of Princip's energy absorbing layer arrangements (*e.g.*, between two horizontally spaced cushions, in the space provided between the cushions that are left open to enable air flow between the inner and outer vents), at, for example, each temple.

118. For example, as to Princip's first preferred embodiment, a POSITA would have found it obvious to: (i) separate the "combined...left and right side panel[]" of the outer shell assembly as shown in Figs. 1-2 (EX-1006, ¶38)—which combined panel is "preferably not secured" to the other outer shell panels (*id.*, ¶39)—from the energy absorbing layer 50 by (ii) unfastening the "outer fastening points 54" that connect the outer shell panels to the energy absorbing layer (*id.*, ¶¶35, 39, Fig. 6); and (iii) insert a flat, long-lasting, versatile cooling pack of the type disclosed in Akamatsu at each of the wearer's temples (on either side of combined left and right side outer shell panel). The energy absorbing layer would remain attached to the inner shell 30 via disclosed "inner fastening points" (Ex-1006, ¶35, Fig. 6) and thus the cushioning need to not be disturbed in inserting/replacing the cooling packs. Further, the energy absorbing layer would and could, per Princip's disclosures (discussed at length above), be arranged to so-accommodate the cooling packs to suit the wearer's needs.

119. As another example, as to Princip's second preferred embodiment, a POSITA would have found it obvious to separate the outer shell panel 142bs from

the external padding layer 150 by loosening the screws/fasteners that secure the outer shell panel to the external padding layer (EX-1006, ¶56, Figs. 10-12) and insert a flat, long-lasting, versatile cooling pack of the type disclosed in Akamatsu at each of the wearer's temples (on either side of outer shell panel 142bs). The external padding layer would remain attached to the inner shell 130 via disclosed "hook and loop fasteners" such as "Velcro" (Ex-1006, ¶51) and thus the cushioning need to not be disturbed in inserting/replacing the cooling packs. Further, the external padding layer would and could, per Princip's disclosures (discussed at length above), be arranged to so-accommodate the cooling packs to suit the wearer's needs.

120. Accordingly, adding Akamatsu's versatile cooling pack to the highly-customizable spaces between Princip's inner and outer shells in two or more outer shell panels, or at multiple places within the same panel, would have involved combining prior art elements according to known methods to yield a predictable result: desired cooling without compromising desired protection.

C. Claim Analysis

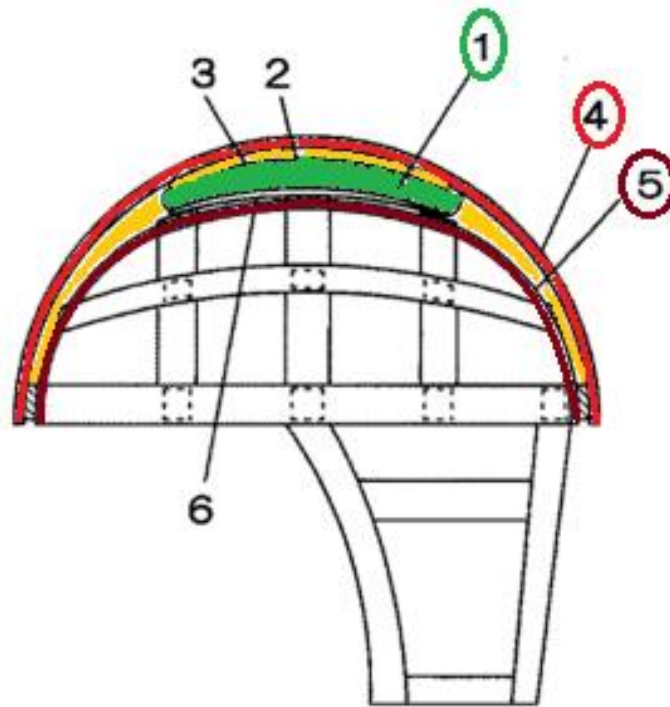
i. Claim 8

- (a) [8] *"The modular helmet of claim 7, including a plurality of cooling packets that are coupled to the outer shell and positioned within the climatic zone."*

121. In combination, Princip discloses all claim 7 elements. *See* Ground 2 [7pre-c], *supra*.

122. In combination, Akamatsu discloses placing a **cooling packet** in the **climatic zone** between a helmet's **inner shell** and **outer shell**.

[Selected Drawing] Fig. 2



123. Akamatsu describes a cooling packet for use in a helmet. EX-1008, ¶1 (“The present invention relates to head-cooling cooling material for insertion inside a helmet or hat to cool a head, and specifically to a head-cooling cooling material that uses normal paraffin as a cooling medium, and to a helmet and hat with cooling material.”), ¶¶10-15, Claims 1-2.

124. Akamatsu describes placing the cooling packet between a helmet's inner and outer layers. *Id.*, Fig. 2, ¶26 (“After this cooling material 1...is put inside

a freezer and chilled, it is...inserted into a bag-shaped receiving part 6 anchored along the vicinity of the crown portion inside a helmet 4 in the air space between the inside surface of the helmet 4 and a hat body 5 made of cloth tape that is fitted to the inside of the helmet 4.”), Claim 3.

125. Akamatsu discloses that the cooling packets can **be coupled to the outer shell** of the helmet. Akamatsu describes anchoring the cooling packet, located between the inner and outer shells, to either the inner or outer shell. *Id.*, ¶18 (“Claim 2 of the present invention proposes a configuration in which a locking member is provided to a side surface of a bag or container used for the cooling material in order to anchor the cooling material to the inside surface of a helmet [(i.e., the outer shell) or hat [(i.e., the inner shell)].”), ¶19, Claim 2, Claim 3.

126. As previously discussed, Sect. VIII.B., *supra*, it would have been obvious to a POSITA to modify Princip to include two or more of Akamatsu’s cooling packs between its inner and outer shells. Indeed, given the similarities between the modular helmets’ structures (i.e., removably attached and radially spaced inner and outer shells); the highly customizable nature of Princip’s climatic zone and outer shell panels; the versatility and durability of Akamatsu’s cooling packet (i.e., long-lasting, reusable, relatively flat, flexible, and sturdy); and the well-known use of cooling materials to cool helmet wearers’ heads, such a modification

would have been straightforward for a POSITA to implement and would have led to predictable results.

127. Accordingly, the Princip-Akamatsu combination renders Claim 8 obvious.

ii. Claim 9

- (a) [9] *“The modular helmet of claim 8, wherein at least one cushion of the plurality of cushions includes a height that is different than a height of at least one cooling packet of the plurality of cooling packets.”*

128. In combination, it would have been obvious that at least one cushion has a height differing from the height of at least one cooling packet.

129. Princip discloses numerous non-limiting possibilities for cushion structure, configuration, and placement. EX-1006, ¶53, ¶51, ¶35. Further, Princip discloses that the cushions and their arrangements can be between panels depending upon wearer needs. *Id.*, ¶41. Additionally, it was well-known that cushions typically work by compressing under applied force. *Id.*, ¶34 (“As compression occurs, the fluid, typically air, is forced out of a controlled air valve, and then filled back with air after impact. Such systems are conventional and well known to those skilled in the art.”).

130. Akamatsu discloses a cooling pack filled with “normal paraffin aqueous solution in gel form.” EX-1008, ¶1, ¶10. “This cooling material is in a

relatively flat shape, and sturdy and highly flexible material is used for the bag so that it can be anchored along the inside of a helmet or hat.” *Id.*, ¶16. The normal paraffin aqueous solution in gel form cooling packs do not operate like a cushion; they are not intended to compress in size to work. The property of a cushion is trying to dissipate mechanical energy while the property of the cooling pack is trying to decrease temperature or thermal energy. Because these two entities have different properties, they in turn will have different materials, volumes, and sizes, including heights. Thus, while cushions may be arranged as seen in Princip’s preferred embodiments—where the cushions substantially fill the space between the inner and outer shells—this would not necessarily be the case for the Akamatsu cooling packs.

131. Thus, in a combination where at least two panels of Princip’s multi-panel outer shell have a cooling pack between the inner and outer shells, or where two or more cooling packs are placed between a single panel’s inner and outer shells, it would be obvious to a POSITA that the combination could include at least one of those cushions having a different height—to any extent—than at least one of the cooling packs.

132. Accordingly, the Princip-Akamatsu combination renders claim 9 obvious.

iii. Claim 1

(a) *[1pre] “A modular helmet comprising:”*

133. See Ground 2 [7pre], *supra*.

- (b) [1a] “an inner shell adapted to be positioned onto a user's head;”

134. See Ground 2 [7a], *supra*.

- (c) [1b] “an outer shell coupled to the inner shell, the outer shell spaced a distance radially outward from the inner shell to define a climatic zone between the inner shell and the outer shell; and”

135. See Ground 2 [7b], *supra*.

- (d) [1c] “a cooling assembly positioned within the climatic zone between the inner shell and the outer shell, the cooling assembly including a plurality of cooling packets that are coupled to the outer shell; and”

136. See Ground 3 [8], *supra*.

- (e) [1d] “a plurality of cushions that are coupled to the outer shell and positioned within the climatic zone.”

137. See Ground 2 [7c], *supra*.

138. Accordingly, the Princip-Akamatsu combination renders claim 1 obvious.

iv. Claim 2

- (a) [2] “The modular helmet of claim 1, wherein at least one cushion of the plurality of cushions includes a height that is different than a height of at least one cooling packet of the plurality of cooling packets.”

139. See Ground 3 [9], *supra*.

140. Accordingly, the Princip-Akamatsu combination renders claim 9 obvious.

v. Claim 3

(a) [3pre] “A modular helmet comprising:”

See Ground 2 [7pre], *supra*.

(b) [3a] “an inner shell adapted to be positioned onto a user's head;”

141. See Ground 2 [7a], *supra*.

(c) [3b] “an outer shell coupled to the inner shell, the outer shell spaced a distance radially outward from the inner shell to define a climatic zone between the inner shell and the outer shell; and”

142. See Ground 2 [7b], *supra*.

(d) [3c] “a cooling assembly positioned within the climatic zone between the inner shell and the outer shell, the cooling assembly including a plurality of cooling packets that are coupled to the outer shell, wherein the inner shell includes a plurality of inner vents configured to couple the climatic zone in flow communication with an area adjacent the users [sic] head”

143. See Ground 2 [7a-7b] and Ground 2 [8], *supra*.

144. The inner vents 22/134 connect the climatic zone (defined between the inner and outer shells) to the area adjacent the wearer's head. EX-1006, Figs. 3-12, ¶42, ¶50, ¶51.

145. Accordingly, the Princip-Akamatsu combination renders claim 3 obvious.

vi. Claim 4

- (a) [4] *“The modular helmet of claim 3, wherein the outer shell includes a plurality of outer vents configured to couple the climatic zone in flow communication with ambient air.”*

146. See Ground 2 [7b], *supra*.

147. Accordingly, the Princip-Akamatsu combination renders claim 4 obvious.

vii. Claim 5

- (a) [5] *“The modular helmet of claim 4, wherein at least one inner vent is orientated coaxially with a corresponding outer vent.”*

148. See Ground 2 [7b], *supra*. Princip further describes that at least one inner and outer vent may be coaxially aligned. EX-1006, Claim 18 (“said inner shell and said outer shell assembly include a plurality of vent openings, at least one said outer shell vent opening radially aligned over at least one said inner shell vent opening.”), ¶55 (“The combination panel 142bs also includes vent openings 143 that align with the larger vent openings 134 of the inner shell 130.”), *compare* Fig. 2 (outer shell with vents 22) *with* Fig. 3 (inner shell with vents 22), *see* Fig. 12 (showing coaxial alignment of at least one inner and out vent).

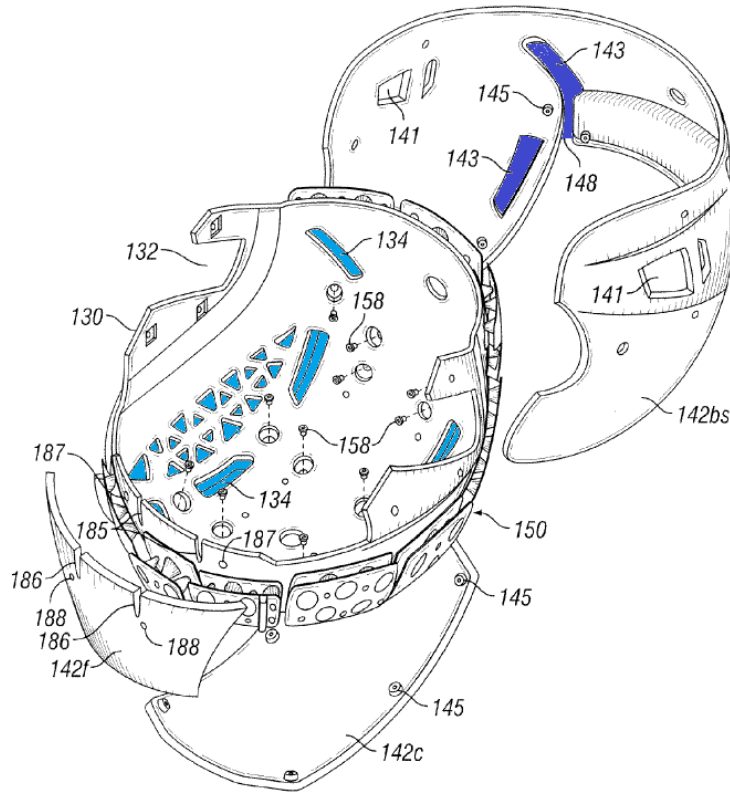


FIG. 12

149. Accordingly, the Princip-Akamatsu combination renders claim 5 obvious.

viii. Claim 6

- (a) [6] “The modular helmet of claim 1, further including an attachment mechanism coupled to the inner shell and the outer shell, wherein the outer shell is removably coupled to the inner shell.”

150. See Ground 2 [11], *supra*.

151. Accordingly, the Princip-Akamatsu combination renders claim 6 obvious.

ix. Claim 18

- (a) [18] *“The modular helmet of claim 3, further including an attachment mechanism coupled to the inner shell and the outer shell, wherein the outer shell is removably coupled to the inner shell.”*

152. See Ground 2 [11], *supra*.

153. Accordingly, the Princip-Akamatsu combination renders claim 18 obvious.

IX. GROUND 4: CLAIMS 3, 4, AND 18 ARE ANTICIPATED BY BEDFORD

A. Bedford

154. Bedford, titled “Cooling helmet,” discloses two preferred helmet embodiments shown in annotated Figs. 2 and 4 below.⁷ Like the ’167 Patent, Bedford describes each embodiment as “[a]n impact protective item of headwear (1) which has inner (2) and outer (6) impact resistant parts nesting one with respect to the other.” EX-1009, Abstract, ¶9, ¶¶49-51.

⁷ Bedford’s third preferred embodiment relates to cloth headwear, like a baseball cap. EX-1009, ¶¶61-67, Figs. 5-6.

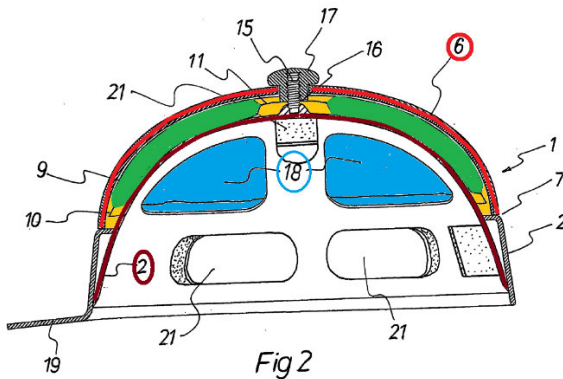


Fig 2

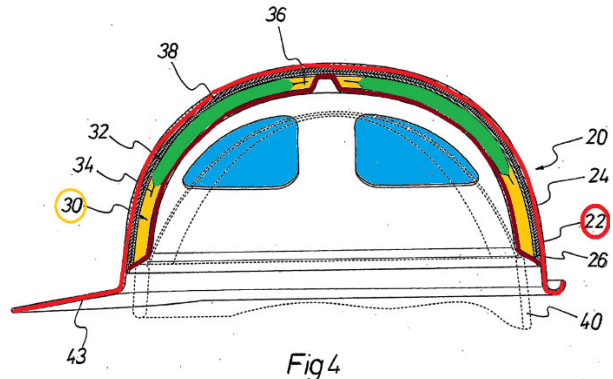


Fig 4

155. The inner and outer parts, which are removably attached to one another (EX-1009, ¶¶9, 40, 45, 54-56, Claims 19-20), are **radially spaced apart to create between them a cavity**. *Id.*, ¶¶36-37 (“There is provided an outer part 6 of crown shape which is of a dome shape and which arranged to generally have an outer lower edge which con-forms to a periphery 7 of the lower part 2 so as to define a cavity 8 between the two.”); ¶¶50-51 (“The helmet 20 has an outermost shell which forms there by an outer part 22... There is also provided an insulating material 24 which is of a dome shape, and which is adapted to generally conform to the periphery 26 of an inner part 28 so as to define a cavity 30 between the two which is to say the outer part 22 and the inner part 28 both of which are of dome shape and which provide for the inner part 28 to nest within the outer part 22.”), Figs. 1-4. Bedford recognized, long before the ’167 Patent, that “structurally separating the crown of a headwear item into at least two parts with an intermediate part in between provides an opportunity to control within a contained space arrangements for airflow and cooling effect and distribution of cooling air from this.” *Id.*, ¶12.

156. A **plurality of cooling packs** are located between the inner and outer parts. Bedford refers to these cooling packs as “**intermediate part[s]**.” EX-1009, ¶¶9-11 (“An article of headwear having a crown which has an outer part of crown shape, and an inner part of crown shape of a size and shape adapted to and nesting with the outer part and *at least one intermediate part* which is positioned to be intermediate the said outer and inner crown parts and which outer and inner parts are together adapted to support in removable fashion the intermediate part, and where the intermediate part is comprised of at least in the main of a fluid. In preference the fluid is held in *one or more pliable pouches* which can be removable and replaceable with other pouches. Preferably the fluid is a freezable gel so that there can be a plurality of such pouches which can be used to replace one another so that as one is warmed another from a freezer can replace this to maintain a preferred extent of cooling.”), ¶¶38-39, ¶¶52-53 (“This cavity 30 is adapted to receive within it a pack 32 which contains a freezable gel, which is provided by two sheets of pliable plastic material welded together along inner and outer seams 34 and 36 so as to define a pouch 38. Within the pouch 38 there is the freezing gel which is adapted to be frozen at colder temperatures of typically zero degrees centigrade or below, and which will therefore once frozen, melt and provide thereby cooling effect.”), Claims 19-20. The cooling packs are **removably coupled** to the outer shell. *Id.*, ¶¶45, 54, 56.

157. Bedford further describes that the inner and outer parts have vents for air flow. Bedford refers to the vents as “**apertures**.” EX-1009, ¶41, ¶68 (“In each case embodiment the design has been provided with an inner part and an outer part and in each case there are apertures to be provided through the parts which have not been shown specifically but which will be able to be placed in position and be judged as to size and location to best balance the need for maintaining of insulation as compared to allowing for a cooling effect with air passage.”). Further, the inner part “[a]peratures 18 are positioned in distributed fashion in the inner part 2 so as to allow for air flow from the frozen gel into an air space beneath the inner part 2.” *Id.*, ¶41, ¶57 (“Once again therefore it will be seen that the cooling materials are arranged to be held above and out of direct contact with the head or skin of a user and this then allows for air to circulate and also for better insulation and control of air flow past the frozen materials to be achieved.”), ¶12; Figs. 2, 4.

B. Claim Analysis

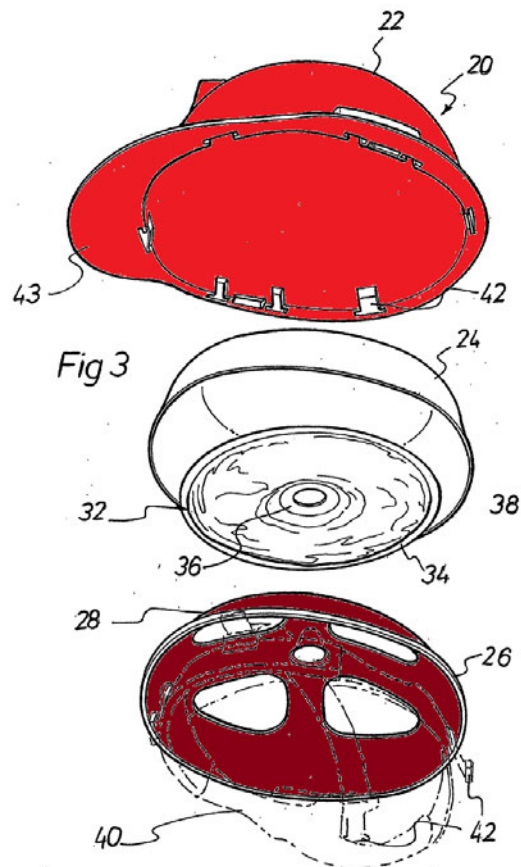
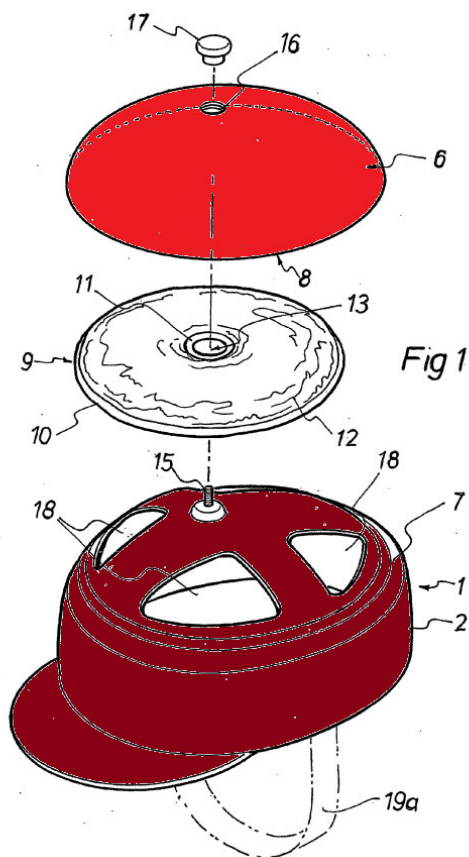
i. Claim 3

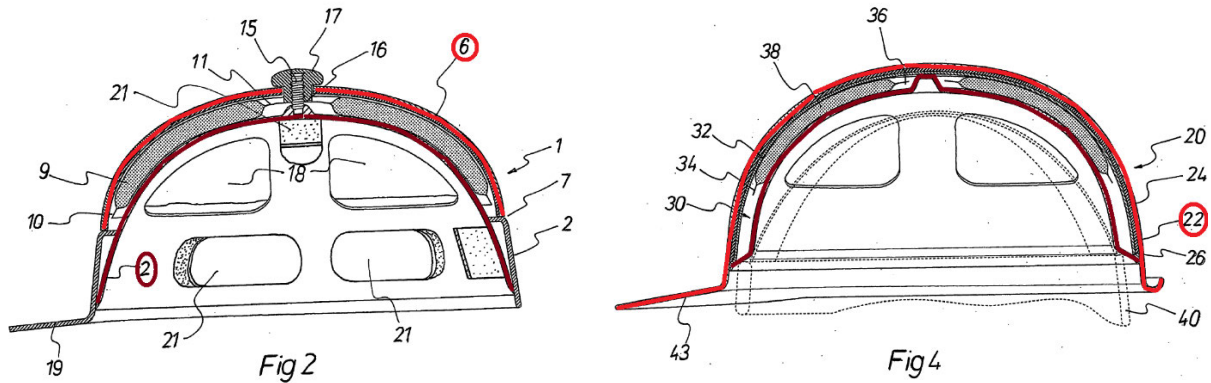
(a) *[3pre] “A modular helmet comprising:”*

158. Bedford describes a modular helmet. As to Figures 1-2, annotated below, Bedford describes a helmet 1 that includes multiple modules, including an **inner impact resisting part** (2) (inner shell) and an **outer impact resistant part** (6) (outer shell), and are nested “one with respect to the other and shaped to hold

between them a replaceable pouch (9) with a gel cooling or otherwise of a user.”

EX-1009, Abstract, ¶9, ¶¶36-37. Bedford similarly describes Figures 3 and 4 (annotated below) as “[a] helmet 20” with multiple modules, including “an **outermost shell which forms there by an outer part 22**” and “an insulating material 24...which is adapted to generally conform to the periphery 26 of **an inner part 28**” (inner shell) “so as to define a cavity 30 between the two which is to say the outer part 22 and the inner part 28 both of which are of dome shape and which provide for the inner part 28 to nest within the outer part 22.” *Id.*, ¶¶49-51.





(b) [3a] “an inner shell adapted to be positioned onto a user’s head;”

159. Bedford’s helmet includes an **inner shell**, which Bedford interchangeably refers to as an inner part or lower part (shown above in Figures 1 and 3, reproduced and annotated above in [3pre]).⁸ EX-1009, Abstract (“An impact protective item of headwear (1) which has inner (2) and outer (6) impact resistant parts nesting one with respect to the other and shaped to hold between them a replaceable pouch (9) with a gel cooling or otherwise of a user.”); ¶¶36-37 (“Accordingly, the helmet 1 has an inner part 2 of crown shape which is moulded from an impact resistant plastics material this being glass fibre reinforced polyester in this case.”); ¶¶50-51 (“The helmet 20 has an outermost shell which forms there

⁸ Bedford also refers to the “inner part” 2/28 as the “lower part.” EX-1009, ¶37, ¶40, ¶44, ¶46.

by an outer part 22...There is also provided an insulating material 24 which is of a dome shape, and which is adapted to generally conform to the periphery 26 of ***an inner part 28*** so as to define a cavity 30 between the two which is to say the outer part 22 and the inner part 28 both of which are of dome shape and which provide for the inner part 28 to nest within the outer part 22.”), Figs. 1-4. Additionally, Bedford’s inner part is made of similar materials as those being used in the inner shell of the ’167 patent. *Compare* EX-1009, ¶¶36-37, *with* EX-1001, 4:34-45.

160. Moreover, a POSITA would have understood that the inner shell is **adapted to be positioned onto a user’s head**. *See* EX-1009, Figs. 1-4 (showing inner part inside cavity conforming to wearer’s head); Abstract (“This invention ***relates to headwear particularly suited to be worn by persons requiring headwear*** that will provide impact protection for the wearer.”); ¶¶42-43, ¶¶46-47, ¶¶60-61, ¶67, ¶71.

- (c) [3b] “an outer shell coupled to the inner shell, the outer shell spaced a distance radially outward from the inner shell to define a climatic zone between the inner shell and the outer shell; and”

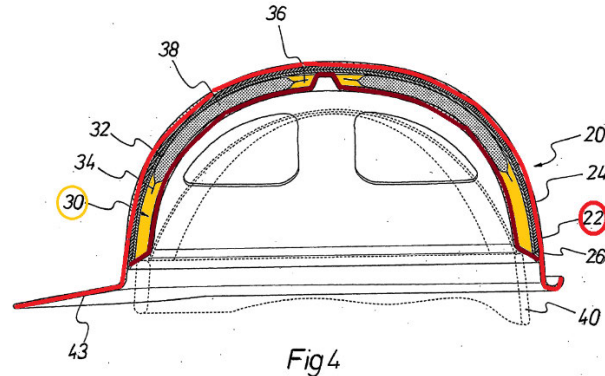
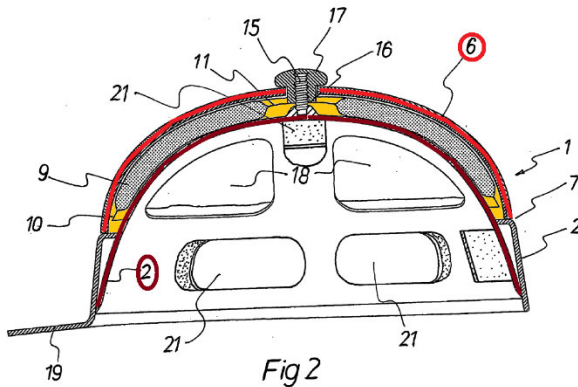
161. Bedford's helmet includes an **outer shell**, which Bedford interchangeably refers to as outermost shell, outer part, and upper part⁹. EX-1009, Abstract ("An impact protective item of headwear (1) which has inner (2) and outer (6) impact resistant parts nesting one with respect to the other and shaped to hold between them a replaceable pouch (9) with a gel cooling or otherwise of a user."), ¶¶50-51 ("The helmet 20 has an outermost shell which forms there by an outer part 22...."), Figs. 1-4.

162. This outer shell is **coupled to the inner shell**. EX-1009, ¶40 ("The upper part 6 is held in position by a bolt 15 embedded within the lower part 2 at a central location and projects upwardly so as to pass through aperture 16 and to be held in position by nut 17."), ¶54 ("The insulating material 24 and inner part 28 are held together, and then collectively secured to the outermost shell, via the helmet webbing 40 (represented by the dashed lines), which is of a type conventionally found in such construction helmets, which in this case as is conventional is

⁹ Bedford also refers to "outer part[s]" 6/22 as the "outermost shell" or the "upper part." *See, e.g.*, EX-1009, ¶13, ¶44, ¶50, ¶54.

removably attached to the outermost shell via means of clips 42 adapted to engage the outermost shell 22.”).

163. As in the '167 Patent, Bedford's **outer shell** is spaced a distance radially outward from the **inner shell** to define **a climatic zone** between the two. Figures 2 and 4, annotated below, show this climatic zone between the outer part 6/22 (outer shell) and the inner part 2/22 (inner shell). *See* EX-1009, Figs. 1, 3; EX-1001, 6:6-7 ('167 Patent explaining that “the climatic zone 20 is defined between the inner shell and the outer shell”), Abstract (“The outer shell is spaced a distance radially outward from the inner shell to define a climatic zone between the inner shell and the outer shell.”), Figs. 1-2, 18-26; 4:7-20, 9:58-62.

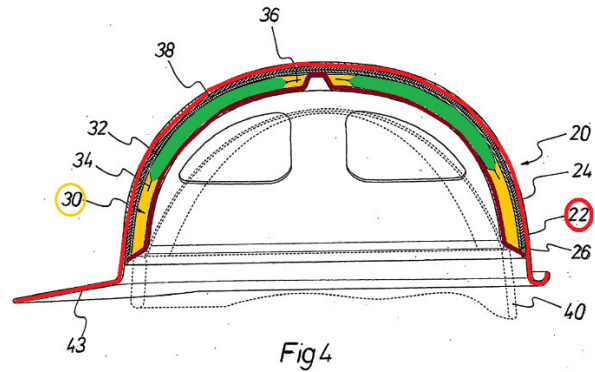
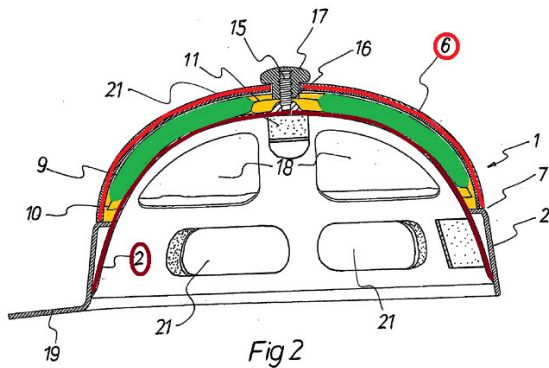


164. Bedford refers to this space as **a cavity** formed between the inner and outer shells. EX-1009, ¶¶36-37 (“There is provided an outer part 6 of crown shape which is of a dome shape and which arranged to generally have an outer lower edge which conforms to a periphery 7 of the lower part 2 so as to define a cavity 8 between

the two.”), ¶¶50-51 (“The helmet 20 has an outermost shell which forms there by an outer part 22 which is moulded from an appropriate impact resistant plastics material as per a conventional construction helmet such as a polycarbonate plastics material. There is also provided an insulating material 24 which is of a dome shape, and which is adapted to generally conform to the periphery 26 of an inner part 28 so as to define a cavity 30 between the two which is to say the outer part 22 and the inner part 28 both of which are of dome shape and which provide for the inner part 28 to nest within the outer part 22.”).

- (d) *[3c] “a cooling assembly positioned within the climatic zone between the inner shell and the outer shell, the cooling assembly including a plurality of cooling packets that are coupled to the outer shell, wherein the inner shell includes a plurality of inner vents configured to couple the climatic zone in flow communication with an area adjacent the users [sic] head”*

165. The '167 Patent's only disclosures of the cooling assembly describe it as “a plurality of cooling packets” coupled to either the inner or outer shell. EX-1001, Abstract, 1:65-67, 2:51-52, Fig. 6, 6:29-7:4. As described below, Bedford describes a **cooling assembly including a plurality of cooling packets** positioned within the climatic zone between the inner and outer parts, which Bedford refers to as the **“intermediate part.”** EX-1009, ¶¶9-11, ¶17, Claims 19-20.



166. In the helmet embodiment shown in Figs. 1-2, Bedford discloses “a replaceable pouch (9) with a gel cooling or otherwise” between the inner and outer parts. EX-1009, Abstract, ¶¶38-39 (“This cavity 8 is shaped so as to receive within it a pack 9 which is provided by two sheets of pliable plastic material welded together along inner and outer seams 10 and 11 so as to define a pouch 12 with a central hole 13 passing through it. Within the pouch 12 there is a freezing gel which is adapted to be frozen at colder temperatures typically zero degrees centigrade or below and which will therefore once frozen, be available to melt and provide thereby cooling effect.”). Similarly, in the embodiment shown in Figs. 3-4, Bedford discloses a replaceable pouch 38 with a gel or other coolant between the inner and outer parts. *Id.*, ¶¶52-53 (“This cavity 30 is adapted to receive within it a pack 32 which contains a freezable gel, which is provided by two sheets of pliable plastic material welded together along inner and outer seams 34 and 36 so as to define a pouch 38. Within the pouch 38 there is the freezing gel which is adapted to be frozen at colder

temperatures of typically zero degrees centigrade or below, and which will therefore once frozen, melt and provide thereby cooling effect.”).

167. Bedford describes **a plurality of** cooling packets. EX-1009, ¶¶9-12 (“In one form of this invention there is proposed an article of headwear having...*at least one intermediate part* which is positioned to be intermediate the said outer and inner crown parts and which outer and inner parts are together adapted to support in removable fashion the intermediate part, and where the intermediate part is comprised of at least in the main of a fluid. In preference the fluid is held in *one or more pliable pouches* which can be removable and replaceable with other pouches. Preferably the fluid is a freezable gel so that there can be a plurality of such pouches which can be used to replace one another so that as one is warmed another from a freezer can replace this to maintain a preferred extent of cooling. By structurally separating the crown of a headwear item into at least two parts with an intermediate part in between provides an opportunity to control within a contained space arrangements for airflow and cooling effect and distribution of cooling air from this.”), Claims 19, 20.

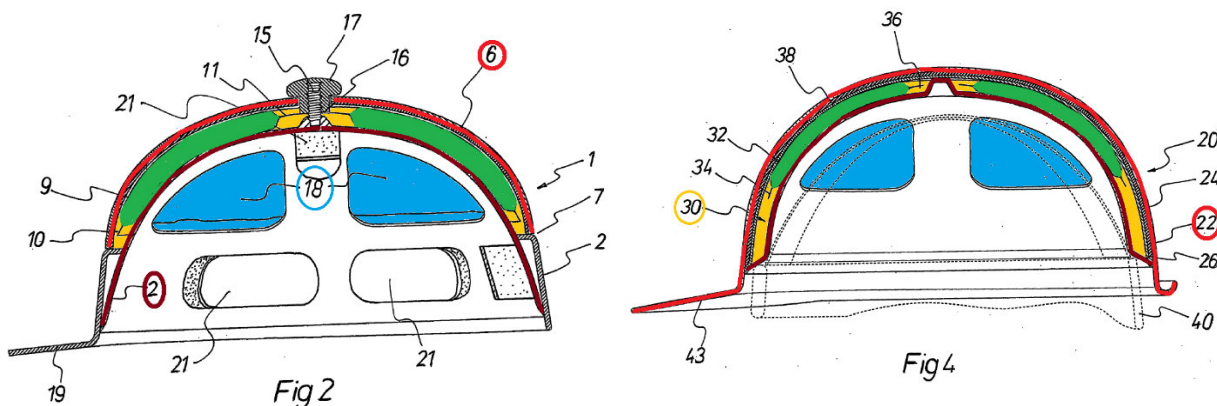
168. From these disclosures, a POSITA would have understood that an intermediate part can include “one or more pliable pouches” filled with cooling material (e.g., a freezable gel) and that the helmet can include multiple intermediate parts. Because Bedford contemplates multiple intermediate parts, with each being

made up of multiple pouches of cooling materials, a POSITA would have understood that Bedford's helmet includes a plurality of cooling packets.

169. These cooling packets are **coupled to the outer shell**. In the helmet embodiment shown in Figs. 1-2, "[t]he pack 9 can be removed from time to time by simply undoing the nut 17 and lifting the upper part away and replacing the pack with a further frozen pack so that a person wearing the hat may be able to be kept cool over periods of typically an hour or so according to tests thus far conducted." EX-1009, ¶45. In the embodiment shown in Figs. 3-4, "[t]he insulating material 24 and inner part 28 are held together, and then collectively secured to the outermost shell, via the helmet webbing 40 (represented by the dashed lines), which is of a type conventionally found in such construction helmets, which in this case as is conventional is removably attached to the outermost shell via means of clips 42 adapted to engage the outermost shell 22. The brim 43 is in this case now a part of the outer part 22 which provides for the inner part to in this case fit or nest within the outer part 22. Such an arrangement of helmet webbing is removable therefore relatively easily, in order to facilitate replacement of the pouch 38 once for instance it is no longer frozen with a further frozen pack as before." *Id.*, ¶54, ¶56.

170. From these disclosures, a POSITA would have understood that Bedford's outer shell is coupled to the inner shell and thus, the cooling packets disposed between the inner and outer shells are also coupled to the outer shell.

171. Bedford's inner shell includes a plurality of **inner vents** configured to couple the climatic zone in flow communication with an area adjacent the user's head.



172. For example, apertures 18 (the plurality of inner vents) are “positioned in distributed fashion in the inner part 2” (the inner shell) “to allow for air flow from the frozen gel,” included in the intermediate part positioned in Bedford's climatic zone (*see supra* [3b]), into an air space beneath the inner part 2,” which a POSITA would have understood as the area adjacent to the user's head. EX-1009, ¶41, ¶57 (“Once again therefore it will be seen that the *cooling materials are arranged to be held above and out of direct contact with the head or skin of a user* and this then allows for air to circulate and also for better insulation and control of air flow past the frozen materials to be achieved.”), ¶68 (“In each case embodiment the design has been provided with an inner part and an outer part and in each case there are apertures to be provided through the parts which have not been shown specifically

but which will be able to be placed in position and be judged as to size and location to best balance the need for maintaining of insulation as compared to allowing for a cooling effect with air passage.”), Figs. 1-4. And, because air flow is enabled between Bedford’s climatic zone and the area adjacent to the user’s head, a POSITA would have understood that Bedford’s inner vents couple the climatic zone in flow communication with the area adjacent to the user’s head. *Id.*

173. Accordingly, Bedford anticipates claim 3.

ii. Claim 4

- (a) [4] *“The modular helmet of claim 3, wherein the outer shell includes a plurality of outer vents configured to couple the climatic zone in flow communication with ambient air.”*

174. Bedford’s outer shell includes a **plurality of outer vents**, which Bedford refers to as apertures. EX-1009, ¶68 (“In each case embodiment the design has been provided with an *inner part* and *an outer part* and in each case *there are apertures to be provided through the parts* which have not been shown specifically but which will be able to be placed in position and be judged as to size and location to best balance the need for maintaining of insulation as compared to allowing for a cooling effect with air passage.”).

175. Bedford describes that the plurality of outer vents **configured to couple the climatic zone in flow communication with ambient air**. A POSITA would

have understood that the disclosed outer apertures (outer vents) necessarily vent between the outer part and the area beneath the outer part (*i.e.*, the cavity/climatic zone) because the apertures are “provided through” the outer part. EX-1009, ¶68 (“In each case embodiment the design has been provided with an inner part and an outer part and in each case there are apertures to be provided through the parts which have not been shown specifically but which will be able to be placed in position and be judged as to size and location to best balance the need for maintaining of insulation as compared to allowing for a cooling effect with air passage.”), ¶12 (“By structurally separating the crown of a headwear item into at least two parts with an intermediate part in between provides an opportunity to control within a contained space arrangements for airflow and cooling effect and distribution of cooling air from this.”).

176. Providing an aperture through the outer part therefore connects (*i.e.*, couples in flow communication) the cavity/climatic zone below the outer part (the climatic zone) with the ambient air above the outer part (outer shell).

177. Accordingly, Bedford anticipates claim 4.

iii. Claim 18

- (a) [18] “*The modular helmet of claim 3, further including an attachment mechanism coupled to the inner shell and the outer shell, wherein the outer shell is removably coupled to the inner shell.*”

178. Bedford describes **an attachment mechanism coupled to** the inner and outer shells (which is the same as or equivalent to the structures included in the '167 Patent (*see* Section V, *supra*; EX-1001, 9:10-9:44) such that the outer shell is removably coupled to the inner shell. EX-1009, Claims 19, 28.

179. In the helmet embodiment shown in Figs. 1-2, the “outer and inner parts are together adapted to support in removable fashion the intermediate part....” EX-1009, ¶9, ¶40 (“The upper part 6 is held in position by a bolt 15 embedded within the lower part 2 at a central location and projects upwardly so as to pass through aperture 16 and to be held in position by nut 17.”), ¶45 (“The pack 9 can be removed from time to time by simply undoing the nut 17 and lifting the upper part away and replacing the pack with a further frozen pack so that a person wearing the hat may be able to be kept cool over periods of typically an hour or so according to tests thus far conducted.”).

180. In the embodiment shown in Figs. 3-4, “[t]he insulating material 24 and innerpart 28 are held together, and then collectively secured to the outermost shell, via the helmet webbing 40 (represented by the dashed lines), which is of a type conventionally found in such construction helmets, which in this case as is conventional is removably attached to the outermost shell via means of clips 42 adapted to engage the outermost shell 22... Such an arrangement of helmet webbing is removable therefore relatively easily, in order to facilitate replacement of the

pouch 38 once for instance it is no longer frozen with a further frozen pack as before.” EX-1009, ¶¶54-56.

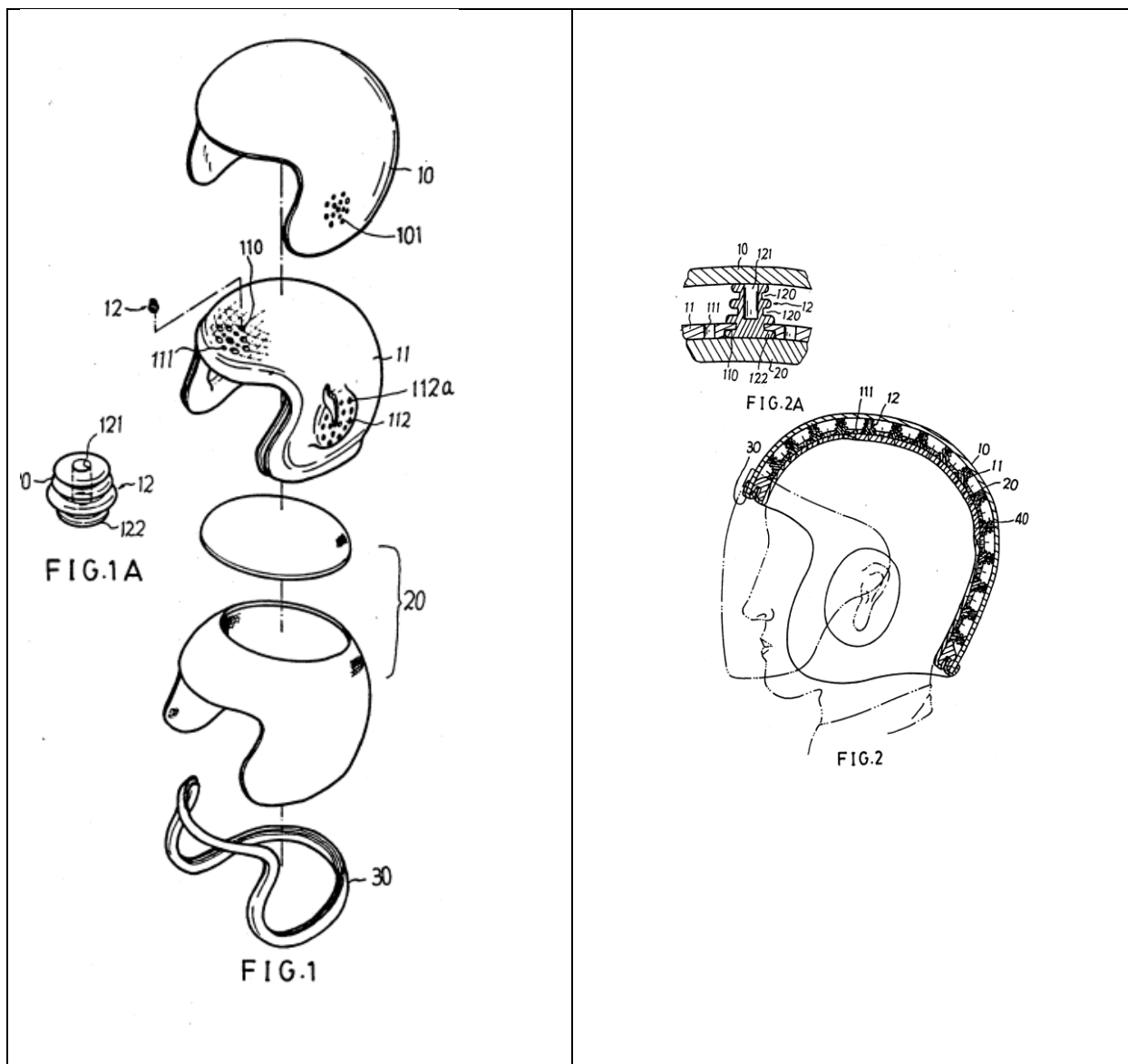
181. Accordingly, Bedford anticipates claim 18.

X. GROUND 5: CLAIM 7 IS OBVIOUS IN VIEW OF LIU

A. Liu

182. Like the '167 Patent, Liu discloses a modular helmet that includes “an outer shell secured with an inner shell defining an air chamber between the two shells, a plurality of cushioning bellows retained between the two shells, an air-penetrable layer adhered on an inside surface of the inner shell disposed around a wearer’s head, and a cap frame sealably combining the two shells and the air-penetrable layer to form a complete safety helmet having a great dampening effect for reducing an external impact force acting upon the helmet by the plurality of cushioning bellows between the two shells for enhancing safety of a wearer of the helmet.” EX-1011, Abstract.

183. Liu’s modular helmet is shown in FIGS. 1, 1A, 2, and 2A below.



B. Claim Analysis

i. Claim 7

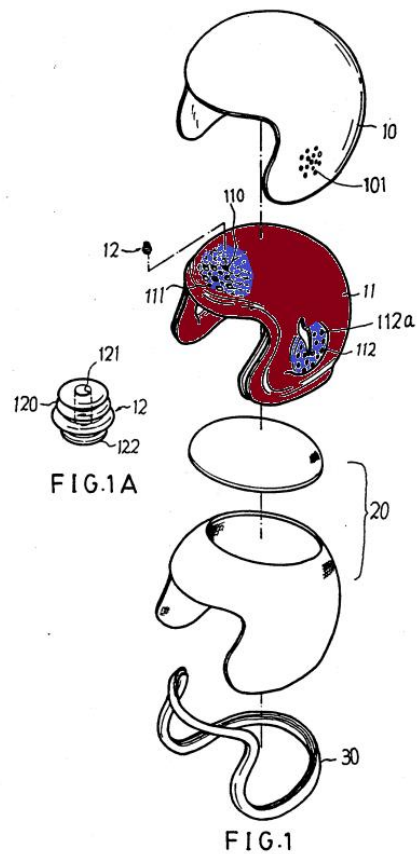
(a) *[7pre]*

184. Liu describes a modular helmet. Like the '167 Patent, Liu describes a “helmet” with multiple modules, including an inner shell, “an outer shell

juxtapositionally secured with [the] inner shell defining an air chamber between the two shells, a plurality of cushioning bellows retained between the two shells, an air-penetrable layer adhered on an inside surface of the inner shell disposed around a wearer's head, and a cap frame sealably combining the two shells and the air-penetrable layer.” EX-1011, Abstract, 1:29-32, 1:56-60, 2:61-66; *see* EX-1001, 2:1-4, 1:58-2:23.

(b) [7a]

185. Liu’s helmet includes an **inner shell**, which is shown, *e.g.*, in Fig. 1 as inner shell 11. EX-1011, Abstract (“A safety helmet includes an outer shell juxtapositionally secured with an inner shell defining an air chamber between the two shells.”), 1:29-32, 1:56-60.



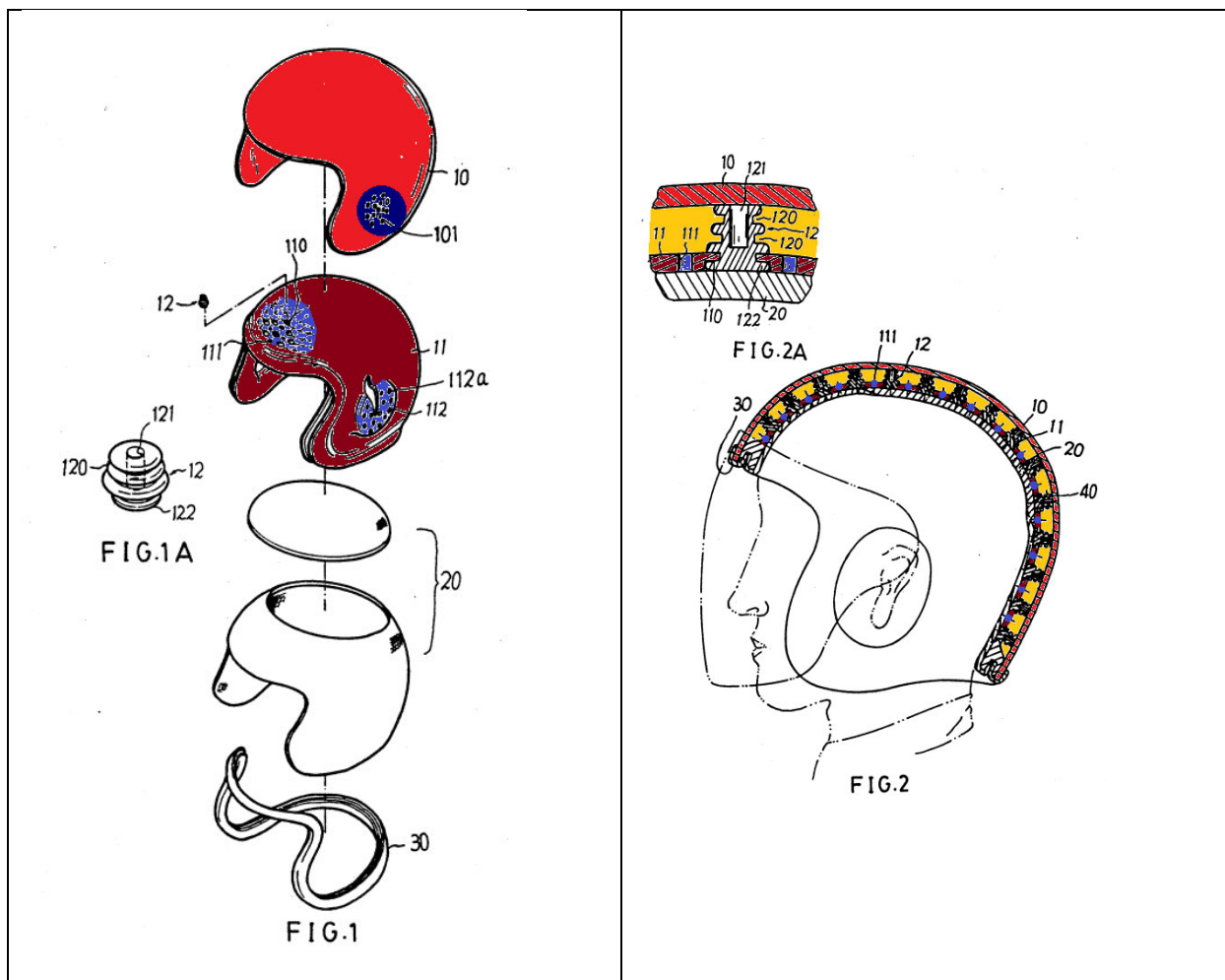
186. The inner shell is **adapted to be positioned onto a user's head**. EX-1011, FIG. 2 (showing inner layer inside cavity conforming to wearer's head), Abstract ("an inside surface of the inner shell disposed around a wearer's head"), FIG. 1.

187. Liu's inner shell includes **a plurality of inner vents**. EX-1011, 2:3-7 ("The inner shell 11 is formed with **a plurality of venting holes 111** in the inner shell 11 for fluidically communicating the air chamber 40 defined between the two shells 10, 11, and the air-penetrable layer 20 adjacent to a wearer's head."), 2:61-66, 3:11-15, claim 1; 2:22-32 ("The inner shell 11 further includes a pair of ear shields

112 on two opposite sides of the inner shell 11 for holding a wearer's two ears in the shields 112 having **a plurality of inner perforations 112a** drilled in each ear shield 112; and the outer shell 10 also includes a plurality of outer perforations 101 drilled in two opposite sides on the outer shell 10 projectively corresponding to the two ear shields 112 of the inner shell 11 for transmitting outside or environmental sound waves through the outer perforations 101, the inner perforations 112a, and the air-penetrable layer 20 towards the wearer's ears.”), 4:6-16, claim 2.

(c) [7b]

188. Liu's helmet includes an **outer shell** that is “juxtapositionally secured with” (i.e., coupled to) the inner shell. EX-1011, Abstract, 1:29-32, 1:56-60, FIG. 1 (annotated below).



189. Like the '167 Patent, Liu's **outer shell** is spaced a distance radially outward from the **inner shell** to define **a climatic zone** between the shells, as shown in annotated FIG. 2 and 2A below. Specifically, and as shown in FIG. 2, the outer and inner shells define "**an air chamber between the two shells.**" EX-1011, Abstract, 1:29-32 , 1:56-60, 2:3-7, 2:33-66, 3:11-15, Claim 1, Claim 3, 4:18-22.

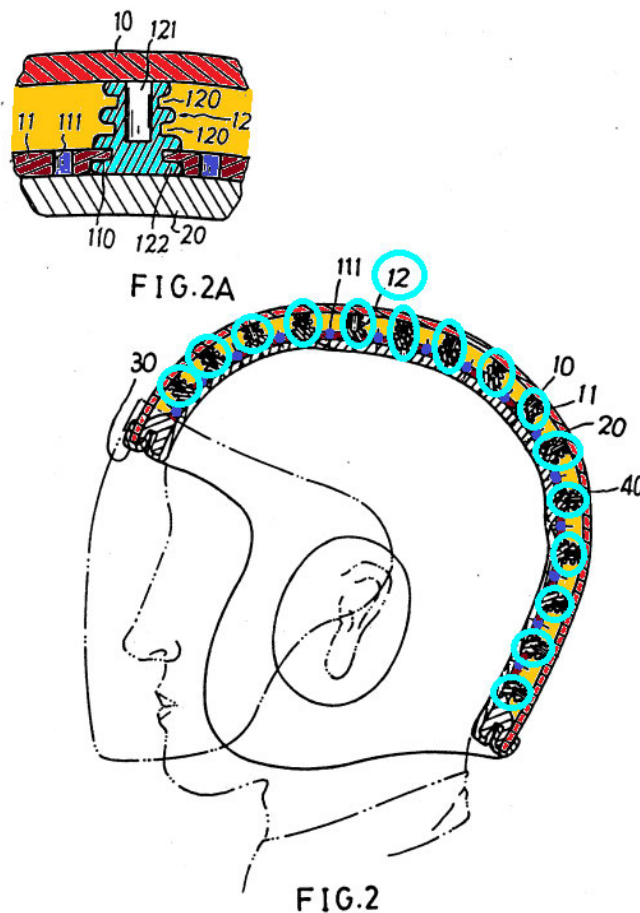
190. Liu further describes that the **outer shell** includes a plurality of **outer vents** configured to couple the climatic zone in flow communication with ambient air. In particular, Liu's helmet includes "**outer perforations**" (as shown in FIG. 1

above) “formed in the **outer shell**” that “ventilate air or moisture from or in the **air chamber between the outer shell and the inner shell** and from the wearer’s head for a comfortable wearing of the helmet.” EX-1011, 4:18-22, 2:22-37, Claim 3, 2:3-7 (“The inner shell 11 is formed with a plurality of venting holes 111 in the inner shell 11 for fluidically communicating the air chamber 40 defined between the two shells 10, 11, and the air-penetrable layer 20 adjacent to a wearer’s head.”), 2:61-66, 3:11-15, Claim 1, 2:22-32 (“The inner shell 11 further includes a pair of ear shields 112 on two opposite sides of the inner shell 11 for holding a wearer’s two ears in the shields 112 having a plurality of inner perforations 112a drilled in each ear shield 112; and the outer shell 10 also includes a plurality of outer perforations 101 drilled in two opposite sides on the outer shell 10 projectively corresponding to the two ear shields 112 of the inner shell 11 for transmitting outside or environmental sound waves through the outer perforations 101, the inner perforations 112a, and the air-penetrable layer 20 towards the wearer’s ears.”), 4:6-16, Claim 2.

191. From these disclosures, a POSITA would have understood that Liu’s helmet enables air circulation between the helmet interior and the ambient air, through the air chamber/climatic zone and the outer vents/perforations. In this manner, Liu’s outer vents couple the climatic zone in flow communication with ambient air.

(d) [7c]

192. Liu discloses a cushion assembly that includes a plurality of cushions and is positioned within the climatic zone between the inner shell and the outer shells. EX-1011, Abstract (“A safety helmet includes an outer shell juxtapositionally secured with an inner shell defining an air chamber between the two shells, a plurality of cushioning bellows retained between the two shells.”).

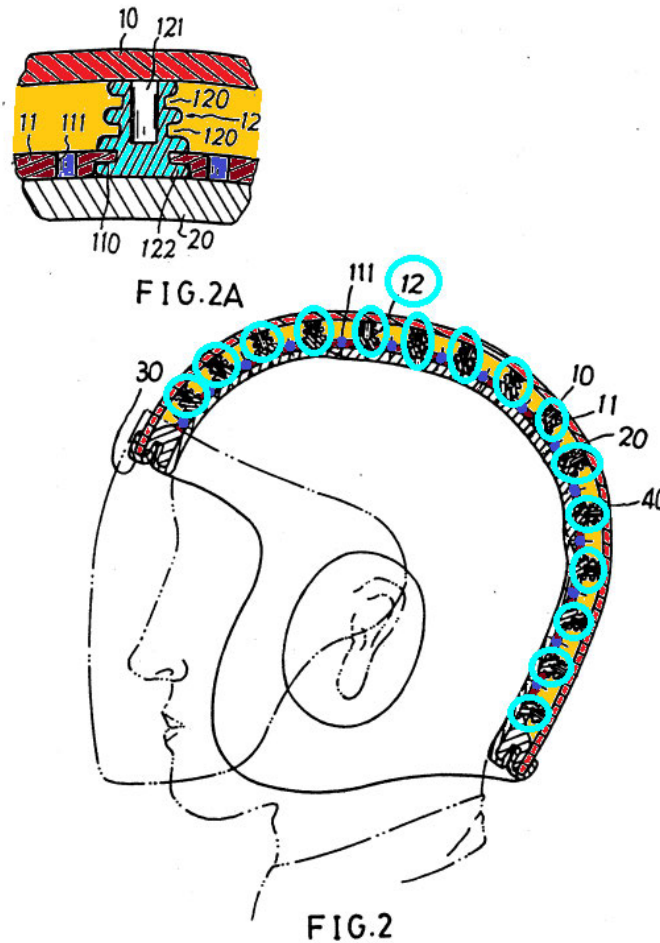


193. Liu’s cushioning bellows are similar to the ’167 Patent’s cushion assembly, which is described as having varying number of cushions of varying

dimensions and being made up of energy “absorptive material.” EX-1001, 7:59-8:41.

194. Similarly, Liu’s cushioning bellows “hav[e] a great dampening effect for reducing an external impact force acting upon the helmet,” and each “cushioning bellows 12 [is] preferably made of resilient elastomers.” EX-1011, Abstract, 1:36-42, 2:8-9. When “an external impact force” acts upon Liu’s helmet, the impact force “compresses the bellows 12 to release the air in the socket 121 outwardly into the chamber 40 (direction A) to dampen the force” and “the compression of the corrugated flanges 120 of the bellows 12 will also weaken the force F, and moreover the bellows as made of elastomer material will itself serve as or act like a ‘spring’ for a buffer of the impact force.” EX-1011, 2:44-53, Figs. 3, 3A.

195. Liu cushioning bellows are coupled to the outer shell. For example, Liu discloses that “each cushioning bellows 12” can include “corrugated flanges 120 normally contacting an inside surface of the outer shell 10,” as shown in Fig. 2A. EX-1011, 2:8-21. Liu further discloses that the outer and inner shells are secured to each other. EX-1011, Abstract.



196. From these disclosures, and given that the '167 Patent does not disclose any specific means for coupling the cushions to the outer shell (EX-1001, 7:59-8:27), a POSITA would have understood that Liu's cushioning bellows are coupled to the outer shell.

197. If it is determined that the "coupl[ing]" in 7[c] requires attaching "cushions" and the "outer shell," it would have been obvious to modify Liu so that its cushioning bellows are secured/attached to the outer shell. Liu already discloses that "a retaining base portion 122 formed on a bottom portion of the bellows 12" is

“engageably fixed in each bellows hole 110 formed in the inner shell 11 as shown in FIG. 2A” (reproduced above). EX-1011, 2:8-21, FIGS. 2, 2A.

198. A POSITA would have found it obvious to invert Liu’s cushioning arrangement so that each bellow is engageably fixed in bellow holes formed in the outer shell, instead of the inner shell. Such a modification would have been predictable, as it represents one of two ways in which the cushioning bellows could be engageably secured/fixed within the space defined between the shells: either being secured to the inner shell or the outer shell. Moreover, a POSITA would recognize that the cushioning bellows would achieve the same force dampening effect regardless of the orientation (*e.g.*, “impact force compressing the bellows 12 to release the air in the socket . . . to dampen the force . . . and the compression of the . . . bellows will also weaken the force . . .”). EX-1011, 2:44-58. The ’167 Patent confirms that such cushion-coupling orientation can be a design choice, stating that while the helmet “may include a plurality of cushions [] that are coupled to the inner surface [] of the outer shell,” the cushions “*may also be coupled to the outer surface [] of the inner shell...*” EX-1001, 7:59-64.

199. Thus, modifying Liu’s cushioning bellows to be engageably fixed within holes formed in the outer shell would have simply involved choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success.

200. Accordingly, Liu renders Claim 7 obvious.

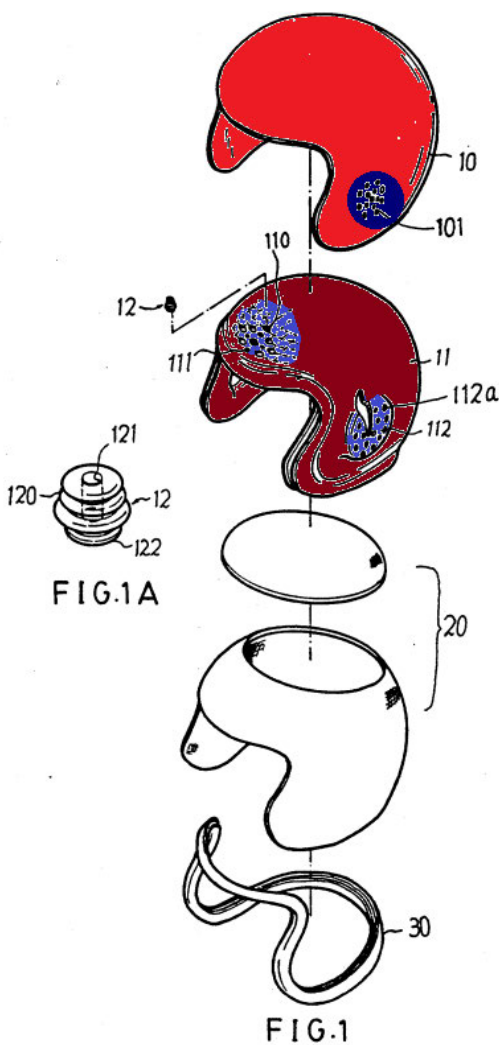
ii. Claim 10

201. Liu discloses that the number of inner vents may differ from the number of outer vents.

202. As discussed at [7a] and [7b], *supra*, Liu discloses a plurality of both inner and outer shell vents. EX-1011, 2:3-7, 2:22-32, 2:61-66, 3:11-15, 4:6-16, 4:18-22, Claims 1-3.

203. Liu does not require or even disclose the same number of inner and outer shell vents. A POSITA would have understood that these descriptions disclose that the number of inner and outer vents need not be equal and can, of course, differ.

204. Further, Liu's Fig. 1 (annotated below) shows a greater number of **inner vents 111 and 112a** on **inner shell 11** than **outer vents 101** on **outer shell 10**.



205. From these descriptions, and given that it was well-known for the modular helmets to have differing number of inner and outer vents (EX-1006, Figs. 1-3, 7-12, ¶18, ¶42, ¶¶50-51), a POSITA would have understood or at least found obvious that the number of inner and outer vents in Liu's helmet need not be equal and can, of course, differ.

206. Accordingly, Liu renders Claim 10 obvious.

XI. ADDITIONAL REMARKS/CONCLUSION

207. I currently hold the opinions set expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

208. I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patents issued thereon.

Dated: 11/15/2021

By: Mark F. Housley