

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Steven T. 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

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**PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT
NO. 10,617,167 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42**

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PETITIONER’S EXHIBIT LIST

EX-1001	U.S. Patent No. 10,617,167 to Baldi (“the ’167 patent”)
EX-1002	Prosecution History of the ’167 Patent (“the Prosecution History”)
EX-1003	Declaration of Dr. Mark Horstemeyer
EX-1004	Curriculum Vitae of Dr. Mark Horstemeyer
EX-1005	U.S. Patent No. 2,625,683 to Roth (“Roth”)
EX-1006	U.S. Application Publication No. 2012/0017358 to Princip (“Princip”)
EX-1007	RESERVED
EX-1008	Certified English Translation of Japanese Patent Application Publication No. 2005-273119 to Akamatsu (“Akamatsu”)
EX-1009	U.S. Patent Application Publication No. US 2006/0005291 to Bedford (“Bedford”)
EX-1010	U.S. Patent No. 9,408,423 to Guerra (“Guerra”)
EX-1011	U.S. Patent No. 5,204,998 to Liu (“Liu”)
EX-1012	U.S. Patent No. 5,231,703 to Garneau (“Garneau”)
EX-1013	U.S. Patent No. 5,327,585 to Karlan (“Karlan”)
EX-1014	U.S. Patent No. 5,539,934 to Ponder (“Ponder”)
EX-1015	U.S. Patent No. 10,729,203 to Krishnan (“Krishnan”)

- EX-1016 “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-1017 Email correspondence between Petitioner’s and Patent Owner’s
Counsel (between November 9 and 11, 2021)
- EX-1018 Scheduling Order (Dkt. 21) in *Apalone, Inc. v. Schutt Sports,
LLC*, Case No. 3:21-cv-03186 (C.D. Ill.)
- EX-1019 Docket Listing, *Geissele Automatics, LLC v. Lewis Machine
and Tool Co.*, Case No. 4:19cv4030 (C.D. Ill.)
- EX-1020 Nov. 15, 2021 Correspondence from Petitioner’s Counsel to
Patent Owner’s Counsel, Regarding Stipulation for ’167 Patent

LISTING OF CHALLENGED CLAIMS (CLAIMS 1-11, 18)

Claim 1	
1[pre]	A modular helmet comprising:
1[a]	an inner shell adapted to be positioned onto a user's head;
1[b]	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
1[c]	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
1[d]	a plurality of cushions that are coupled to the outer shell and positioned within the climatic zone.
Claim 2	
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.
Claim 3	
3[pre]	A modular helmet comprising:
3[a]	an inner shell adapted to be positioned onto a user's head;
3[b]	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
3[c]	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.

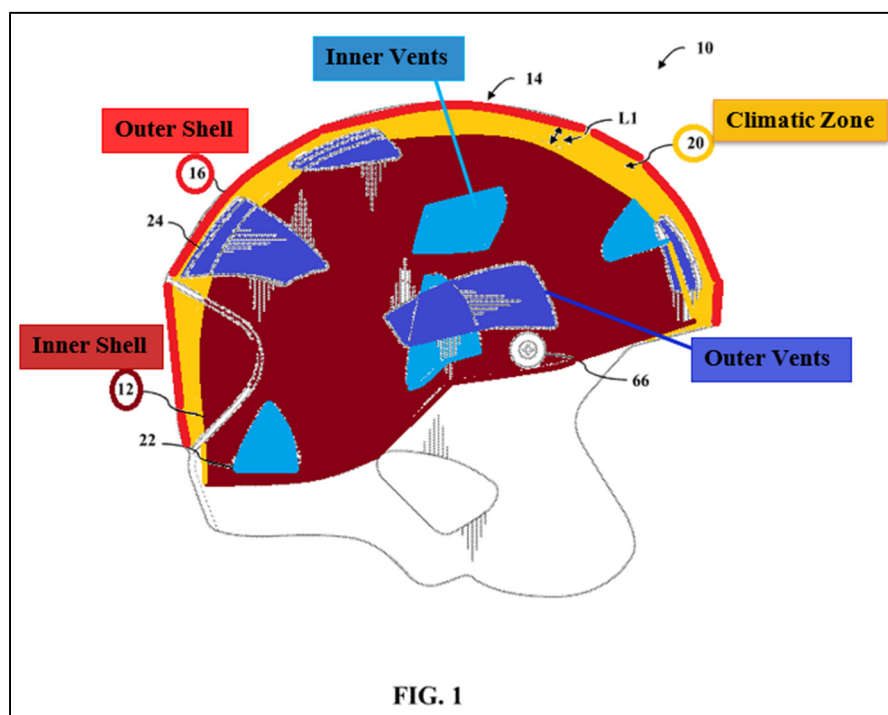
Claim 4	
4	The modular helmet of claim 3, wherein the outer shell includes a plurality of outer vents configured to couple the climatic zone in flow communication with ambient air.
Claim 5	
5	The modular helmet of claim 4, wherein at least one inner vent is orientated coaxially with a corresponding outer vent.
Claim 6	
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.
Claim 7	
7[pre]	A modular helmet comprising:
7[a]	an inner shell adapted to be positioned onto a user's head, the inner shell includes a plurality of inner vents;
7[b]	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
7[c]	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.
Claim 8	
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.
Claim 9	

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.
Claim 10	
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.
Claim 11	
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.
Claim 18	
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.

I. INTRODUCTION

Certor Sports, LLC (“Certor”) and Schutt Sports, LLC (“Schutt”) (collectively “Petitioner”) petition for Inter Partes Review (“IPR”) of claims 1-11 and 18 (“Challenged Claims”) of U.S. Patent 10,617,167 (“’167 Patent”). A reasonable likelihood exists that Petitioner will prevail on at least one Challenged Claim.

The ’167 Patent is directed to a helmet that protects the wearer from both impact- and temperature-related injuries. EX-1001, 1:15-20, 3:54-58, 3:46-49. To that end, the ’167 Patent describes a modular helmet (*e.g.*, annotated Figure 1, below) including an **outer shell** with **vents** and an **inner shell** with **vents**, which shells are radially spaced apart to create a “**climatic zone**” between them. This climatic zone can include **cushioning** and/or **cooling packs**. EX-1001, Claims 1, 3. The cushioning dampens impact by absorbing force/energy (*id.*, 3:54-58), while the ventilation and optional cooling packs keep the wearer’s head cool. *Id.*, 3:46-49, 4:7-33, 5:20-52.



However, these are conventional helmet features known in the art for decades. EX-1003, ¶¶15-22. For example, Roth (*see* Grounds 1A-1B) stated that this modular helmet arrangement—radially-spaced inner and outer shells with cushioning between—was “a new concept” *in 1947*, almost 70 years before the ’167 Patent made the same claim. EX-1005, 1:51-2:44. Such modular helmets have since become well known, being deployed in Princip and Liu (*see* Grounds 2-3, 5) among several other helmet references. EX-1010, 1:16-19 (in 2014, recognizing that “[p]rior art helmets have generally comprised a single layer rigidly secured to the head of a user, or *multiple layers including absorbing elements there between.*”¹);

¹ Emphasis added throughout unless otherwise noted.

see EX-1011, Figs. 1-2, 1:30-42, 1:56-2:2, Claim 1 (in 1992, describing, radially-spaced inner and outer shells with cushioning there between); EX-1012, Abstract, Figs. 3-7, 1:64-2:9, 2:59-62 (same, 1992); EX-1003, ¶¶15-22.

Inner and outer shell vents have likewise long been conventional helmet features. EX-1003, ¶¶15-22. For example, Roth disclosed inner and outer shell vents “for effectively ventilating [a helmet] interior to prevent overheating” of the wearer’s head. EX-1005, 1:47-50, 7:3-15, 8:11-42, Claims 7-8, Figs. 5-8, 12. Again, in the decades since Roth, such vents have become commonplace in helmets, such as those, *e.g.*, described in Liu and Princip. *See* EX-1011, Fig. 1, 2:3-37, Claims 1-3 (providing, in 1992, inner and outer vents for helmet ventilation); EX-1012, 1:67-2:9, 3:63-4:13, Figs. 1-11 (same, 1992); EX-1009, ¶27, ¶41, ¶68 (same, 2003); EX-1010, 4:25-26 (same, 2014); EX-1006, ¶42, Figs. 1-3, Fig. 7, ¶¶50-51, Fig. 12, ¶¶55-57, Claim 18; EX-1003, ¶¶15-22.

Cooling packs have likewise long been conventional helmet features for cooling wearer’s heads. EX-1003, ¶¶15-22. For example, in 1993, Karlan described a cooling pack that was “readily adaptable for use in hats, caps and helmets...” EX-1013, 2:12-17, 1:24-28; EX-1009, ¶¶37-39, ¶¶52-53, ¶57, ¶64, Claims 19-21, Figs. 1-4 (same, 2003); EX-1008, Fig. 2, Abstract, Claims 1-4, ¶1, ¶¶16-17 (same, 2005). And in 1995, 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; *see* EX-1003, ¶¶15-22.

Thus, before November 22, 2016 (the earliest possible priority date for the ’167 Patent), these features—and the claimed combinations therefore—were long-known solutions to well-known issues: balancing cooling with impact protection. EX-1003, ¶¶15-22. These Challenged Claims are anticipated and/or rendered obvious by prior art references that pre-date the ’167 Patent by decades and which were not considered during prosecution as to the Challenged Claims. Petitioner respectfully submits that an IPR should be instituted and the Challenged Claims canceled as unpatentable.

II. IPR REQUIREMENTS

A. Standing

Petitioner certifies that the ’167 Patent is available for IPR. This Petition is being filed within one year of a complaint’s service against Certor and Schutt in *Apalone Inc. v. Schutt Sports LLC*, CDIL-3-21-cv-03186. Petitioner is not barred/estopped from requesting this review.

B. Challenge and Relief Requested

Petitioner requests an IPR of the Challenged Claims on the grounds set forth in the table below. Additional explanation/support for each ground is set forth in Dr. Horstemeyer’s declaration (EX-1003).

Ground	'167 Patent Claims	Basis
1A 1B	7, 10	§102: Roth §103: Roth
2	7, 10, 11	§102: Princip
3	1-6, 8-9, 18	§103: Princip-Akamatsu
4	3, 4, 18	§102: Bedford
5	7, 10	§103: Liu

Each reference pre-dates provisional application 62/425,397, filed November 22, 2016 (“Critical Date”), which is the earliest application from which the ’167 Patent claims priority.²

Reference	Date
Roth	01/20/1953 (issued)
Princip	01/26/2012 (published)
Bedford	10/31/2003 (filed) 01/12/2006 (published)
Akamatsu	10/06/2005 (published)
Liu	05/20/1992 (filed) 04/27/1993 (issued)

C. Claim Construction

Because the evidence below and the prior art’s description of the claimed elements are similar to that of the ’167 Patent’s specification, no claim constructions

² Petitioner takes no position on the ’167 Patent’s entitlement to this priority date.

are necessary “to resolve [a] controversy.” *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011).

However, if the Board construes “attachment mechanism” as a means-plus-function term, then its function is to removably couple the inner and outer shells, and the disclosed structure is: “[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; EX-1003, ¶¶34-35. This alternative construction does not change the analysis of the prior art at issue here, because the prior art discloses an attachment mechanism that accomplishes the same function, and uses the same or equivalent structure disclosed in the ’167 Patent. *See* §§V.B.2(c), V.C.3(h)-(i), V.D.2(c); EX-1003, ¶¶34-35

Petitioner is pursuing prior art-based invalidity grounds in this IPR and is not waiving arguments concerning invalidity grounds (*e.g.*, §112) that cannot be raised.

III. ’167 PATENT

A. Overview

Generally, the ’167 Patent relates to a modular helmet with multiple modules, including at least an **inner shell** and **outer shell**. EX-1001, Abstract. Both the inner and outer shells may be “made out of a flexible material, a semi rigid material, or a rigid material.” EX-1001, 4:34-5:19; EX-1003, ¶¶23-30.

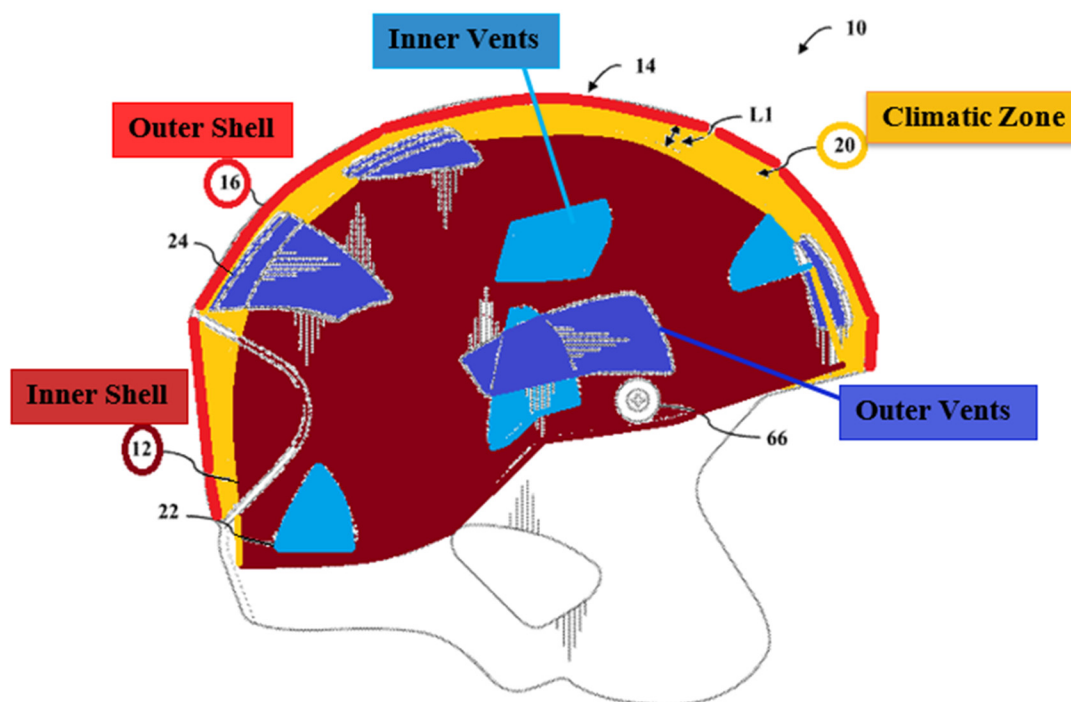


FIG. 1

“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... For example, FIGS. 1 and 2 show the [helmet] *without any additional components* positioned within climatic zone 20 ... *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 ... 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).

But the climatic zone is not always empty. It may 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 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 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.

The inner and outer shells may have a “**plurality of inner vents**” and a “**plurality of outer vents**,” respectively. *Id.*, 2:4-9. 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, 5:20-6-28.

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 “a rigid configuration, a flexible

configuration, or a combination of both.” *Id.*, 9:6-13.

B. Relevant Prosecution History

The only substantive Office Action (EX-1002, 177-183): (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 Roth (EX-1005), with claims 15-20 objected to as depending from rejected claim 13. EX-1002, 179-181; EX-1003, ¶¶31-33. The examiner did not apply Zebur’s teachings to the fastening assembly claims or Roth’s teachings to the modular helmet claims. *Id.* 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; EX-1003, ¶33.

IV. LEVEL OF ORDINARY SKILL IN THE ART

A POSITA as of the ’167 Patent’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. EX-1003, ¶¶13-14. Superior education could compensate for a deficiency in work experience, and vice-versa. *Id.*

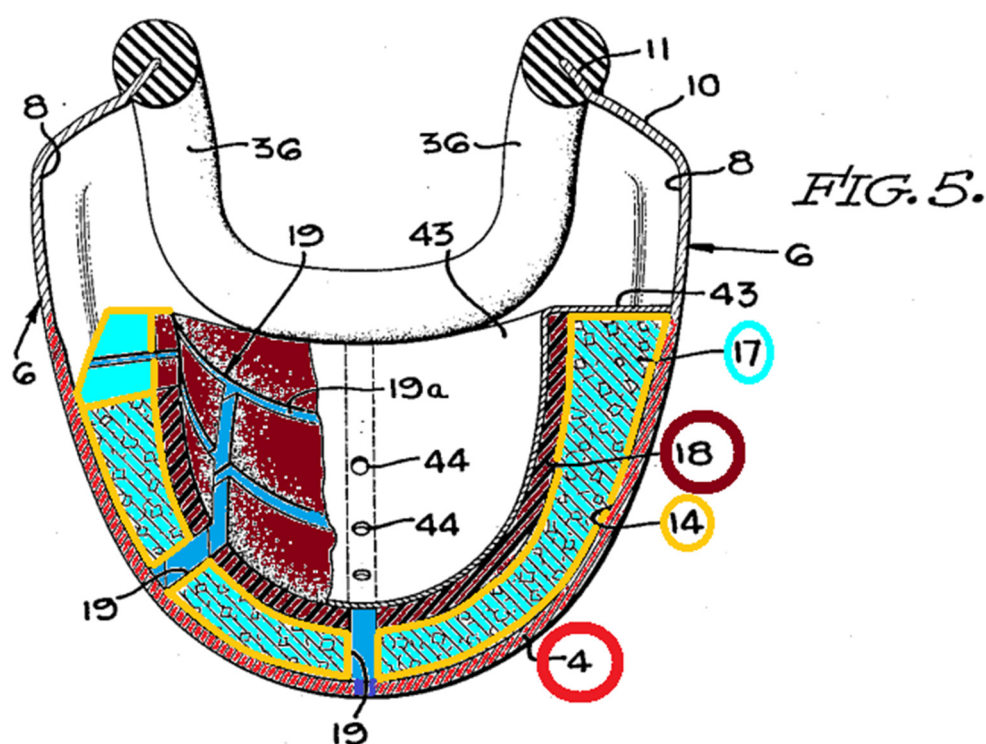
V. APPLYING PRIOR ART TO CHALLENGED CLAIMS

A. Ground 1A: Roth Anticipates Claims 7, 10; Ground 1B: Roth Renders Obvious Claims 7, 10

1. Roth

Roth, titled “Crash Helmet,” was filed in 1947—almost 70 years before the ’167 Patent’s filing. Like the ’167 Patent, Roth describes a modular helmet that protects a wearer’s head by providing a padding layer (“energy absorbing layer”) between two shells (EX-1005, 1:1-5, 2:3-44) and “effectively ventilat[es] the interior to prevent overheating...when wearing the helmet.” EX-1005, 1:46-50; EX-1003, ¶36.

In particular, Roth’s “helmet” 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.” EX-1005, 1:51-55; EX-1003, ¶37.



As shown, the outer shell is **spaced a distance radially outward** from the inner shell (EX-1005, Figs. 3-6, 5:44-56) and the energy absorbing layer is placed in this space 14. EX-1005, Figs. 3-6, 1:51-55, 5:44-58; EX-1003, ¶38.

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; EX-1003, ¶39. Roth's energy absorbing layer can be a "thick protective wall" created by combining "small pieces

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.

of energy absorbent material” (*i.e.*, cushioning material) with a solidifying “binder” and molding this “cementitious material” along the outer shell contour 4. EX-1005, 6:8-74; EX-1003, ¶¶__.

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. EX-1005, Figs. 3-8, 13, Claim 2, 6:7-36, 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.”); EX-1003, ¶40. These cushions can be **coupled to** the interior of the outer shell “by any convenient means such as a suitable cement....” EX-1005, 6:13-21; EX-1003, ¶40.

Roth’s helmet includes an inner shell in the form of **inner layer 18 made of resilient material**, which is applied to the energy absorbing layer 17. EX-1005, 1:51-55 (“The helmet ... comprises a rigid outer shell, a layer just within the outer shell, of energy-absorbing material; and ... 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), ... of any resilient or cushioning material”), Claim

1, 5:44-56, Figs. 3-5; EX-1003, ¶41. The inner layer 18 is made of resilient material and is formed along the wall of inner shell 3 (used to create space 14). *Id.*

Roth describes that the inner layer may have a plurality of **inner layer vents**. EX-1005, 7:3-15 (“For ventilation purposes, to keep the interior of the helmet cool, ... , 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; EX-1003, ¶42.

Roth’s outer shell has a plurality of **outer shell vents**. EX-1003, ¶43. 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.**”); EX-1003, ¶43.

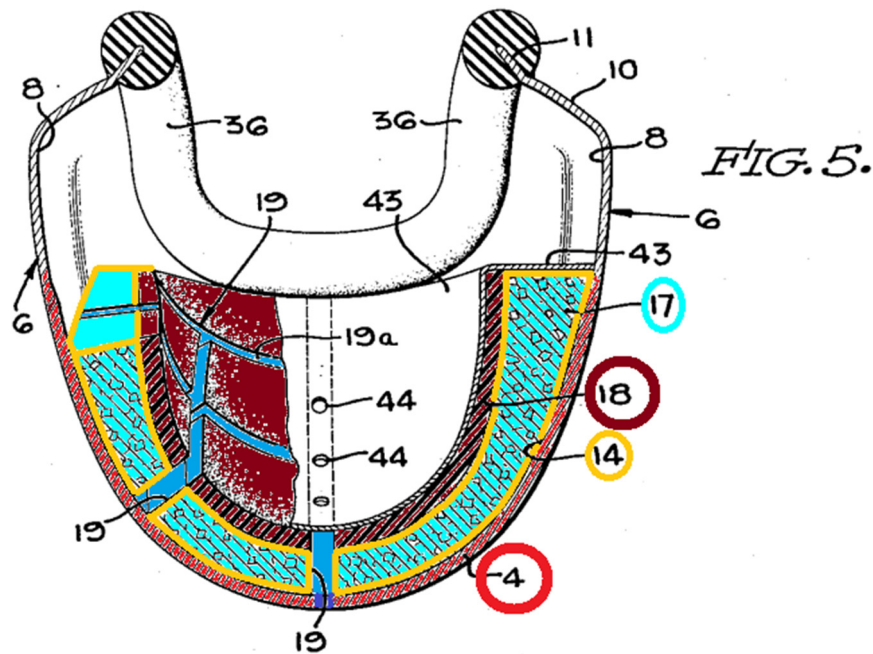
Roth also discloses another vent opening in the outer shell, to which a ventilating hose can be connected for supplying cool air to the helmet interior. EX-1005, 3:68-72; EX-1003, ¶44.

2. Analysis

(a) Claim 7

[7pre]

Roth describes a modular helmet. Like the '167 Patent, Roth's "helmet" includes multiple modules, including "a rigid **outer shell**," "a layer just within the outer shell, of **energy-absorbing material**," and "**a second, or inner layer of resilient material**." EX-1005, 1:51-55, 4:49-56; *see* EX-1001, 1:58-2:23 ("The modular helmet includes an inner shell adapted to be positioned onto a user's head, an outer shell, and a cushion assembly."); EX-1003, ¶45.



[7a]

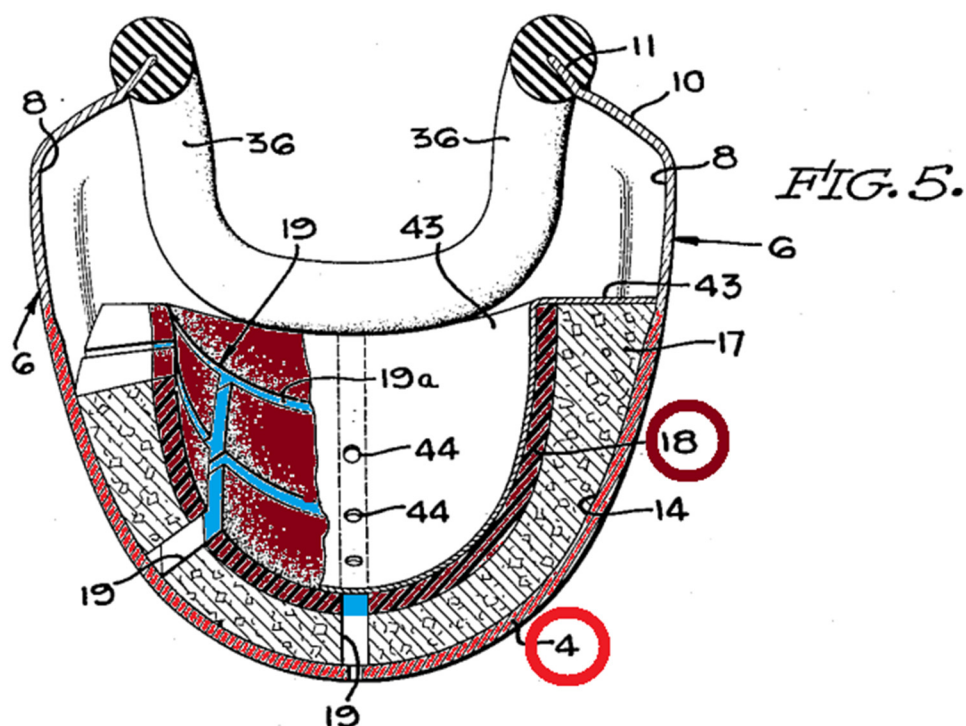
Roth discloses an **inner shell**. Like the '167 Patent's "inner shell"

descriptions, Roth's **inner layer 18** 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 ..., 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"), 5:44-56, Figs. 3, 5-6; EX-1003, ¶46. **Inner layer 18** is made of resilient material and is formed along the wall of inner shell 3 (used to create space 14). *See* EX-1005, 5:44-56, Claim 1, Figs. 3, 5; EX-1003, ¶46.

Roth's inner shell is **adapted to be positioned onto a user's head**. *See* EX-1005, Figs. 3-6, 8 (showing inner layer inside cavity conforming to wearer's head), 1:51-55, 4:49-56, 1:35-36, 4:20-25, 5:44-56, 6:69-75, Claim 1; EX-1003, ¶47.

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**. EX-1005, 7:3-15 ("For ventilation purposes, to keep the interior of the helmet cool, and to provide *channels* ..., 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; EX-1003, ¶¶48-50.



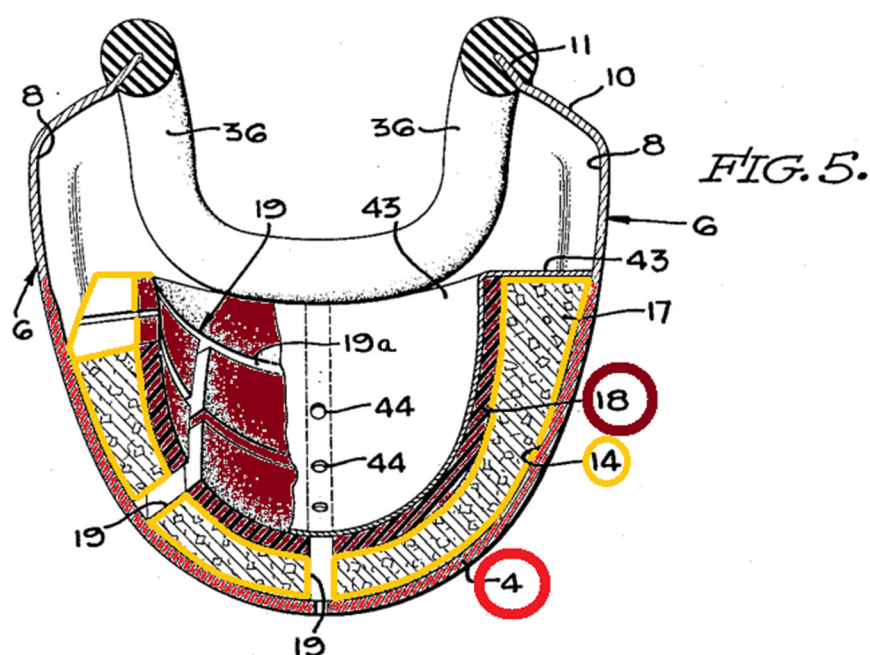
[7b]

Roth’s helmet includes an **outer shell**. EX-1005, 1:51-55 (“The helmet of the present invention comprises *a rigid outer shell*”), 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 “rigid material”); EX-1003, ¶51.

Roth’s outer shell 4 is attached to the inner layer 18 (inner shell) in a couple

of ways, each independently showing the **outer shell is coupled to the inner shell**. EX-1003, ¶¶52-54. *First*, 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 inner and outer shell walls spaced apart. EX-1005, 5:45-56; EX-1003, ¶¶52-54. *Second*, Roth's inner layer 18 (inner shell) is coupled to the cushioning layer (protective wall 17) via "cementing" or another suitable manner, and the cushioning layer in turn is cemented or otherwise attached to the outer layer/shell 4. EX-1005, 6:13-7:2; *see* Figs. 2-3; EX-1003, ¶¶52-54.

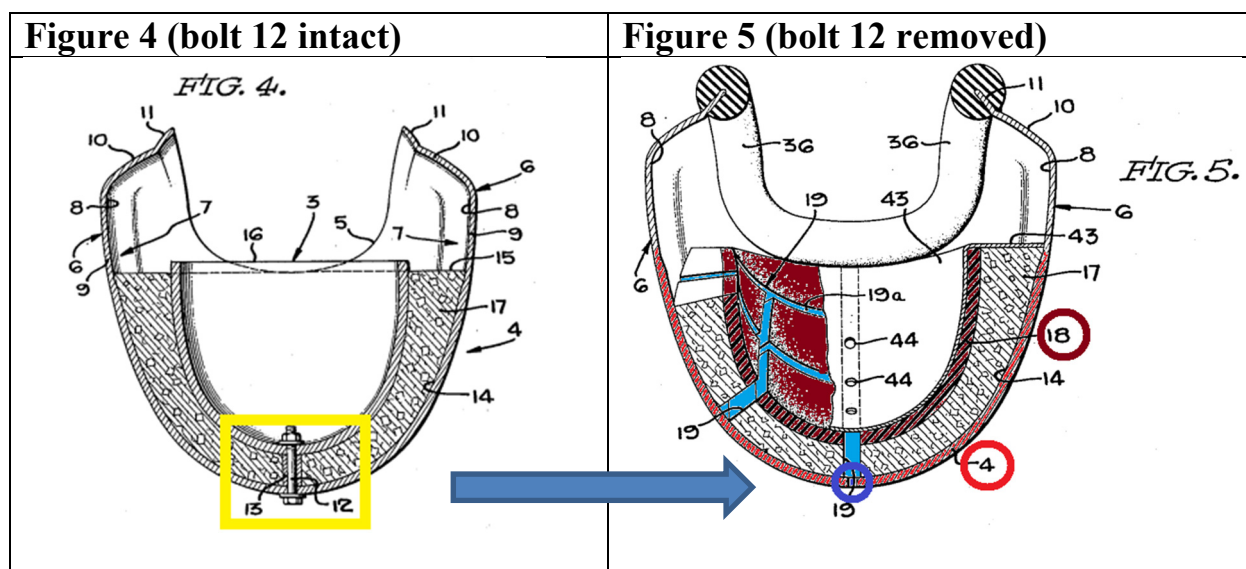
The **outer shell** is spaced a distance radially from the **inner shell** to define **a climatic zone between the two**. *See* EX-1005, 5:44-56, Figs. 3-6 (showing/describing outer shell 4 spaced radially from inner shell 3/inner layer 18 to create space 14 in between); *see* EX-1001, 6:6-7 ("the climatic zone 20 is defined between the inner shell and the outer shell."), Abstract, Figs. 1-2, 18-26; 4:7-20, 9:58-62; EX-1003, ¶55.



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.

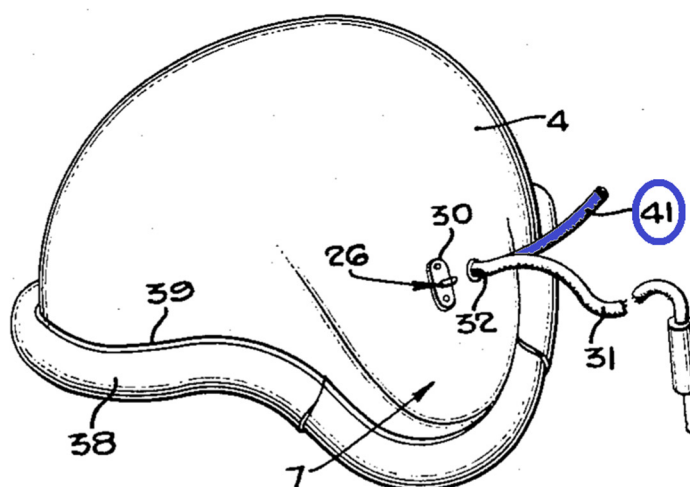
As shown below, the outer and inner shells are preferably separated as shown in Figures 3-4 “by means of *one or more* screws or bolts 12” such that “the walls of the two shells [are] spaced apart a desired amount to provide a wall space, or molding space.” EX-1005, 5:45-56; EX-1003, ¶¶56-60. Thus, while Figure 4 (reproduced below) shows one such bolt/screw combination, a POSITA would have understood that Roth describes using more such combinations. EX-1005, 5:45-56; EX-1003, ¶¶56-60. 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 (“[T]he **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.*”); EX-1003, ¶¶56-60. A POSITA would have thus understood that these outer shell vent openings couple the Roth’s climatic zone in flow communication with ambient air. EX-1003, ¶¶56-60.



Roth also describes an additional vent opening in the outer shell with a “connection for [a] ventilating hose” (shown in annotated FIG. 12 below) through which cool air “is supplied to the ventilating ducts” in the helmet interior . EX-1005, 3:68-72, 8:11-17; EX-1003, ¶¶56-60.

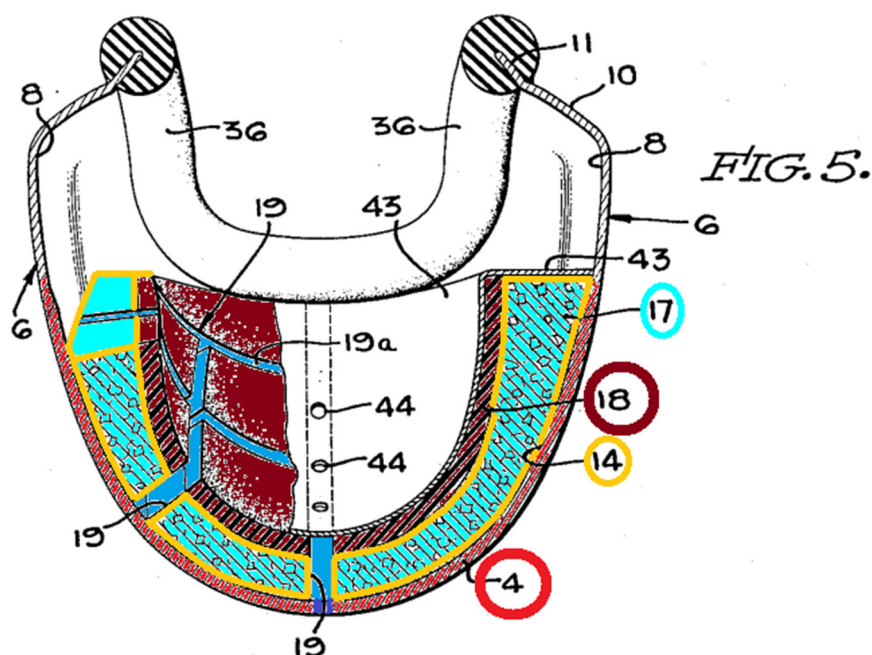
FIG. 12.



A POSITA would have understood or found obvious that this vent opening couples the climatic zone in flow communication with ambient air when it receives ambient air (*e.g.*, through the hose 41 or otherwise) that 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, Fig. 12; EX-1003, ¶¶56-60.

[7c]

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" placed/positioned in the climatic zone (*see* [7b], *supra*; incorporated here), *e.g.*, in the space between the **inner liner 18** and the **outer shell 4**.

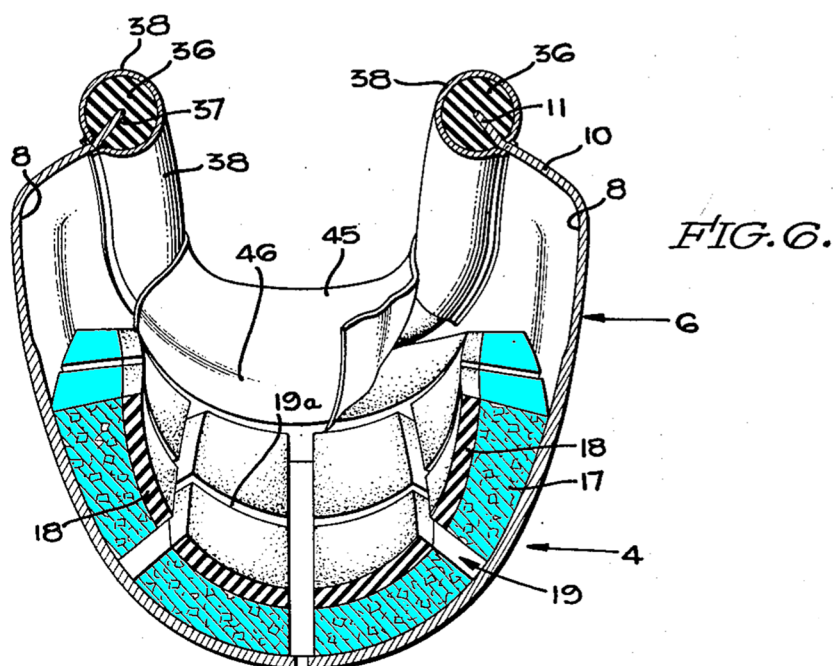


EX-1005, Fig. 5 (annotated); 1:51-55, Claim 16, 5:57-56, 2:10-30; EX-1003, ¶61.

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. EX-1001, 7:59-8:41; EX-1003, ¶62. 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; EX-1003, ¶62.

Roth's energy absorbing layer 17 includes a **plurality of cushions** that are created by dividing this layer 17 into separate pieces/blocks, thereby defining ventilation channels between these pieces/blocks. 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 for channels provided for ventilation.”), 7:3-15 (spacing apart “large blocks of energy-absorbent material” to “form a ventilating channel system”; for “small dice of energy-absorbent material in a binder,” cutting “grooves 19 through the inner layer of rubber and the protective wall 17”), *see* Figs. 3-8; EX-1003, ¶63. Annotated Figure 6, below, shows the energy absorbing layer 17 separated into separate cushions via the ventilation grooves 19. EX-1003, ¶63.



These cushions are **coupled to the outer shell** by any “convenient” attachment means, *e.g.*, “a suitable cement.” EX-1005, 6:13-21; EX-1003, ¶64.

Accordingly, Roth anticipates or renders obvious Claim 7. EX-1003, ¶65.

(b) Claim 10

In Roth, the number of inner vents (plurality of ventilation channels/grooves) differs from the number of outer vents (vents created by bolt/screw, vent opening in the outer shell with hose connection). *See* [7a]-[7b], *supra* (incorporated here); EX-1005, 7:3-15, 8:37-42, Figs. 3-7, EX-1003, ¶66. Roth does not require or even disclose the same number of inner layer and outer shell vents. Thus, a POSITA would have understood from Roth's disclosure that the number of inner and outer vents need not be equal and can, of course, differ. EX-1003, ¶66.

Alternatively, a POSITA would have found it obvious to modify Roth's helmet, to include an unequal number of inner and outer vents. EX-1003, ¶67. Roth aims "to provide a helmet" that "effectively ventilat[es] its interior to prevent overheating." EX-1005, 1:46-50. Roth's helmet achieves its ventilation goals by providing the inner layer and outer shell vents (per [7a]-[7b], *supra*); however, Roth does not require the helmet to have the same number of inner and outer vents. *Id.*, 7:3-15, Figs. 3-7, 5:44-55, 8:37-42; EX-1003, ¶67. And, before the Critical Date, it was well known for modular helmets—like those in Roth—to include an unequal number of inner and outer vents. EX-1012, 4:52-54; EX-1006, Figs. 1, 3, 11, 12; EX-1011, Fig. 1, 2:3-7, 2:33-37, Claims 1-3; EX-1003, ¶67. A POSITA would have thus found it obvious that Roth's helmet could implement various configurations of

inner and outer vents, including a configuration with unequal number of inner and outer vents. EX-1003, ¶67.

Accordingly, Roth anticipates or renders obvious claim 10. EX-1003, ¶68.

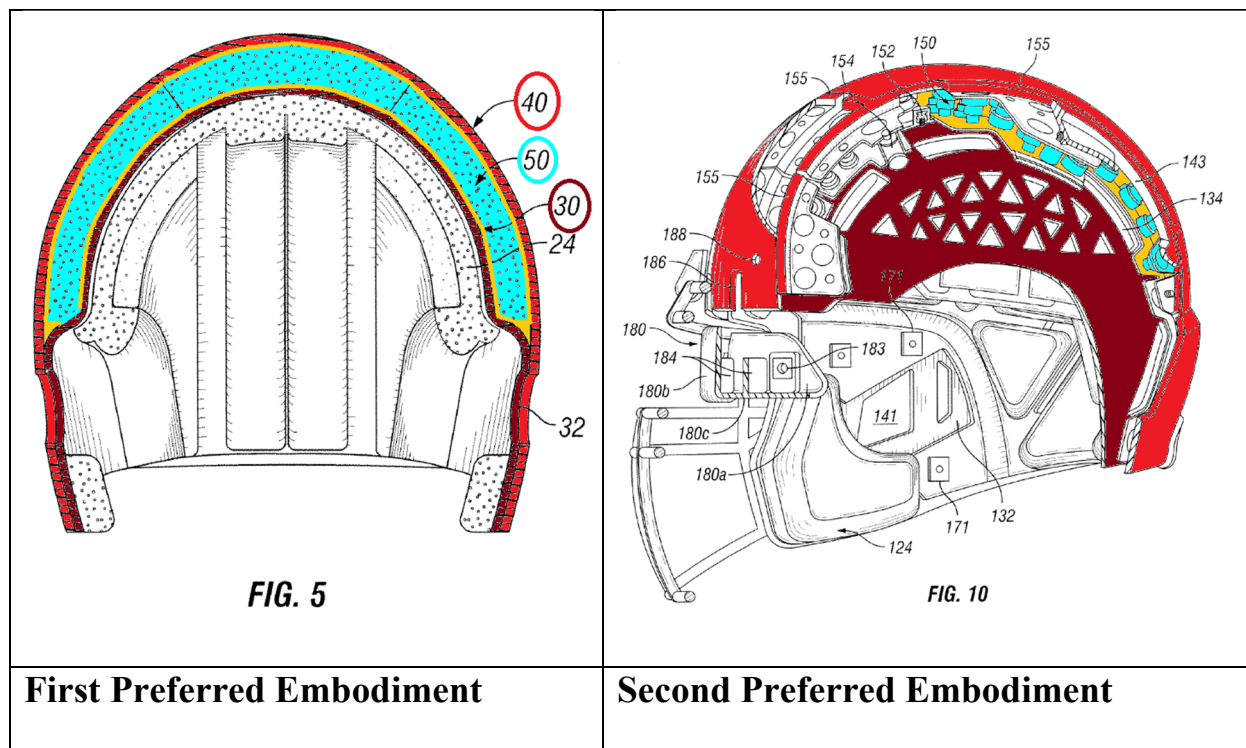
B. Ground 2: Princip Anticipates Claims 7, 10, 11

1. Princip

Like the '167 Patent, Princip describes a “protective helmet having an **inner shell** and an **outer shell** assembly,” which are removably attached to one another. EX-1006, Abstract, ¶37, Fig. 6, ¶51, ¶¶56-58; EX-1003, ¶69.

Princip discloses two preferred embodiments.⁴ These embodiments generally share the primary features described herein. *See* EX-1006, ¶¶48-49; EX-1003, ¶70.

⁴ *See* EX-1006, Figs. 1-6, ¶¶37-46 (first preferred embodiment); *see id.*, Figs. 8-15, ¶¶48-57 (second preferred embodiment).



As shown, both helmet embodiments include inner and outer shells that are **radially spaced apart** with a **padding layer in between**. EX-1006, Abstract, ¶32, ¶35, ¶49, ¶¶51-52; EX-1003, ¶71. Princip calls this padding layer “external energy absorbing layer” or “external padding layer.” *Id.* This layer’s padding can be arranged and customized to suit the wearer’s needs. EX-1006, ¶53, ¶51, ¶35; EX-1003, ¶71. For example, external energy absorbing layer (EAL) 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.” EX-1006, ¶51, ¶35. Still further, in a “multi-panel outer shell assembly,” the EAL may comprise “multiple individual energy

absorbing layer segments corresponding substantially to the shape and size of the multiple shell panels 42.” *Id.*, ¶41.

The external padding layer is **coupled to** the outer shell. EX-1006, ¶35 (“The padding layer 50 also includes one or more outer fastening points 54 for affixing” it to “the outer shell assembly 40”), ¶37, ¶51 (“The external padding layer 150 preferably include a plurality of inner shell attachment points 152 and outer shell attachment points 154.”), ¶¶56-58; EX-1003, ¶72.

Princip further describes ventilation through the “plurality of air vents,” which “allow for maximum air flow and to circulate the inside helmet air through the air vents.” EX-1006, ¶42; EX-1003, ¶73. The **inner and outer shells have vents for ventilation**. EX-1006, ¶42 (“[H]elmet 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, ¶¶50-52 (“The inner shell 130 has a plurality of vent openings 134 therethrough for purposes of air ventilation.... 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.”), Fig. 12, ¶¶54-55 (outer shell likewise “includes vent openings 143 that align with the larger vent openings 134 of the inner shell 130”); EX-1003, ¶73.

2. Analysis

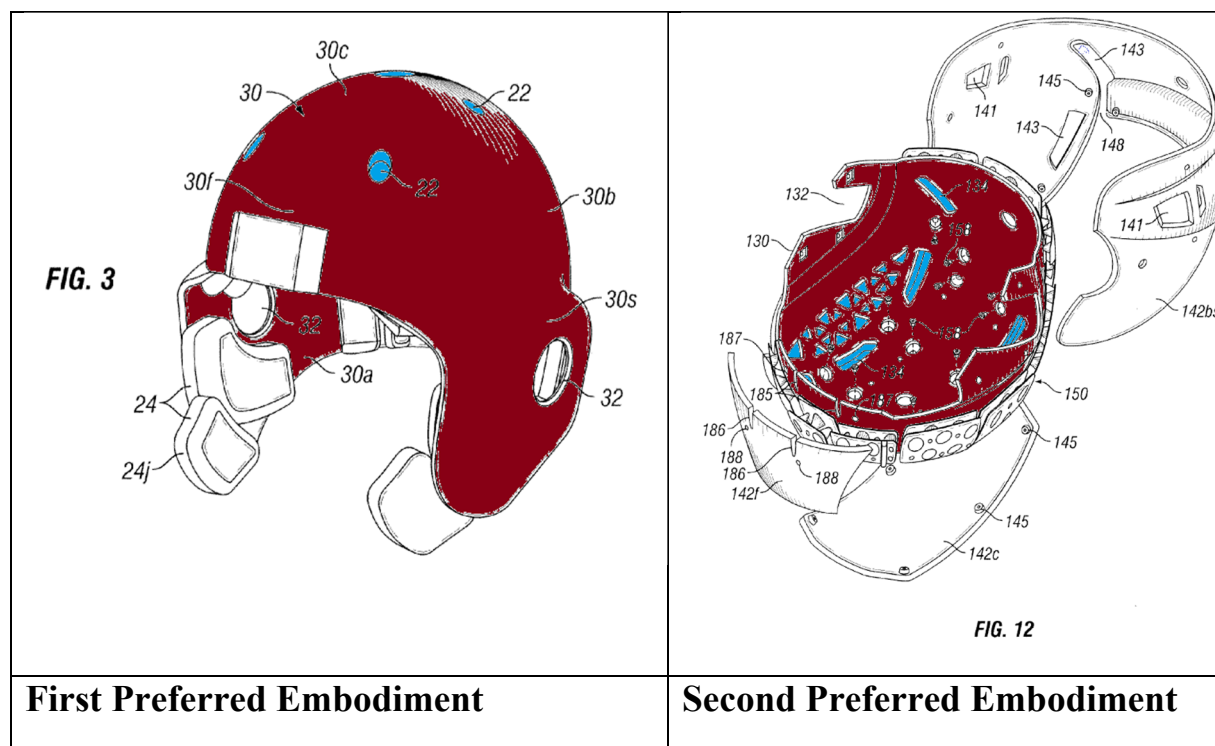
(a) Claim 7

[7pre]

Princip describes a modular helmet. EX-1003, ¶74. 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, ¶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, 2:1-4, 1:58-2:23; EX-1003, ¶74.

[7a]

Princip’s protective helmet includes an **inner shell**, which is shown, *e.g.*, in Fig. 3 (helmet 20) and Fig. 12 (helmet 120) below. EX-1006, Abstract (“A protective helmet having an inner shell and an outer shell assembly.”), ¶32, ¶¶49-50; EX-1003, ¶75.

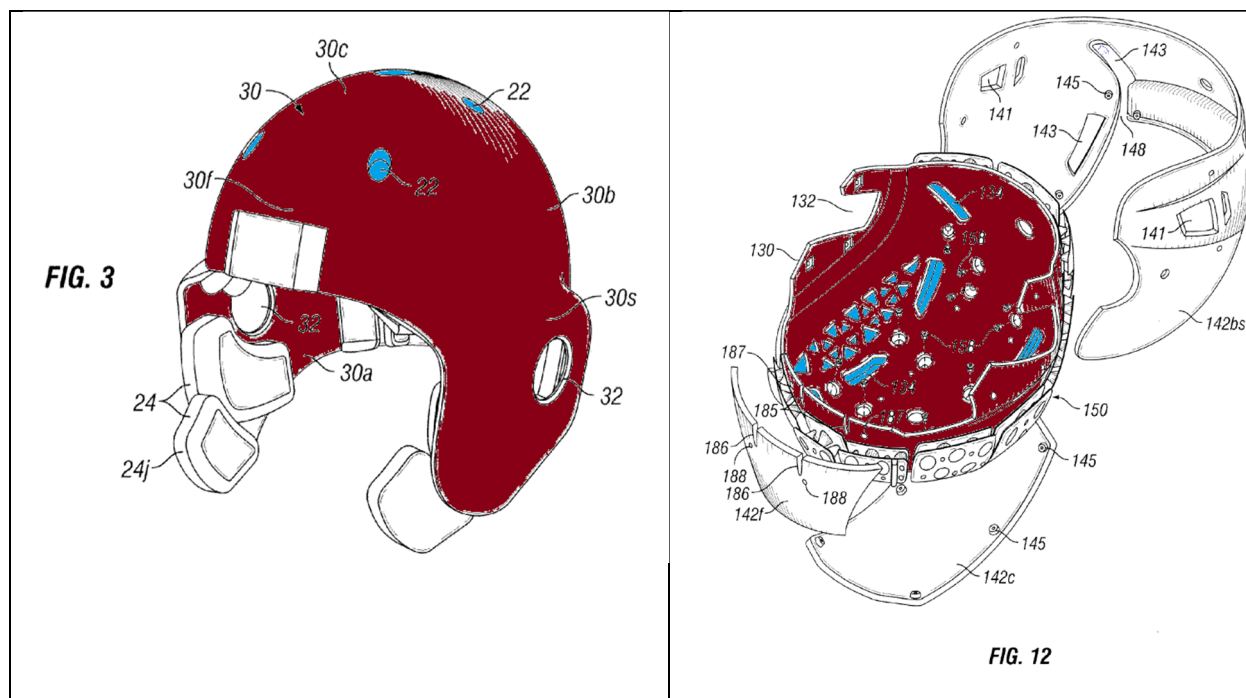


Like the '167 Patent, Princip's inner shell is made of "a rigid material" such as "a rigid plastic such as a polycarbonate, a rigid thermoplastic or a thermosetting resin, a composite fiber or possibly a liquid metal." EX-1006, ¶33; EX-1001, 4:34-45; EX-1003, ¶76.

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 (describing positioning of inner shell and a removable internal padding on a user's head), ¶34 (padding on inner of inner shell is removable); EX-1003, ¶77.

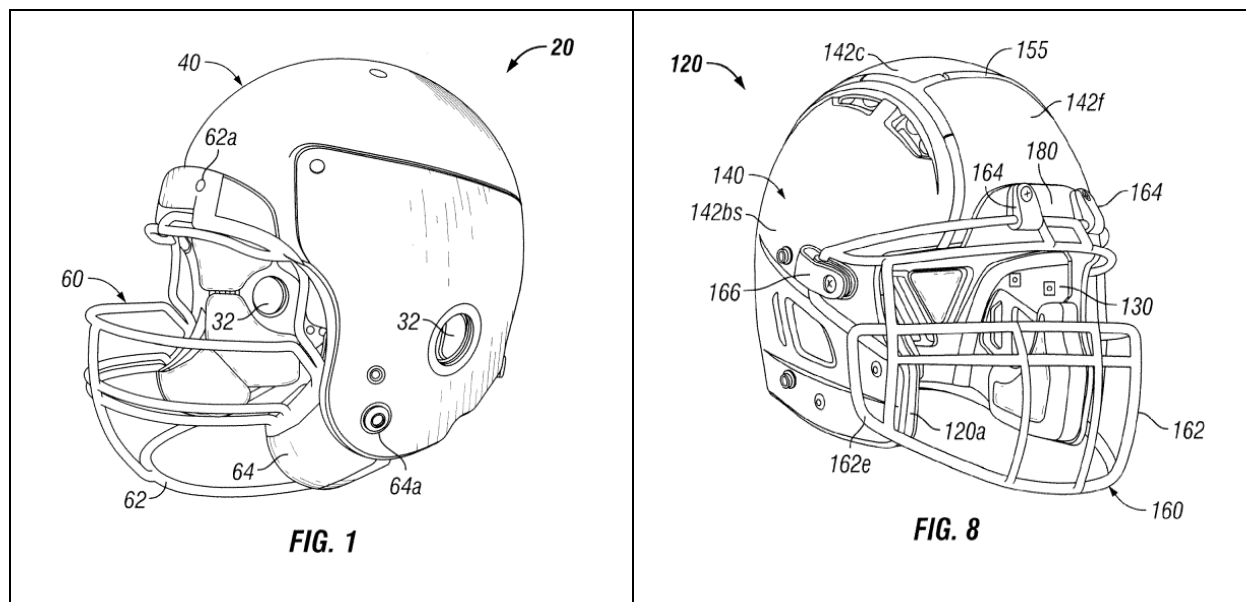
Princip's inner shell includes a **plurality of inner vents**. EX-1003, ¶78. Figure 3 (below, left) shows air vents 22 for ventilation on the inner shell in one embodiment (EX-1006, ¶18, ¶42), and Figure 12 (below, right) shows another

embodiment that similarly includes vent openings 134 on the inner shell 130. EX-1006, ¶¶50-51 (providing openings in padding layers that are aligned with vents to enable ventilation), Figs. 1-3, 7-12; EX-1003, ¶78.



[7b]

Princip's protective helmet includes an **outer shell** called "the outer shell assembly." EX-1006, Abstract, ¶32, ¶¶36-38, ¶49, ¶54-55; EX-1003, ¶¶79-81. The outer shell assembly can include a single shell panel or multiple shell panels (Figs. 1 and 8 below include multiple panels). *See, e.g.*, EX-1006, ¶¶36-39, ¶54, ¶64, Figs. 16-17; EX-1003, ¶¶79-81.

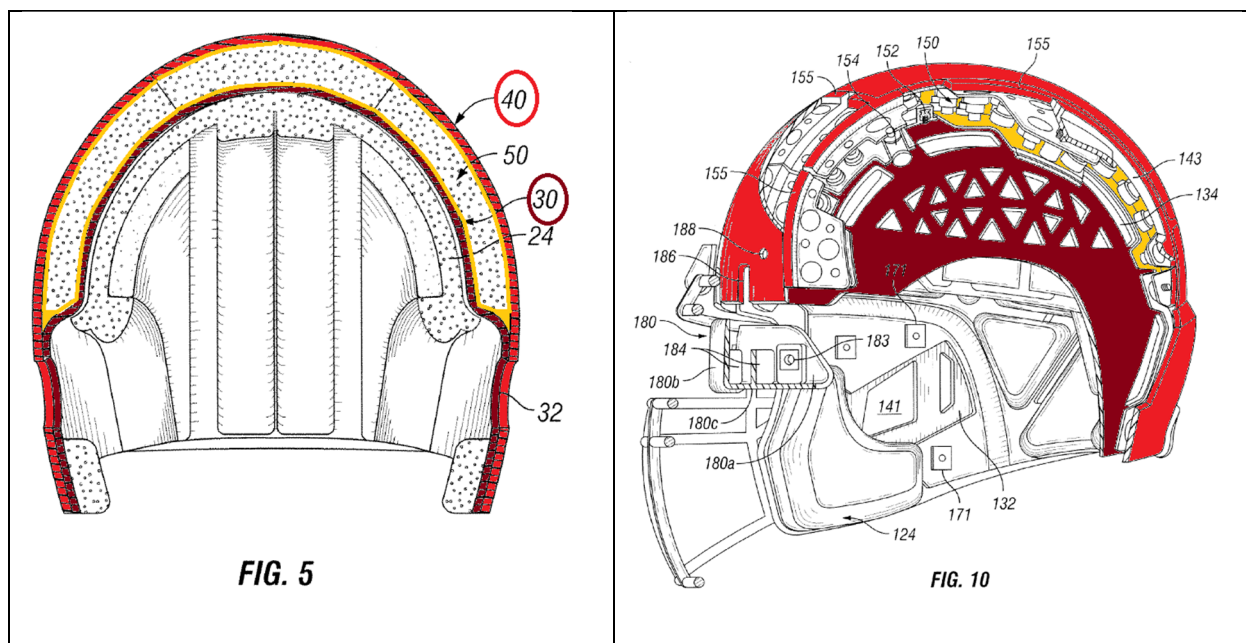


Like the outer shell described in the '167 Patent, Princip's outer shell panel(s) are made of "a rigid material," such as "a rigid plastic such as a polycarbonate, a rigid thermoplastic or a thermosetting resin, a composite fiber or possibly a liquid metal." EX-1006, ¶36; *see* EX-1001, 4:55-65; EX-1003, ¶82.

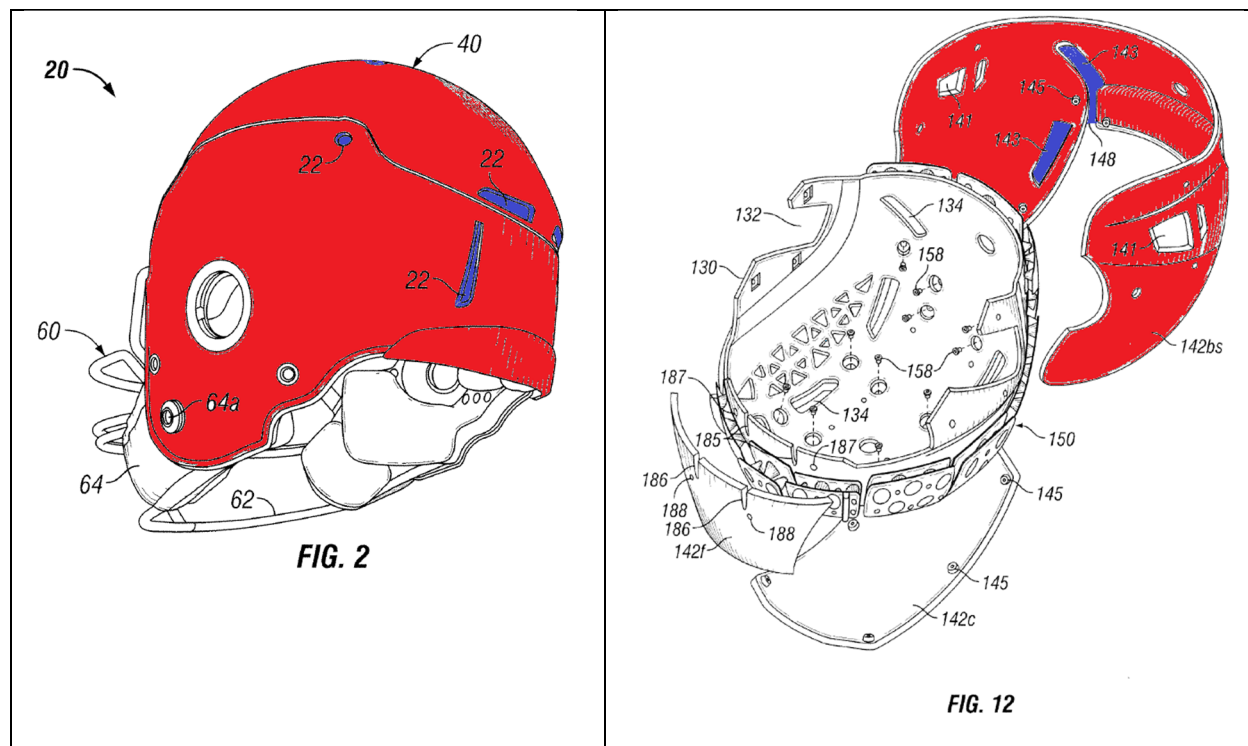
Princip discloses that the outer shell is **coupled to** the inner shell. EX-1003, ¶83. Princip's outer shell assembly can be directly attached to the inner shell "at, or around the ear holes" using, *e.g.*, "screws 170 (FIG. 9) and nuts 171 (FIG. 10)." EX-1006, ¶37, ¶58; FIGS. 5, 8-12, EX-1003, ¶83. Alternatively, the outer shell assembly can be "indirectly attached to the inner shell" via "the external energy absorbing layer." *Id.*

Like the '167 Patent, Princip's **outer shell** is spaced a distance radially outward from the **inner shell** to define **a climatic zone** between the shells. Figures

5 (helmet 20) and 10 (helmet 120), annotated below, show this climatic zone. See EX-1006, Abstract, Figs. 4, 6, 11-13, 15 ¶35, ¶49, ¶¶51-52, Claim 1; EX-1001, 6:6-7; 6:10-27, Abstract, Figs. 1-4, EX-1003, ¶84.



Princip describes that the **outer shell** includes a **plurality of outer vents**. EX-1003, ¶85. Figure 2, below, shows “a plurality of air vents 22” in the outer shell in the first preferred embodiment. EX-1006, ¶42; EX-1003, ¶85. Figure 12, below, shows the second preferred embodiment with a plurality of vent openings 143 in the outer shell. EX-1006, ¶¶54-55; EX-1003, ¶85.



These outer vents are **configured to couple the climatic zone in flow communication with ambient air.** EX-1003, ¶¶86-87. For example, in the first preferred embodiment in Fig. 2, “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; EX-1003, ¶¶86-87. 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, Claim 18, Figs. 8-12; EX-1003, ¶¶86-87. Further, air occupies the residual space between/around this padding

in the climatic zone ([7c], *infra*),⁵ as shown below in annotated Figures 6 and 13, which show two of many possible padding arrangements within Princip's climatic zone.⁶ EX-1006, ¶52 (air fills “the remaining space between the two opposing sheets 190 and 191”); EX-1003, ¶¶86-87.

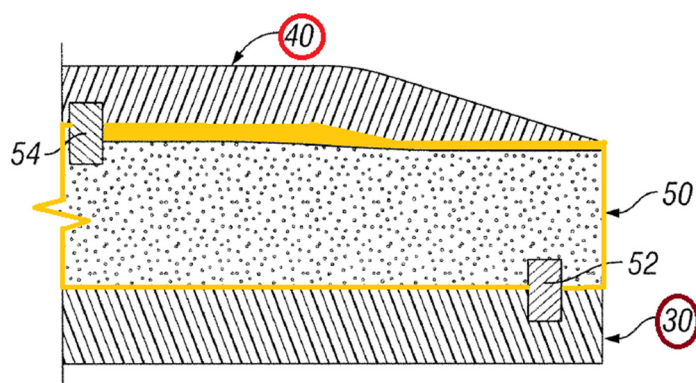


FIG. 6

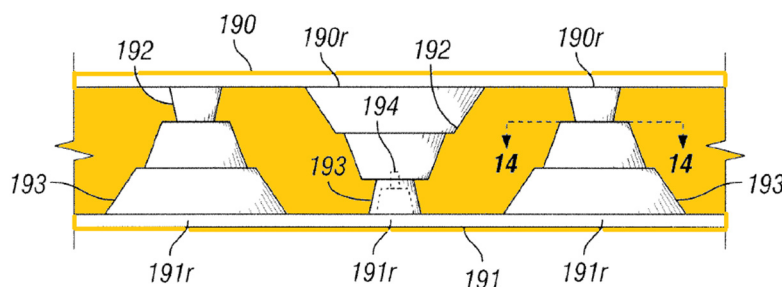


FIG. 13

From these disclosures, a POSITA would have understood that Princip's

⁵ EX-1006, Abstract, ¶32, ¶49. The padding layer can be configured a plethora of ways to suit the wearer's needs. *Id.*, ¶¶51-53, ¶35; EX-1003, ¶¶90-93.

⁶ See 7[c], *infra*; EX-1006, ¶35, ¶¶52-53; EX-1003, ¶¶90-93.

helmets enable air circulation between the helmet interior and ambient air, through the climatic zone and the outer vents. EX-1003, ¶88. As such, Princip's outer vents couple the climatic zone in flow communication with ambient air. EX-1003, ¶88.

[7c]

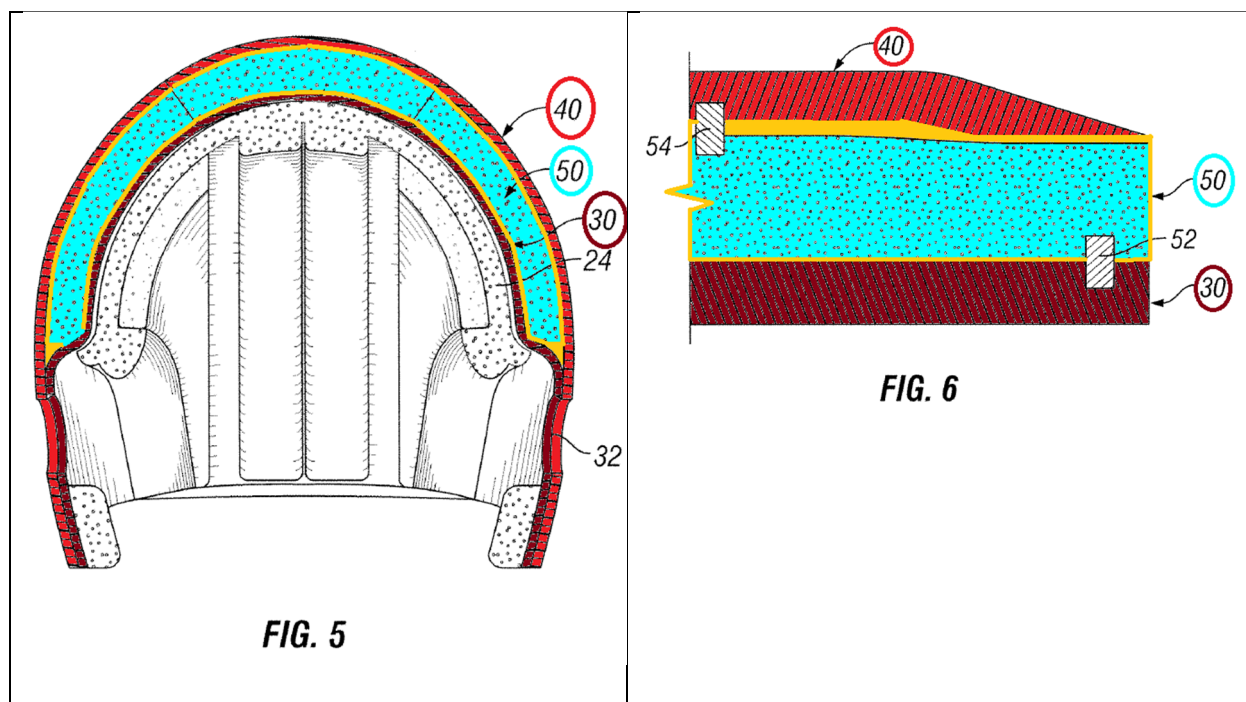
Princip discloses a **cushion assembly** positioned within the **climatic zone** between the **inner shell** and the **outer shell**, which Princip calls the “**energy absorbing layer**” or “**external padding layer**.” EX-1006, Abstract (“[A]n energy absorbing layer is positioned between the inner shell and the outer shell assembly.”), ¶32, ¶49; EX-1003, ¶89.

Princip's external absorbing/padding layer is 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; EX-1003, ¶90. For example, Princip's energy absorbing/padding layer comprises padding (EX-1006, ¶12), which are configurable in a plethora of ways to suit the wearer's needs. *Id.*, ¶¶51-53, ¶35 (layer of mini air or gel cells); EX-1003, ¶¶90-91. These arrangements include a **plurality** of cushions/pads, as further described below. EX-1006, ¶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; EX-1003,

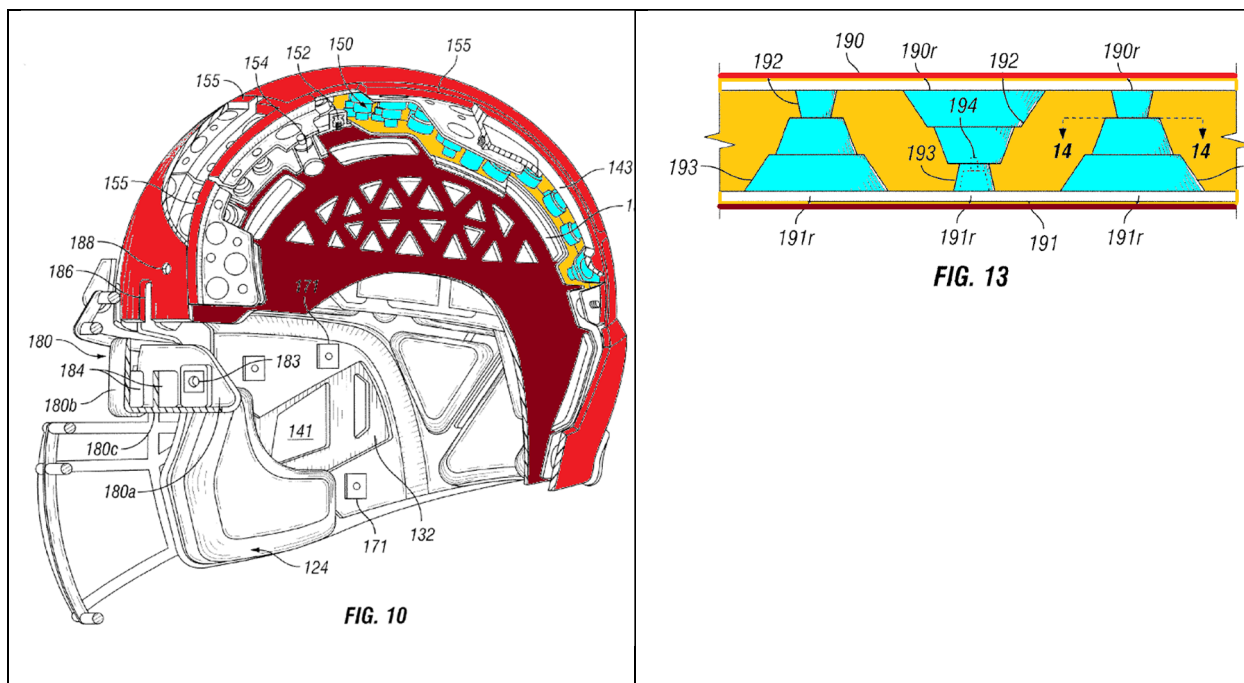
¶¶90-91.

Annotated Figs. 5 and 6 show one 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; EX-1003, ¶92.



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; EX-1003, ¶93.



Princip's cushions are **coupled to the outer shell**. EX-1006, ¶¶35-37 (“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.”), ¶51 (“The external padding layer 150 preferably include a plurality of inner shell attachment points 152 and outer shell attachment points 154.”), ¶¶56-58; EX-1003, ¶94.

Accordingly, Princip anticipates Claim 7. EX-1003, ¶95.

(b) Claim 10

Princip discloses inner and outer vents (*see* [7a-7b], *supra*; incorporated here) and further discloses that the number of **inner vents** differs from the number of **outer vents**. For example, Figures 11 and 12 show a first amount of inner vents 134

that is different from the second amount of outer vents shown in Figure 12. See EX-1006, Figures 1 and 3 (showing more inner than outer “air vents” 22 in helmet 20), Claim 18; EX-1003, ¶96.

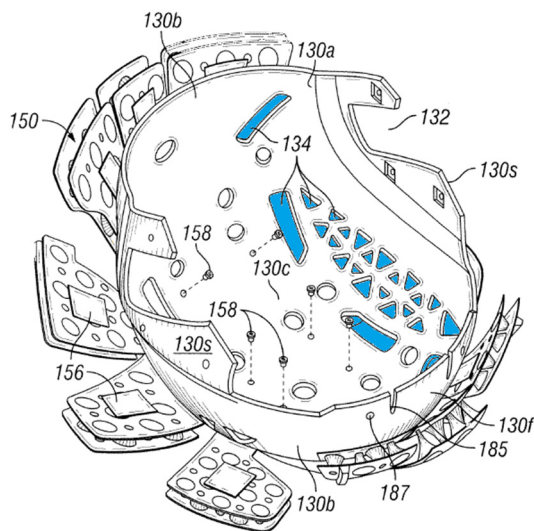


FIG. 11

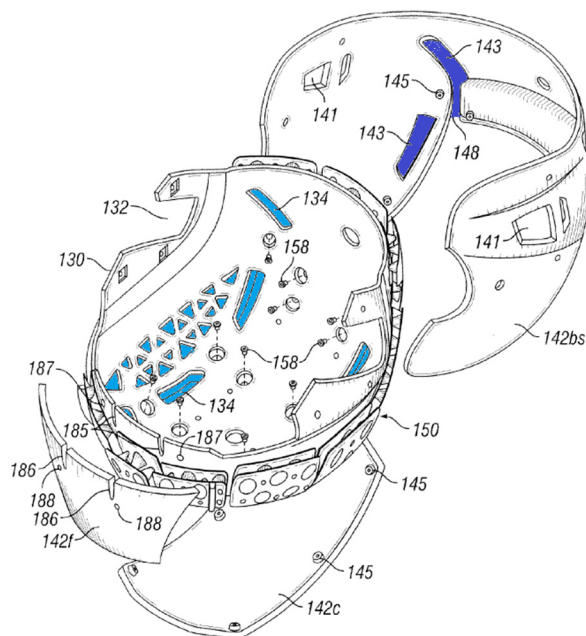


FIG. 12

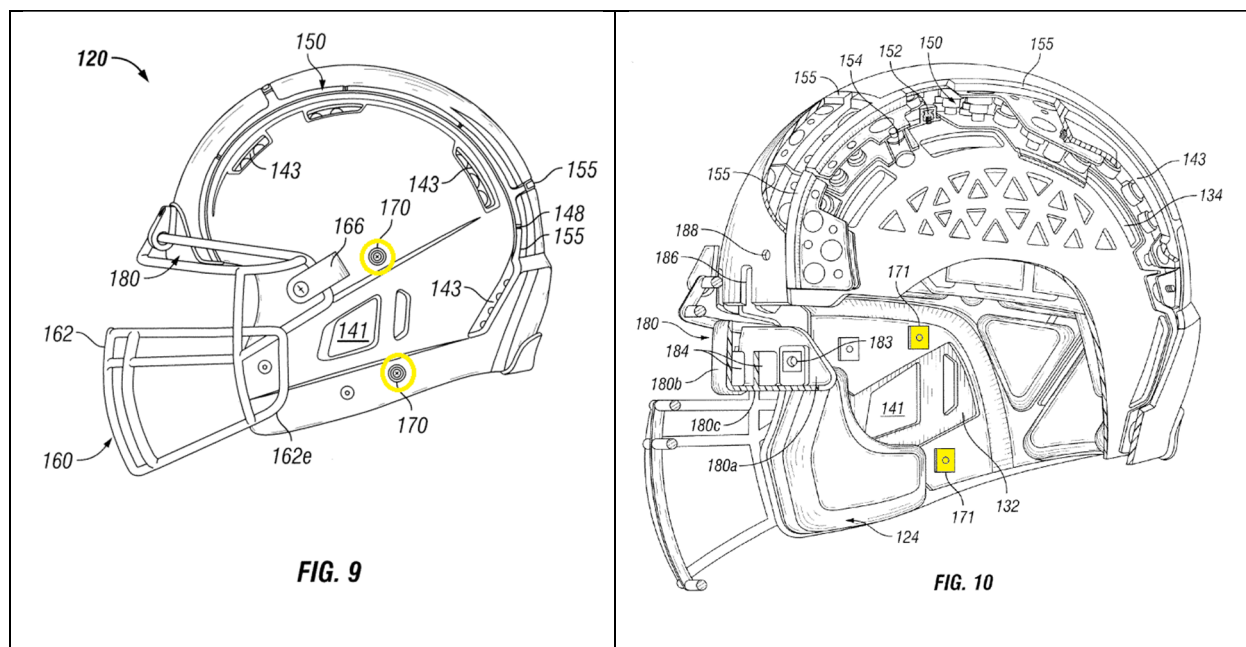
Accordingly, Princip anticipates Claim 10. EX-1003, ¶97.

(c) Claim 11

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; EX-1003, ¶98.

Princip describes **an attachment mechanism coupled to** the inner and outer shells (which is the same as or equivalent to the above-described structures in the '167 Patent). EX-1003, ¶99. 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; EX-1003, ¶99; *see* §II.C, *supra*.



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. EX-1003, ¶100. Accordingly, Princip’s screws and nuts (attachment mechanism) **removably couple** the inner and outer shells. *Id.*

Accordingly, Princip anticipates claim 11. EX-1003, ¶101

**C. Ground 3: Princip and Akamatsu Render Obvious Claims
1-6, 8-9, 18**

1. Akamatsu

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; EX-1003, ¶102. Akamatsu discloses that by 2004 it was well-known to POSITAs to insert cooling materials into helmets to cool wearers’ heads. *Id.*, ¶¶3-9; EX-1003, ¶102. Akamatsu focuses on a long-lasting cooling pack. *Id.*, ¶¶3-9, ¶19, ¶22.

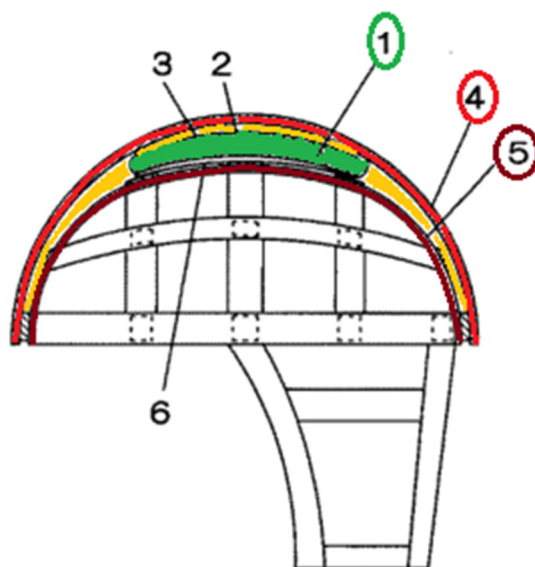
To that end, Akamatsu describes “a head-cooling cooling material” that uses normal paraffin aqueous solution in gel form” as a “cooling medium.” EX-1008, ¶1, ¶10; EX-1003, ¶103. “This cooling material is in a relatively flat shape,” is “sturdy and highly flexible,” and is “enclosed in a water-resistant bag.” EX-1008, ¶10, ¶16. Akamatsu refers to the cooling medium and the bag enclosing it as “the cooling material” (*i.e.*, a cooling pack). EX-1008, ¶27, Fig. 1; EX-1003, ¶103.

Akamatsu describes placing this cooling material in the space between the helmet’s **outer layer 4** and **inner layer 5**. EX-1008, 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.*”); ¶26⁷ (“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.); EX-1003, ¶104. Akamatsu describes placing the cooling material in this radial space 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.” EX-1008, ¶26; EX-1003, ¶104.

⁷ Akamatsu has two, consecutive paragraphs 26, the second of which is the “simple explanation of the drawings,” Figures 1-3. *See* EX-1008. Petitioner will cite the second consecutive paragraph 26 as ¶26*.

[Selected Drawing] Fig. 2



Akamatsu describes that either (i) the cooling material itself 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.” (EX-1008, Claim 2, ¶¶18-19), or (ii) the cooling material may be inserted into a “receiving part,” which is “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.*, Claims 3-4, ¶21; EX-1003, ¶105.

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.” EX-1008, ¶17; EX-1003, ¶106. The cooling material may be positioned at any “suitable sites inside the helmets,” such as the crown. EX-1008, ¶¶21-25, Claim 3.

2. Combination of Princip and Akamatsu

Princip discloses all elements of claim 7's modular helmet. *See* §V.B.2(a), *supra*; EX-1003, ¶107. Although Princip's modular helmets achieve helmet ventilation/cooling, *e.g.*, by enabling air flow between the inner and outer shell vents and through the climatic zone between the shells, Princip does not disclose helmet cooling by including cooling packets in the climatic zone. EX-1003, ¶107. However, a POSITA would have found it obvious to implement Akamatsu's helmet cooling teachings within Princip's modular helmet, such that the climatic zone would further include a plurality of cooling packets. EX-1003, ¶107. As described below, a POSITA would have been motivated to combine these teachings based on the references' similar techniques, structures, and goals to improve wearer's comfort and protection. EX-1003, ¶107.

(a) *Similar Goals, Well-Known Solutions*

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, ¶¶50-52, ¶¶54-55, 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, 2:3-37, 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; EX-1003, ¶¶108-109. 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. EX-1015, 1:36-41, 2:40-67 (citing to research available at EX-1016); EX-1003, ¶¶108-109. Indeed, Akamatsu recognizes that conventional helmets had "poor ventilation" leading to potentially "dangerous conditions." EX-1008, ¶2; EX-1003, ¶¶108-109.

A POSITA would have thus been motivated to seek out helmet cooling techniques for implementation within Princip's helmet, to achieve sufficient head cooling. EX-1003, ¶110. Before the Critical Date, it was well-known to use cooling materials/packs 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, ¶¶52-57, ¶64, Claims 19-21, Figs. 1-4; EX-1014, 1:25-27; EX-1003, ¶110. 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; EX-1003, ¶110. 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. EX-1008, Fig. 2, Abstract, Claims 1-4, ¶1, ¶¶16-17. Accordingly, a POSITA would have been motivated to implement well-known head cooling solutions, as in Akamatsu, for implementation within Princip's helmet. EX-1003, ¶110.

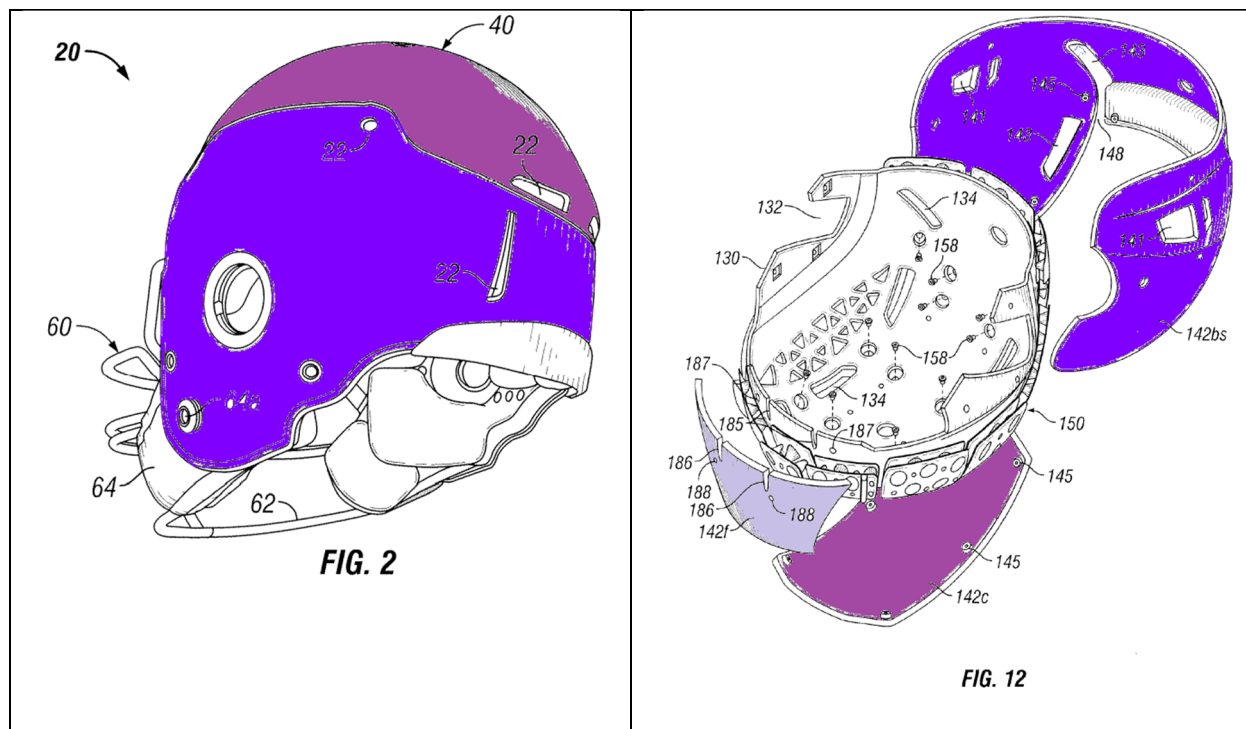
The references' similar structure and goals would have further motivated implementing Akamatsu's cooling techniques within Princip's helmet. EX-1003, ¶¶111-112. Princip and Akamatsu describe similar modular helmets with materials between the helmet's inner and outer shells: cushioning layers in Princip and cooling packs in Akamatsu. EX-1006, Abstract, ¶32, ¶35, ¶¶49-52; EX-1008, *e.g.*, Fig. 2, Claim 3, ¶26; EX-1003, ¶¶111-112. Additionally, Princip and Akamatsu also concern keeping helmet wearers' safe, including by keeping heads both cooled and protected from impacts. EX-1006, ¶¶9-12, ¶42, ¶51; EX-1008, ¶2; EX-1003, ¶¶111-112. Thus, the references' similar modular structure and protection/safety goals would have motivated providing, within the radial space defined between Princip's inner and outer shells, cushioning layers (as in Princip) and cooling packs (as in Akamatsu). EX-1003, ¶¶111-112. 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. EX-1003, ¶111. The resulting combination is predictable, at least because elements of the combined system would perform similar functions (helmet cooling as in Akamatsu, impact protection as in Princip) that they had been known to perform prior to the combination. EX-1003, ¶¶111-112.

(b) *Similar and Complementary Structures*

These similar modular helmet disclosures provide further motivation when considered in view of Akamatsu's adaptable cooling pack and Princip's robust customization. EX-1003, ¶113.

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; EX-1003, ¶114.

Princip discloses highly customizable padding between a helmet's inner and outer shells. EX-1006, ¶53, ¶51, ¶35; EX-1003, ¶115. And in a multi-panel outer shell assembly, each panel itself can further be customized, *e.g.*, to have a different padding, thickness, and spacing configuration between the inner and outer shells. EX-1006, ¶40-41 (“Individual panels 42 can be designed, modified or customized for different players or player positions such as a football lineman, receiver, or quarterback.”), Figs. 2, 12 (below, showing outer shell panels); EX-1003, ¶115. 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.”*** EX-1006, ¶41.



The references' similar modular helmet arrangements, Princip's customization disclosures, and Akamatsu's adaptable cooling pack disclosures would have motivated a POSITA to modify Princip's customizable padding arrangement to enable positioning of Akamatsu's adaptable cooling packs in the same radial space defined by both references' inner and outer shells. EX-1003, ¶¶116-119. In the resulting combination, the cooling packs could be placed at any suitable location 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; EX-1003, ¶¶116-119. Locations "most in need of being cooled" include "the forehead and temples." EX-1013, 1:25-26; EX-1003, ¶¶116-119. Therefore, a POSITA would have found it obvious to

customize one or more of Princip's outer-shell panels to include two or more of Akamatsu's flat, long-lasting cooling packs in-line with one or more of Princip's energy absorbing layer arrangements at, for example, each temple. EX-1003, ¶¶116-119.

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. EX-1003, ¶120.

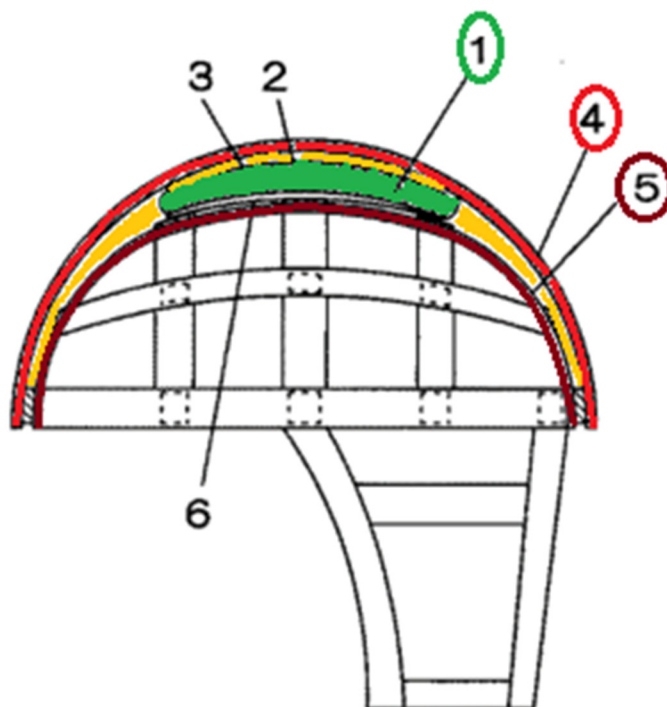
3. Analysis

(a) Claim 8

In combination, Princip discloses all claim 7 elements. *See* Ground 2 [7pre-c], *supra* (incorporated here); EX-1003, ¶121.

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



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; EX-1003, ¶123.

Akamatsu describes placing the cooling packet between a helmet’s inner and outer layers. EX-1008, 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; EX-1003, ¶124.

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. EX-1008, ¶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; EX-1003, ¶125.

As previously discussed, Sect. V.C.2., *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. EX-1003, ¶126. 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. EX-1003, ¶¶126-127.

Accordingly, Princip-Akamatsu renders Claim 8 obvious. *Id.*

(b) Claim 9

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. EX-1003, ¶128.

Princip discloses numerous non-limiting possibilities for cushion structure, configuration, and placement. EX-1006, ¶53, ¶51, ¶35; EX-1003, ¶129; §V.B.2.(a) [7c] *supra* (incorporated here). Further, Princip discloses that the cushions and their arrangements can vary between panels depending upon wearer needs. EX-1006, ¶41; EX-1003, ¶129. Additionally, it was well-known that cushions typically work by compressing under applied force. EX-1006, ¶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.”); EX-1003, ¶129.

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 cushion; they are not intended to compress in size to work. EX-1003, ¶130.

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. EX-1003, ¶130.

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 Princip's single panel's inner and outer shells, it would be obvious to a POSITA that the combination would include at least one of those cushions having a different height—to any extent—than at least one of the cooling packs. EX-1003, ¶¶131-132.

Accordingly, Princip-Akamatsu renders claim 9 obvious. *Id.*

(c) Claim 1

[1pre]

See Ground 2 [7pre], *supra* (incorporated here); EX-1003, ¶133.

[1a]

See Ground 2 [7a], *supra* (incorporated here); EX-1003, ¶134.

[1b]

See Ground 2 [7b], *supra* (incorporated here); EX-1003, ¶135.

[1c]

See Ground 3 [8], *supra* (incorporated here); EX-1003, ¶136.

[1d]

See Ground 2 [7c], *supra* (incorporated here); EX-1003, ¶137.

Accordingly, Princip-Akamatsu renders Claim 1 obvious. EX-1003, ¶138.

(d) Claim 2

See Ground 3 [9], *supra* (incorporated here); EX-1003, ¶139.

Accordingly, Princip-Akamatsu renders Claim 9 obvious. EX-1003, ¶140.

(e) Claim 3

[3pre]

See Ground 2 [7pre], *supra* (incorporated here); EX-1003, ¶¶140-141.

[3a]

See Ground 2 [7a], *supra* (incorporated here); EX-1003, ¶141.

[3b]

See Ground 2 [7b], *supra* (incorporated here); EX-1003, ¶142.

[3c]

See Ground 2 [7a-7b] and Ground 2 [8], *supra* (incorporated here); EX-1003, ¶143.

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; EX-1003, ¶144.

Accordingly, Princip-Akamatsu renders Claim 3 obvious. EX-1003, ¶145.

(f) Claim 4

See Ground 2 [7b], *supra* (incorporated here); EX-1003, ¶146.

Accordingly, Princip-Akamatsu renders Claim 4 obvious. EX-1003, ¶147.

(g) Claim 5

See Ground 2 [7b], *supra* (incorporated here); EX-1003, ¶148.

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); EX-1003, ¶148.

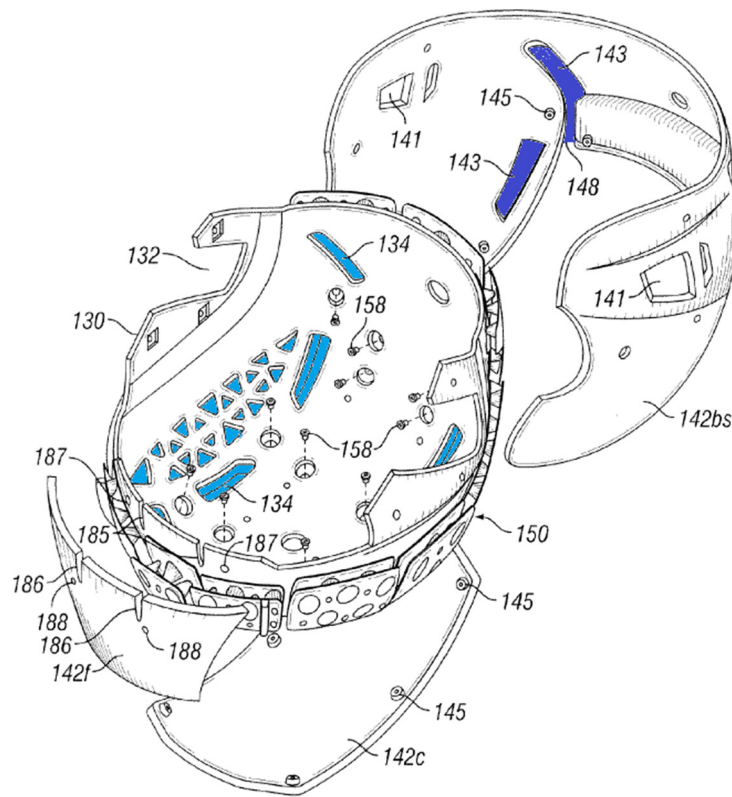


FIG. 12

Accordingly, Princip-Akamatsu renders Claim 5 obvious. EX-1003, ¶149.

(h) Claim 6

See Ground 2 [11], *supra* (incorporated here); EX-1003, ¶150.

Accordingly, Princip-Akamatsu renders Claim 6 obvious. EX-1003, ¶151.

(i) Claim 18

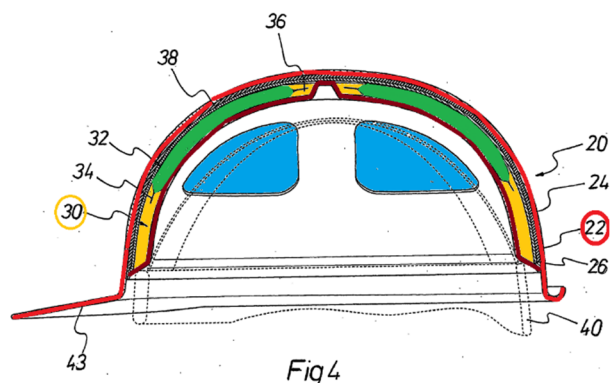
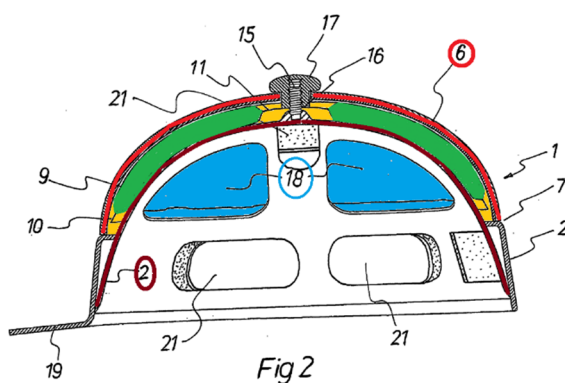
See Ground 2 [11], *supra* (incorporated here); EX-1003, ¶152.

Accordingly, Princip-Akamatsu renders Claim 18 obvious. EX-1003, ¶153.

D. Ground 4: Bedford Anticipates Claims 3, 4, 18

1. Bedford

Bedford, titled “Cooling Helmet,” discloses two preferred helmet embodiments shown in annotated Figs. 2 and 4 below.⁸ 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; EX-1003, ¶154.



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

⁸ Bedford’s third preferred embodiment relates to cloth headwear, like a baseball cap. EX-1009, ¶¶61-67, Figs. 5-6.

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... There is also provided an insulating material 24 ...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”), Figs. 1-4; EX-1003, ¶155. 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.” EX-1009, ¶12; EX-1003, ¶155.

A **plurality of cooling packs** are located between the inner and outer parts. EX-1003, ¶156. 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 ...*at least one intermediate part* which is positioned to be intermediate the said outer and inner crown parts ... 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....”), Claims 19-20; EX-1003, ¶156. The cooling packs are **removably coupled** to the outer shell. EX-1009, ¶¶45, 54, 56; EX-1003, ¶156.

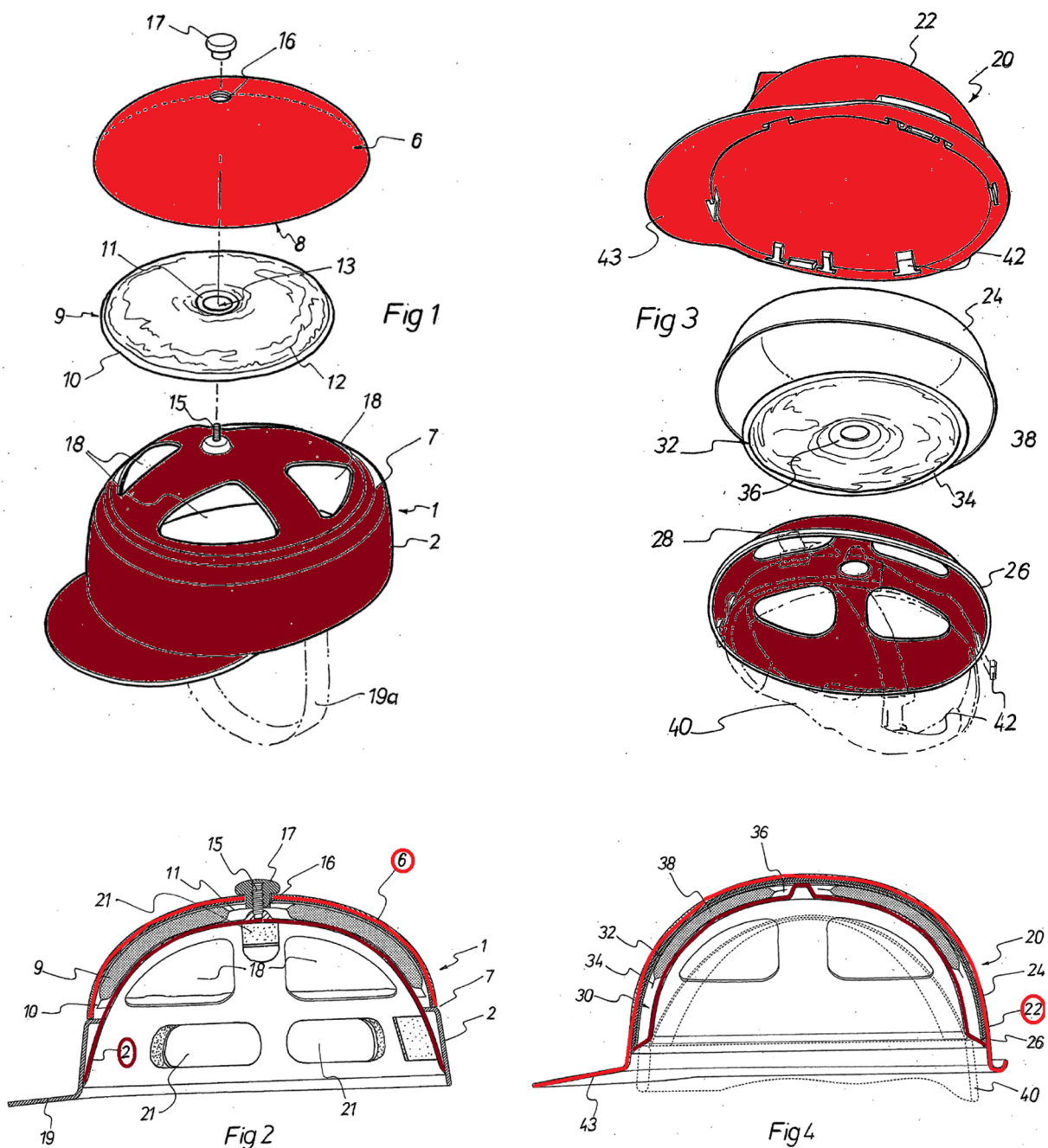
Bedford further describes that the inner and outer parts have vents for air flow. EX-1003, ¶157. Bedford refers to the vents as “**apertures**.” EX-1009, ¶41, ¶68 (“In each case embodiment the design has been provided with an inner part and an outer part and in each case there are *apertures to be provided 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.”); EX-1003, ¶157. 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.” EX-1009, ¶41, ¶57 (“[T]he 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”), ¶12, Figs. 2, 4; EX-1003, ¶157.

2. Analysis

(a) Claim 3

[3pre]

Bedford describes a modular helmet. Figures 1-2, annotated below, show helmet 1 with multiple modules, including an **inner impact resisting part** (2) (inner shell) and an **outer impact resistant part** (6) (outer shell) that are nested “one with respect to the other” EX-1009, Abstract, ¶9, ¶¶36-37; EX-1003, ¶158. Bedford similarly describes Figures 3 and 4 (annotated below) as “helmet” 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).” EX-1009, ¶¶49-51; EX-1003, ¶158.



[3a]

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, annotated

above in [3pre]).⁹ 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”), ¶¶36-37, ¶¶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... and which is adapted to generally conform to the periphery 26 of *an inner part 28*...[such that]the inner part 28 [nests] within the outer part 22.”), Figs. 1-4; EX-1003, ¶159. Bedford’s inner part is made of similar materials as those used for the ’167 Patent’s inner shell. *Compare* EX-1009, ¶¶36-37, *with* EX-1001, 4:34-45; EX-1003, ¶159.

A POSITA would have understood that the inner shell is **adapted to be positioned onto a user’s head**. EX-1003, ¶160; *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.

⁹ Bedford also refers to the “inner part” 2/28 as the “lower part.” EX-1009, ¶37, ¶40, ¶44, ¶46.

[3b]

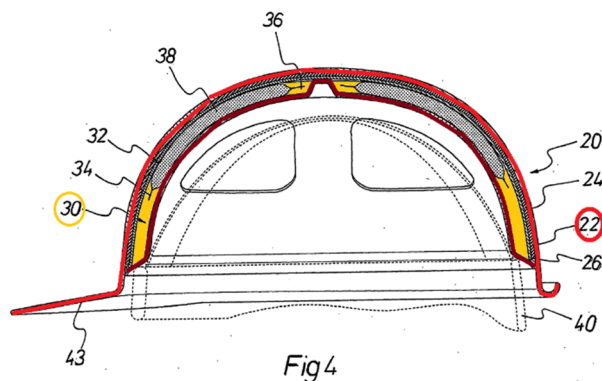
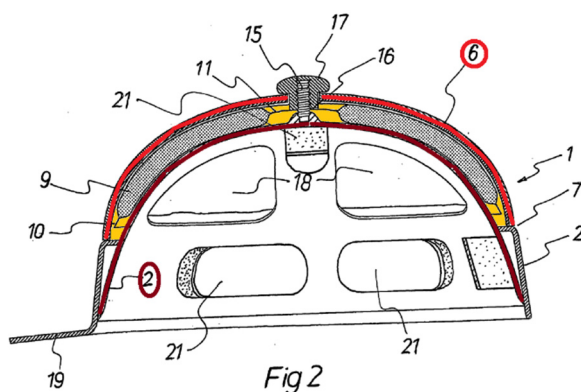
Bedford's helmet includes an **outer shell**, which Bedford interchangeably refers to as outermost shell, outer part, and upper part¹⁰. EX-1009, Abstract (“An impact protective item of headwear (1) which has inner (2) and outer (6) impact resistant parts nesting one with respect to the other”), ¶¶50-51 (“The helmet 20 has an outermost shell which forms there by an outer part 22....”), Figs. 1-4; EX-1003, ¶161.

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 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.”); EX-1003, ¶162.

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

¹⁰ 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.

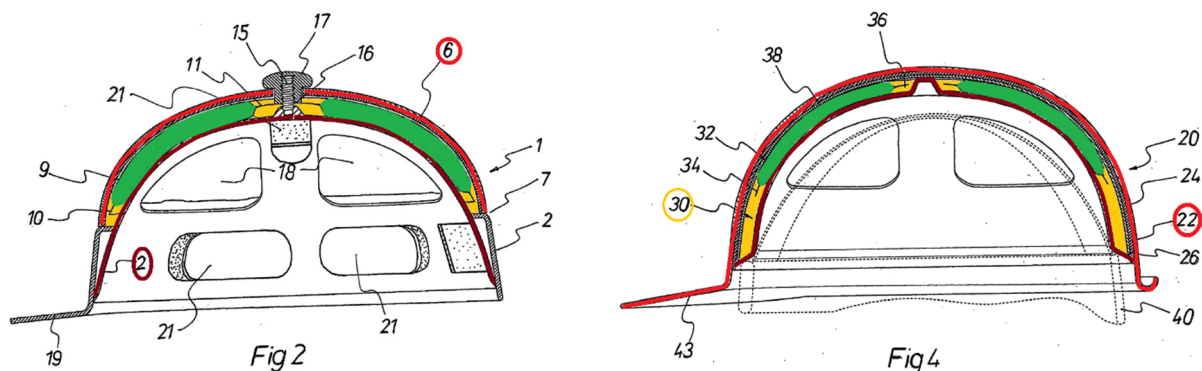
and 4, annotated below, show this climatic zone between the outer part 6/22 (outer shell) and the inner part 2/22 (inner shell). See EX-1009, Figs. 1, 3; EX-1001, 6:6-7 (“the climatic zone 20 is defined between the inner shell and the outer shell”), Abstract (same), 4:7-20, 9:58-62; EX-1003, ¶163.



Bedford calls this space **a cavity** 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” and “an insulating material 24...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...”); EX-1003, ¶164.

[3c]

The '167 Patent's only cooling assembly disclosures 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; EX-1003, ¶165. 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; EX-1003, ¶165.



The helmet embodiment in Figs. 1-2 has "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 ... and provide thereby cooling effect."); EX-1003, ¶166. Similarly, the embodiment in Figs. 3-4 has a replaceable pouch 38 with a gel/other coolant

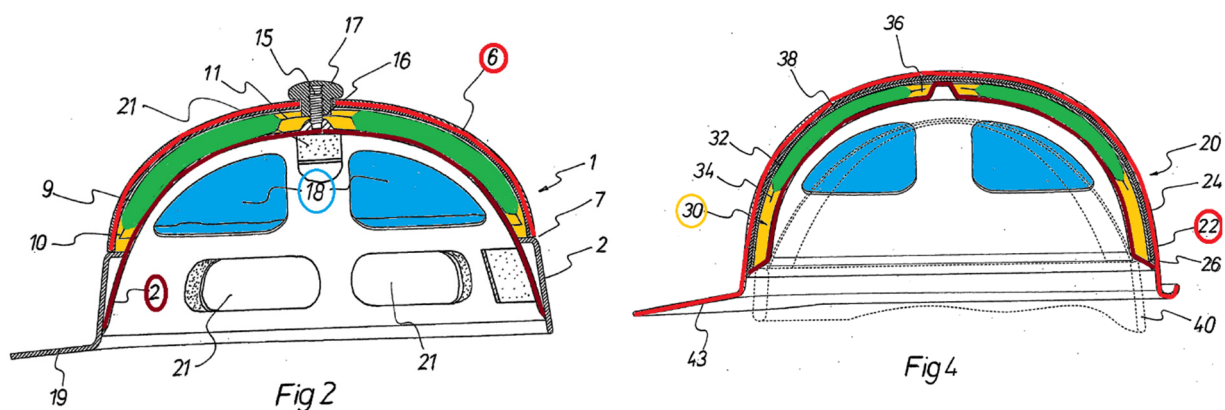
between the inner and outer parts. EX-1009, ¶¶52-53 (“This cavity 30 is adapted to receive within it a pack 32 which contains a freezable gel, which is provided by two sheets of pliable plastic material welded together along inner and outer seams 34 and 36 so as to define a pouch 38. Within the pouch 38 there is the freezing gel which is adapted to be frozen ...and provide thereby cooling effect.”); EX-1003, ¶166.

Bedford describes a **plurality of** cooling packets. EX-1009, ¶¶9-12 (“[A]n article of headwear having...*at least one intermediate part* which is positioned to be intermediate the said outer and inner crown parts ...in removable fashion ..., 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; EX-1003, ¶¶167-168. From these disclosures, a POSITA would have understood that Bedford’s helmet includes a plurality of cooling packets. EX-1003, ¶¶167-168.

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” EX-1009, ¶45; EX-1003, ¶¶169-170. In the embodiment 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 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” EX-1009, ¶54, ¶56; EX-1003, ¶¶169-170. 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 shells are also coupled to the outer shell. EX-1003, ¶¶169-170.

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.



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 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 (“[T]he *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...”), ¶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; EX-1003, ¶172. 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. EX-1003, ¶172.

Accordingly, Bedford anticipates Claim 3. EX-1003, ¶173.

(b) Claim 4

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."); EX-1003, ¶174.

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 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.”); EX-1003, ¶¶175-176. 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). EX-1003, ¶¶175-176.

Accordingly, Bedford anticipates Claim 4. EX-1003, ¶177.

(c) Claim 18

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* EX-1001, 9:10-9:44)), such that the outer shell is removably coupled to the inner shell. EX-1009, Claims 19, 28; EX-1003, ¶178.

In the helmet embodiment 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”); EX-1003, ¶179.

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 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...” EX-1009, ¶¶54-56; EX-1003, ¶180.

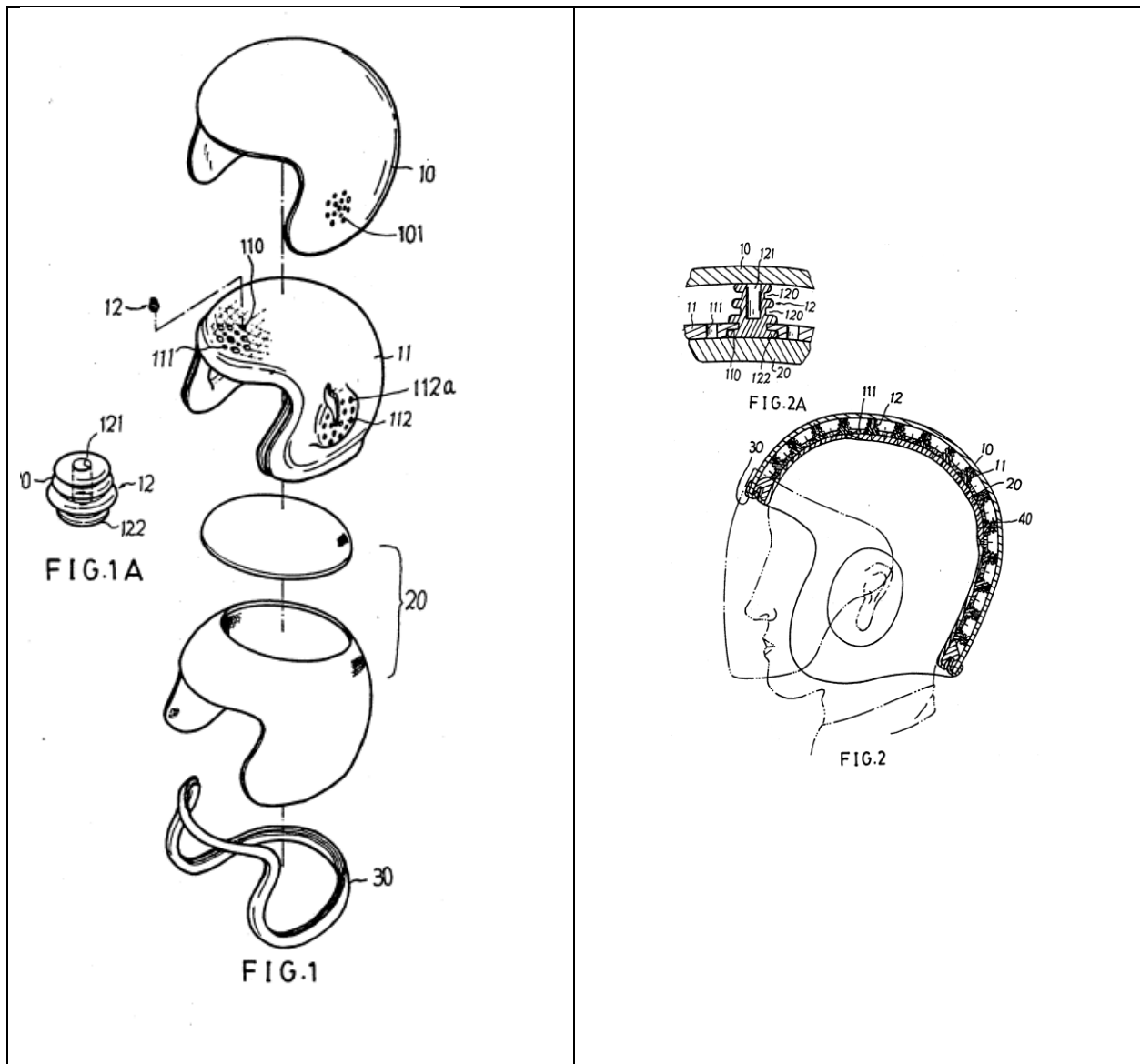
Accordingly, Bedford anticipates Claim 18. EX-1003, ¶181.

E. Ground 5: Liu Renders Obvious Claims 7, 10

1. Liu

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; EX-1003, ¶¶182-183. Liu’s modular helmet is shown in Figs. 1, 1A, 2, and 2A below.



2. Analysis

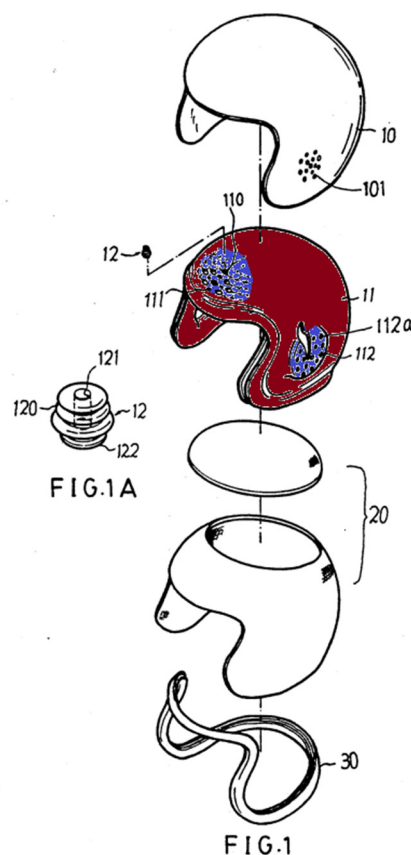
(a) Claim 7

[7pre]

Liu describes a modular helmet. EX-1003, ¶184. 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; EX-1003, ¶184.

[7a]

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; EX-1003, ¶185.



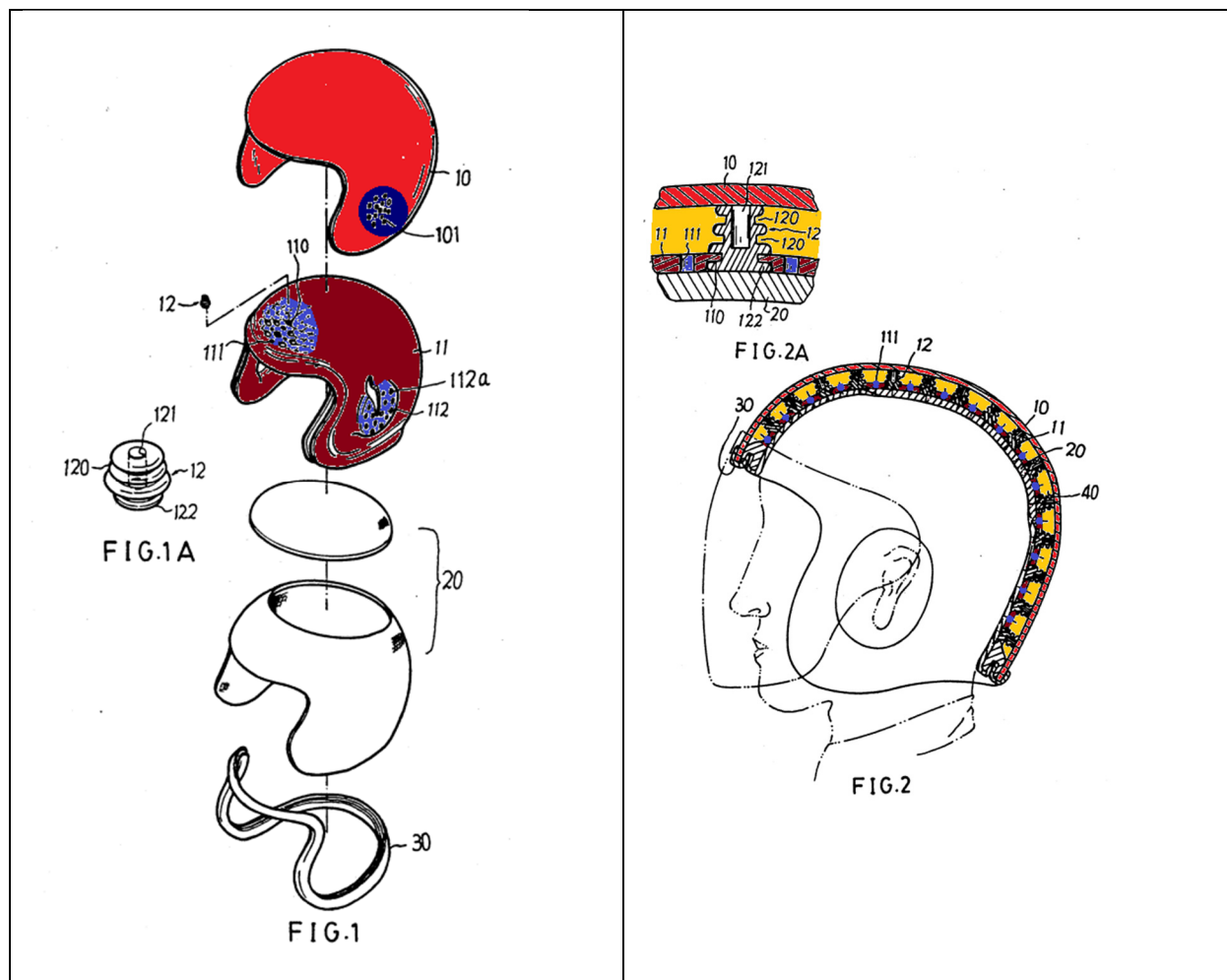
The inner shell is **adapted to be positioned onto a user's head**. EX-1011, FIG. 2 (showing inner layer inside cavity conforming to wearer's head), Abstract ("an inside surface of the inner shell disposed around a wearer's head"), Fig. 1; EX-1003, ¶186.

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; EX-1003, ¶187.

[7b]

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); EX-1003, ¶188.



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 EX-1003, ¶189.

Liu further describes that the **outer shell** includes a plurality of **outer vents** are configured to couple the climatic zone in flow communication with ambient air.

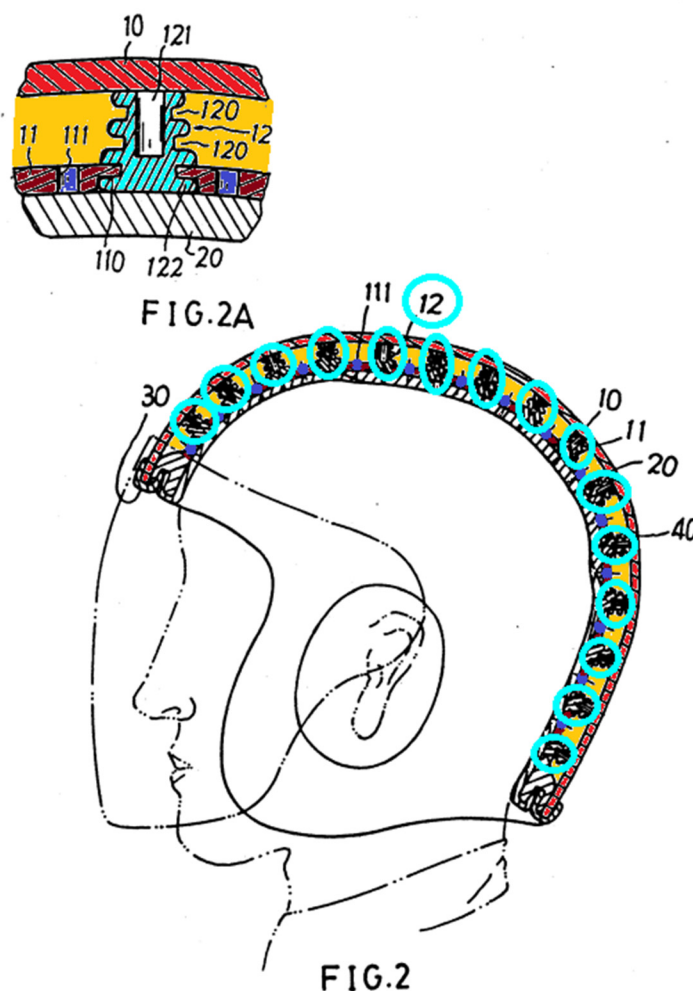
EX-1003, ¶190. In particular, Liu's helmet includes "**outer perforations**" (as shown in FIG. 1 above) "formed in the **outer shell**" that "ventilate air or moisture from or in the **air chamber between the outer shell and the inner shell** and from the wearer's head for a comfortable wearing of the 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; EX-1003, ¶190.

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. EX-1003, ¶191. In this

manner, Liu's outer vents couple the climatic zone in flow communication with ambient air. EX-1003, ¶191.

[7c]

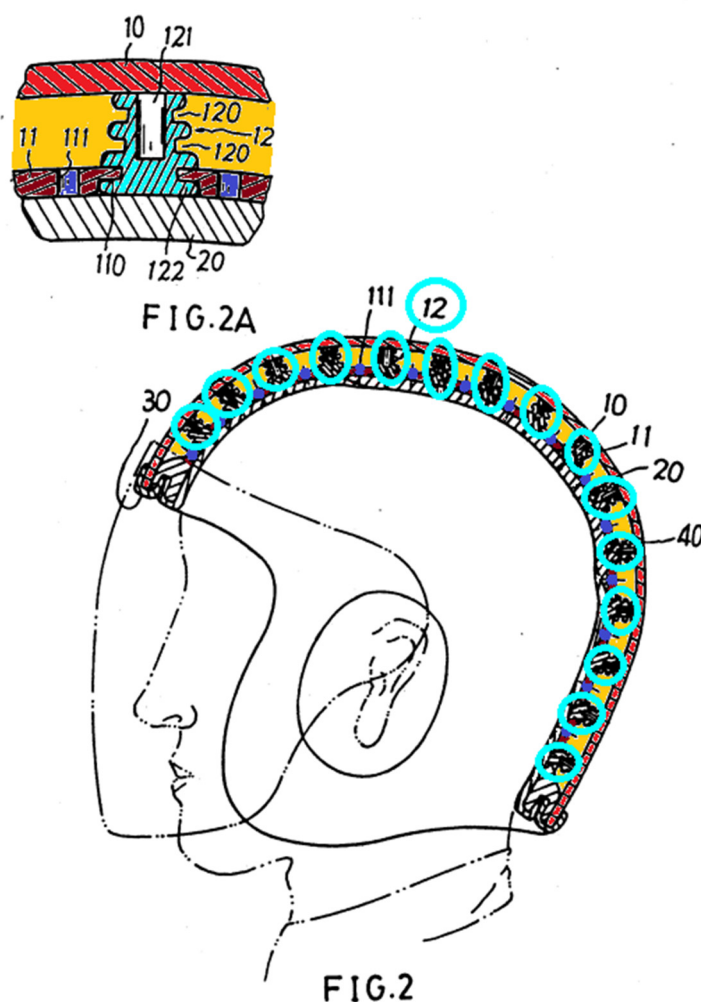
Liu discloses a **cushion assembly that includes a plurality of cushions and is positioned within the climatic zone between the inner shell and the outer shells.** EX-1011, Abstract (“A safety helmet includes an outer shell juxtapositionally secured with an inner shell defining **an air chamber between the two shells**, **a plurality of cushioning bellows** retained between the two shells.”). EX-1003, ¶192.



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; EX-1003, ¶¶193-194. 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; EX-1003, ¶¶193-194.

Liu cushioning bellows are **coupled to the outer shell**. EX-1003, ¶195. 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; EX-1003, ¶195. From these disclosures, and given that the '167 Patent does not require 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. EX-1003, ¶196.

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. EX-1003, ¶197. 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.

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. EX-1003, ¶198. 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. EX-1003, ¶198. 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; EX-1003, ¶198; *see* EX-1001, 7:59-64 (confirming that cushion-coupling orientation can be a design choice, given that cushions could be coupled to inner or outer shell).

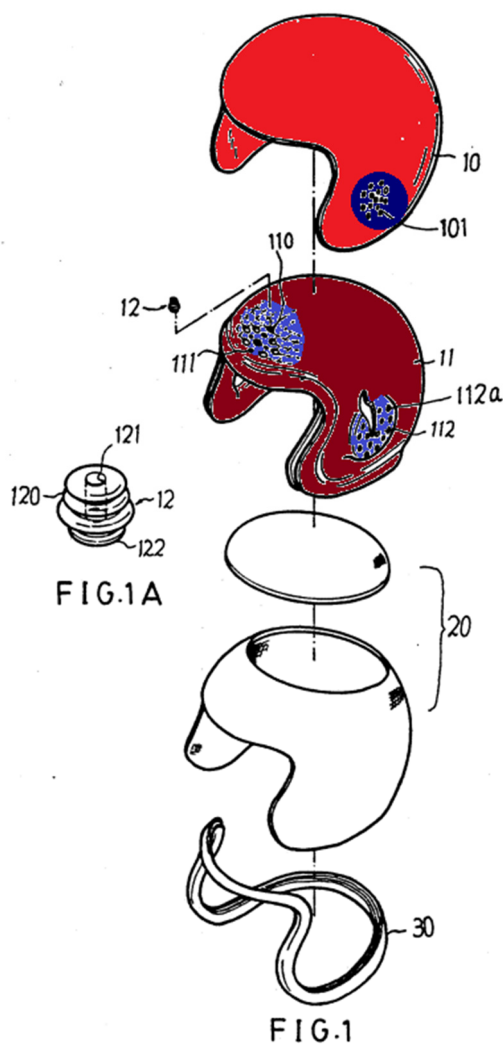
Thus, modifying Liu’s cushioning bellows to be engageably fixed within holes formed in the outer shell would have simply involved choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success.

EX-1003, ¶199.

Accordingly, Liu renders Claim 7 obvious. EX-1003, ¶200.

(b) Claim 10

Liu discloses or at least renders obvious that the number of inner vents may differ from the number of outer vents. EX-1003, ¶¶201-204. As discussed at [7a] and [7b], *supra* (incorporated here), 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. Liu does not require or even disclose the same number of inner and outer shell vents. EX-1003, ¶203. And, in fact, 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**. EX-1003, ¶204.



From these descriptions, and because modular helmets with differing number of inner and outer vents were well-known (EX-1006, Figs. 1-3, 7-12, ¶18, ¶42, ¶¶50-51; *see* §V.A.2(b), *supra*), a POSITA would have understood or found obvious that the number of inner and outer vents in Liu's helmet need not be equal and can, of course, differ. EX-1003, ¶205.

Accordingly, Liu renders Claim 10 obvious. EX-1003, ¶206.

VI. THE BOARD SHOULD NOT EXERCISE ITS DISCRETION TO DENY INSTITUTION

A. §314(a): The *Fintiv* Factors Favor Institution

The *Apple Inc. v. Fintiv, Inc.* factors, and recent Board decisions applying them, favor institution. IPR2020-00019, Paper 11, 5-6 (Mar. 20, 2020) (precedential).

1. Factor 1: The Litigation is in the Early Stages and is Likely to be Stayed Per the Parties' Agreement

The companion litigation is in a very early stage. The parties have not exchanged infringement and invalidity contentions, served any discovery requests, or produced any documents.

In fact, as of this filing, the parties have *agreed to stay all case deadlines* specified in the Scheduling Order (EX-1018), pending resolution of (1) an IPR in this proceeding and (2) the ongoing summary judgment proceedings for the other asserted patent in litigation. EX-1017. The parties further agreed that this contemplated stay would warrant the currently scheduled trial date to be vacated and rescheduled for a later date. EX-1017. Per this agreement, Patent Owner did not serve its infringement contentions that were otherwise due on November 11. And, shortly after filing the instant Petition, Petitioner will file its unopposed motion to stay the litigation.

Moreover, institution would enable the Board to resolve invalidity issues, and an invalidity finding would advance judicial efficiency by relieving the district court from having to conduct trial on the '167 Patent.

In summary, the litigation's very early stage, the parties' agreement to stay the litigation, and the potential for issue simplification increases the likelihood that the court will grant a stay, even pre-institution. *See, e.g.*, EX-1019, 7 (Feb. 6, 2020 Text Order, granting stay pending IPR when parties agree to a stay); *Putco, Inc. v. Carjamz Com Inc.*, No. 20-cv-50109, 2021 WL 4926499, at *1 (N.D. Ill. Mar. 02, 2021) (granting a stay pre-institution because "the issue of infringement would no longer exist" for any claims cancelled by the PTO); *T-Rex Property AB v. Adaptive Micro Systems, LLC*, No. 16-cv-05667, 2017 WL 372311, at *3 (N.D. Ill. Jan. 26, 2017).

2. Factor 2: Final Written Decision will Likely Issue Before Trial

Patent Owner filed its complaint on August 25, 2021. Petitioner is filing this Petition within less than three months after complaint filing, which suggests that a FWD in an IPR from this Petition is expected around May 12, 2023,

The court issued a scheduling order on October 26, 2021 (EX-1018), scheduling trial for April 18, 2023, and specifying dates for preliminary exchanges of terms and proposed constructions. *Id.*, ¶4, ¶9.

As in *NHK*, district court trial dates shift, even in normal times. *Mylan Pharma. Inc. v. Sanofi-Aventis Deutschland GMBH*, IPR2018-01680, Pap. 22, 17 (PTAB 2019). This is even more likely here because, as noted above, the parties have agreed to a stay and have further agreed that the currently-scheduled trial date should be vacated and rescheduled for a later date. EX-1017. As such, it is highly likely that, in response to Petitioner's forthcoming unopposed motion to stay, the Court will set trial for a date later than the currently-scheduled date of April 18, 2023. Accordingly, an FWD in an IPR from this Petition, which is expected around May 12, 2023, will likely issue before the court's trial date.

3. Factor 3: Petitioner's Diligence and IPR Investment Outweigh Parties' Minimal Litigation Investment to Date

As noted above, the companion litigation is in a very early stage, with all invalidity work remaining. As of this filing, there has been no substantive activity as to the '167 Patent. Infringement and invalidity contentions have not been served, discovery has not begun, and claim construction issues have not been identified/briefed. And, given the parties' agreement to stay the litigation (EX-1017) and Petitioner's forthcoming unopposed motion to stay, no substantive activity as to the '167 Patent is expected in the near future.

Moreover, Petitioner's diligence and investment in preparing and filing this Petition—on claims asserted in litigation (claims 7, 10) (EX-1017), as well and

multiple unasserted claims (claims 1-6, 8-9, 11, 18)—far outweigh the parties’ minimal resource investment in the companion litigation. Indeed, Patent Owner did not assert the ’167 Patent against Petitioner until August 25, 2021, and ***Petitioner prepared and filed this Petition less than three months thereafter***—more than nine months before §315(b)’s 1-year deadline.

4. Factor 4: The Petition’s Grounds are Materially Different from What May be Raised in District Court

Consistent with *Fintiv*, Petitioner requests consideration of the unique challenges raised in the Petition. Petitioner has voluntarily stipulated to counsel for Patent Owner that, if the Board institutes this Petition, Petitioner will not assert that the Challenged Claims are invalid on the Petition’s grounds in litigation. EX-1020.

Consequently, the grounds advanced herein are materially different from any that might be addressed in district court (assuming *arguendo* that the litigation is not stayed).

5. Factor 5: This Petition Enables the Board to Resolve Invalidity of Claims that Might Otherwise be Addressed in the District Court Litigation

Accounting for relevant circumstances, including the likelihood of stay and the unique nature of presented grounds, Petitioner’s status as defendant in the litigation is a neutral factor. *Snap, Inc. v. SRK Technology LLC*, IPR2020-00820 Pap. 15, 16 (PTAB Oct. 21, 2020) (precedential). Moreover, because this Petition

challenges the claims asserted in litigation (claims 7, 10) (EX-1017), and multiple unasserted claims, institution would serve overall efficiency and integrity by relieving the district court of needing to conduct trial as to this patent.

6. Factor 6: Other Circumstances Support Institution

The [*Fintiv*] factors “are part of a balanced assessment of all the relevant circumstances in the case,” and, “if the merits of a ground raised in the Petition seem particularly strong...the institution of a trial may serve the interest of overall system efficiency and integrity....” *Fintiv*, 14-15. As demonstrated in this Petition with reference to Dr. Horstemeyer’s testimony, institution would result in invalidation of the Challenged Claims.

B. §325(d): Different Art and Arguments Raised in this Petition Favor Institution

As explained below, this Petition relies upon substantially different art and arguments than those previously presented to the Office, and thus, this Petition should not be denied under §325(d). *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469 Paper 6 (Feb. 13, 2020)(precedential).

None of Grounds 2-5 (based on Princip, Akamatsu, and Liu) were relied upon during the original prosecution. EX-1002, 177-183. And, while Roth (presented in Grounds 1a-1b) was previously presented to the USPTO, Petitioner relies on Roth’s

teachings that were not previously considered. During prosecution, Roth was only applied to the “fastening assembly” claims 12-17 (original claims 13-20)—and not as to any of the challenged “modular helmet” claims. EX-1002, 179-181.

Moreover, Roth anticipates or renders obvious claims that the examiner found undisclosed in the art. Specifically, the examiner allowed claims 7 and 10 (original claims 8 and 11) without comment and without substantively considering Roth. But Roth, when considered as to the “modular helmet” claims, discloses each limitation thereof. *See* §V.A., *supra*. Accordingly, Petitioner’s reliance on Roth herein is substantially different from how it was relied upon during prosecution.

Accordingly, this Petition should not be discretionarily denied under §325(d).

VII. PAYMENT OF FEES

Please charge any fees to Deposit Account No. 06-1050.

VIII. CONCLUSION

Petitioner requests institution of an IPR for the Challenged Claims.

IX. MANDATORY NOTICES UNDER 37 C.F.R § 42.8(a)(1)

A. Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1)

The following is a listing of the real parties-in-interest:

- Certor Sports, LLC;
- Schutt Sports, LLC;
- Schutt AcquisitionCo, LLC (parent of Schutt Sports, LLC);

- Vicis AcquisitionCo, LLC (subsidiary of Certor Sports, LLC);
- Vicis, LLC (subsidiary of Vicis AcquisitionCo, LLC);
- Innovatus VPG Offshore Equity, LP and Innovatus Flagship Fund I, LP
(parents of Certor Sports, LLC).

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

Petitioner is not aware of any disclaimers, reexamination certificates or petitions for inter partes review for the '167 Patent. The '167 Patent is the subject of a civil action including: *Apalone Inc. v. Schutt Sports LLC et al.* CDIL-3-21-cv-03186.

C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel.

Lead Counsel	Backup counsel
Thad Kodish, Reg. No. 53,149 Fish & Richardson P.C. 3200 RBC Plaza 60 South Sixth Street Minneapolis, MN 55402 Tel: 202-783-5070 Fax: 877-769-7945 Email: IPR51690-0004IP1@fr.com	Karan Jhurani, Reg. No. 71,777 Erin Alper, Reg No. 67,205 Fish & Richardson P.C. 3200 RBC Plaza 60 South Sixth Street Minneapolis, MN 55402 Tel: 202-783-5070 Fax: 877-769-7945 PTABInbound@fr.com

D. Service Information

Please address all correspondence and service to the address listed above.

Petitioner consents to electronic service by email at IPR51690-0004IP1@fr.com

(referencing No. 51690-0004IP1 and cc'ing PTABInbound@fr.com).

Respectfully submitted,

Dated: November 15, 2021

/Thad Kodish/

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(Control No. IPR2022-00196)

Attorneys for Petitioner

CERTIFICATION UNDER 37 CFR § 42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13,998 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

Dated: November 15, 2021

/Thad Kodish/

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on November 15, 2021, a complete and entire copy of this Petition for *Inter Partes* Review, Power of Attorney, and all supporting exhibits were provided via Federal Express, to the Patent Owner by serving the PAIR correspondence address of record as follows:

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