

**UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD**

THE BURTON CORPORATION,
Petitioner,

v .

SMITH SPORT OPTICS, INC. AND KOROYD SARL
Patent Owners.

Case No. IPR2022-00354
Patent No. 10,736,373

**DECLARATION OF STEPHANIE BONIN SUPPORT OF
PATENT OWNER'S PRELIMINARY RESPONSE**

I, Stephanie Bonin, declare as follows:

I. INTRODUCTION

1. I, Stephanie Bonin, PhD, PE I am responsible for the content of this declaration. I have been retained by Dorsey & Whitney LLP for Patent Owners Smith Sport Optics, Inc. and Koroyd SARL (“Smith” or “Koroyd”, respectively; collectively, “Patent Owner”) to provide my independent analysis regarding the alleged invalidity of claims 1-5, 7, 12-13, and 15-17 of U.S. Patent No. 10,736,373 (Ex. 1001, the “’373 patent”) (collectively, the “Challenged Claims”).

2. My education, background, experience, and publications are described in my attached curriculum vitae in **Appendix A**. In brief, I hold a Bachelor of Science degree in Engineering Mechanics, a Bachelor of Science degree in Physiology, and a Master of Science degree in Mechanical Engineering from Michigan State University. I hold a PhD degree in Industrial Engineering with a focus on injury biomechanics from the University of Miami. My PhD dissertation evaluated the response of instrumented headforms and cadaver heads during impact attenuation testing and quantified the residual crush to motorcycle helmet foam liners. I was also part of a National Football League-funded project that evaluated the accuracy of helmet- and mouthguard-based instrumentation for measuring head acceleration during head impacts. I investigated the variability of density within and across bicycle helmet liners and quantified the relationship between liner density and

impact attenuation. I have also investigated the impact attenuation response of bicycle helmets when tested at, above, and below the test line prescribed in the performance standard. I am currently evaluating the effectiveness of anti-rotation systems in bicycle helmets under different impact angles, impact speeds, and headform orientations, and anvil surface conditions.

3. I am a licensed Professional Mechanical Engineer in the State of California. I am a member of the American Society of Mechanical Engineers, the Association for the Advancement of Automotive Medicine, the Gait and Clinical Movement Analysis Society Research Society, and ASTM International, where I am the chairperson of the equestrian helmet sub-committee. I am a Senior Biomechanical Engineer at MEA Forensic Engineers & Scientists, Inc. where I specialize in cases involving helmets and helmet-related head injuries and conduct biomechanical analyses for a variety of injuries related to automobile collisions, pedestrian impact, cycling and motorcycle collision, slip/trip/falls, and workplace- and sports-related injuries.

4. I believe that my credentials as set forth in my Curriculum Vitae demonstrate that I am an expert in the fields of helmet design, helmet performance testing, and helmet impact attenuation as it related to reducing head acceleration.

5. I have testified in many cases, both at trial and by deposition in the last four years. These cases are attached to this declaration as **Appendix B**. As described

in greater detail below, I believe that I am qualified to testify and opine at least as to:

- a. The level of ordinary skill of a person in the art of helmet impact attenuation and design at the time of the invention contained in the asserted patent;
- b. what such a person would have understood from the patents and publications available at that time;
- c. how a person of ordinary skill in the art would construe the claims of the '373 patent; and
- d. the validity or invalidity of the challenged claims.

6. I am not, and never have been, an employee of either party. MEA Forensic Engineers & Scientists, Inc. charges my ordinarily hourly rate in connection with my services in this case. My compensation is not related to the outcome of these proceedings, and I will not receive any additional compensation based on the outcome of any IPR or other proceeding involving the Challenged Patent.

7. I am aware that the parties are involved in a litigation in U.S. District Court for the District of Colorado, Civil Action No. 1:21-cv-2112-CMA-SKC.

II. MATERIALS CONSIDERED

8. I have reviewed the '373 patent, the claims of the '373 patent, and the file history of the '373 patent.

9. I have also reviewed the Petition for IPR filed by The Burton Corporation ("Petitioner"), all exhibits in support of that Petition, including the Declaration of Steve Copeland (Ex. 1003).

10. In forming my opinions, I have considered the materials listed above and any other documents cited in this declaration. I have also relied on my own education, knowledge, and experience in the relevant art.

11. I have also considered the understanding of a person of ordinary skill in the art around the time of the invention the Challenged Claims of the Challenged Patent.

III. SUMMARY OF MY OPINIONS

12. In summary, it is my opinion that each of the Challenged Claims of the Challenged Patent is valid and not obvious, despite Petitioner's claims to the contrary. As discussed more fully herein, Petitioner and its expert, Mr. Copeland, have failed to show that it is more likely than not that the Challenged Claims would have been considered obvious to a person of skill in the art ("POSITA", discussed below) at the time of the filing of the application which matured into the '373 patent.

IV. LEGAL PRINCIPLES

13. Patent counsel has informed me of the following patent law principles, upon which I have relied to arrive at my conclusions.

A. Legal Standard for Anticipation

14. It is my understanding that for an invention to be patentable, among other things, it must be new and non-obvious. If the invention has been patented

and is found to be not new or is found to be obvious, that patent may be found to be invalid.

15. A claimed invention is not new if all the limitations of that claim are present in a single prior art reference. If a single prior art reference contains all the limitations, it is said to anticipate the claim. 35 U.S.C. § 102(a) states:

“A person is not entitled to a patent if the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent.”

16. “An anticipating reference must describe the patented subject matter with sufficient clarity and detail to establish that the subject matter existed in the prior art and that such existence would be recognized by persons of ordinary skill in the field of the invention.” *Crown Operations Int'l. v. Solutia, Inc.*, 289 F.3d 1367, 1375 (Fed. Cir. 2002). “For a prior art reference to anticipate in terms of 35 U.S.C. § 102, every element of the claimed invention must be identically shown in a single reference.” *Diversitech Corp. v. Century Steps, Inc.*, 850 F.2d 675, 677 (Fed. Cir. 1988). This “identity” requirement demands that “[e]very element of the claimed invention must be literally present, arranged as in the claim...” *Richardson v. Suzuki Motor Co., LTD.*, 868 F.2d 1226, 1236 (Fed. Cir. 1989). “Whether a reference is analogous art is irrelevant to whether that reference anticipates. A reference may be from an entirely different field of endeavor than that of the claimed invention or may

be directed to an entirely different problem from the one addressed by the inventor, yet the reference will still anticipate if it explicitly or inherently discloses every limitation recited in the claims.” *State Contr. & Eng’g Corp. v. Condotte Am Inc.*, 346 F.3d 1057, 68 USPQ2d 1481, 1488 (Fed Cir. 2003).

17. It has been explained to me that if a claim limitation is not explicitly disclosed or embodied in an item, one should determine whether it is disclosed or embodied “inherently.” A claim limitation is only inherently disclosed or embodied for anticipation if one of ordinary skill in the art would recognize that the claim limitation is always or necessarily present in or required by the disclosure or embodiment.

B. Legal Standard for Obviousness

18. It is my understanding that even if all the limitations of a patented invention cannot be found in a single prior art reference, the patent may still be found invalid if the invention would have been “obvious” to a POSITA at the time of the invention. 35 U.S.C. § 103(a) codifies the requirement that a patented invention cannot be obvious:

“A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”

19. Obviousness may be shown by considering “whether two or more pieces of prior art could be combined, or a single piece of prior art could be modified, to produce the claimed invention.” *Comaper Corp. v. Antec, Inc.*, 596 F.3d 1343, 1351-52 (Fed. Cir. 2010).

20. “If a person of ordinary skill in the art can implement a predictable variation [on the prior art], and would see the benefit of doing so, §103 likely bars its patentability.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417.

21. In considering whether the prior art renders the disputed claims obvious, the court should “be aware . . . of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.” *Id.* at 421. I understand this to mean, among other things, that a POSITA should guard against a tendency to use the patent and patent claims as a guide to identify claim elements in the prior art and then conclude that it would have been obvious to combine those elements to achieve the benefits described in the patent with respect to the inventions of the patent. *See Grain Processing Corporation v. American Maize Products*, 840 F.2d 902, 907 (Fed. Cir. 1988) (“Care must be taken to avoid hindsight reconstruction by using ‘the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claim in suit.’”) (*quoting Orthopedic Equipment Co. v. U.S.*, 702 F.2d 1005, 1012 (Fed. Cir. 1983)). Rather, one should analyze obviousness from the

perspective of a POSITA having no knowledge of the claimed invention or the patent in question at the time the patent application was filed to determine whether the inventions claimed in the patent would have been obvious in view of the prior art and the knowledge and motivations of a POSITA, among other things.

22. In analyzing the differences between the prior art and the claimed invention, one should consider “any differences between the teachings found in the prior art and the claimed invention, from the vantage point of a hypothetical person with ordinary skill in the art.” *Teleflex, Inc. v. KSR, Int’l*, 298 F.Supp. 2d 581, 591 (E.D. Mich. 2003). “The claimed invention should be construed as a whole, although limitations found only in the specification should not be added to the claims.” *Id.* Even if all of the recited elements in the claimed invention are present in the prior art, the claimed invention is not obvious “unless there is some motivation or suggestion to combine the prior art teachings, either in the prior art itself or by reasonable inference from the nature of the problem, or from the knowledge of those of ordinary skill in the art.” *Id.* at 593 (internal quotations omitted).

23. I understand that the Supreme Court has rejected a rigid test of obviousness, but has noted that “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.” *KSR Int’l Co. v. Teleflex, Inc.* 550 U.S. 398, 418 (2007) (affirming *Teleflex*, 298 F. Supp. 2d 581). I have been

informed that the Supreme Court explained that when making a determination of whether the inventor would be motivated to combine elements from prior art references, a court must look to interrelated teachings of multiple patents, the effects of demands known to the design community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art. These elements are necessary to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. Significantly, “[t]he incentive to combine prior art references can come from the prior art itself or be reasonably inferred from the nature of the problem to be solved, leading inventors to look to references related to solutions to that problem.” *Teleflex*, 298 F.Supp. 2d at 594.

24. I understand that “the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). “When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show

that it was obvious under §103.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007).

25. I understand that obviousness is based on four underlying factual inquiries enumerated by the Supreme Court in *Graham v. John Deere*:

- (1) the scope and content of the prior art,
- (2) the differences between the prior art and the claims at issue,
- (3) the level of ordinary skill in the pertinent art, and
- (4) any objective indicia of non-obviousness (also called secondary considerations).

Id. at 406 (quoting *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966) (rejecting the Federal Circuit’s more formalistic inquiry into obviousness)).

V. PERSON OF ORDINARY SKILL IN THE ART

26. I have been informed and understand that for purposes of assessing whether prior art references render a patent claim obvious (whether alone or in combination), the patent and the prior art references must be assessed from the perspective of a POSITA to which the patent is related, based on the understanding of that person at the time of the patent claim’s priority date. I have been informed and understand that a POSITA is presumed to be aware of relevant prior art and the conventional wisdom in the art and is a person of ordinary creativity. I have applied this standard throughout my declaration.

27. For purposes of my analysis herein, I have accepted Mr. Copeland’s conclusion about the level of skill in the art: a POSITA in August 2013 would have

had a Bachelor's degree in mechanical engineering, industrial design, or a similar such degree, and at least two years of experience with helmet design and would have had familiarity with the materials and manufacturing processes thereof. Additional education could have substituted for experience, and vice versa.

28. By 2013, I held a Master's in mechanical engineering and had experience testing and evaluating helmets. Therefore, I was a person of more than ordinary skill in the art during the relevant timeframe.

29. When developing the opinions set forth in this declaration, I assumed the perspective of a POSITA in August 2013, as set forth above.

VI. '373 PATENT

A. Disclosures of the '373 Patent

30. The '373 patent application was filed on August 13, 2013. Ex. 1001 at 1. Smith and Koroyd are listed as Assignees of the '373 patent. Ex. 1002 at 1. The '373 patent's background explains that "[h]elmets are used in many outdoor activities to protect the wearer from head injuries." Ex. 1001 at 1:6-7. Conventional protective helmets at that time commonly employed an outer shell and an inner-liner formed of an impact-absorbing material, ordinarily a type of polystyrene foam (referred to herein as "EPS" foam) or similar foam product.

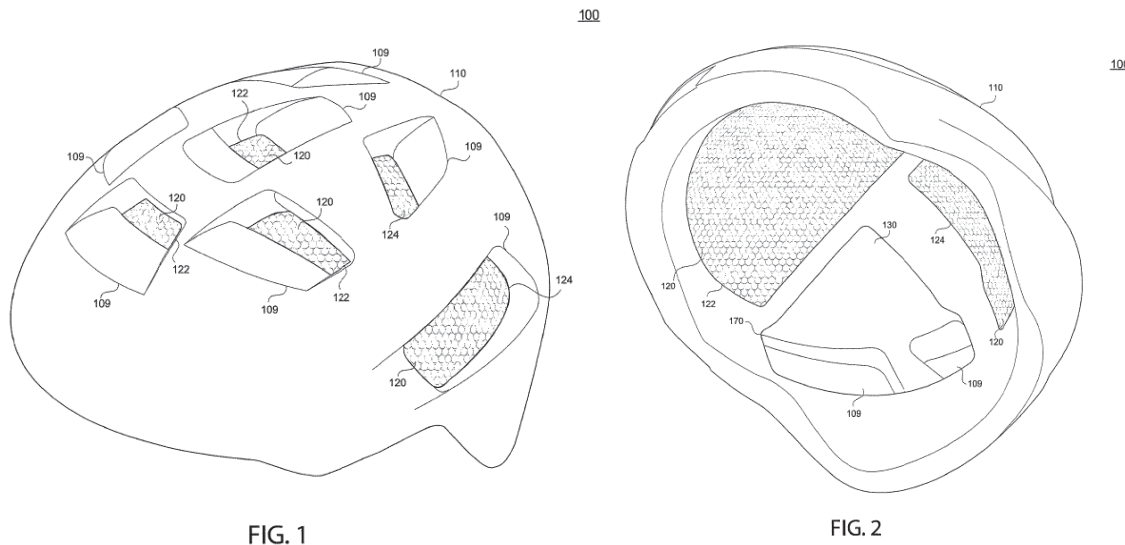
31. The '373 patent discloses improvements on conventional helmet designs through a combination of multiple shock absorbing materials in a specific

configuration, namely, “a helmet formed having a shell, a shock absorbing liner formed from a first shock absorbing material (e.g., expanded polystyrene (EPS) material, expanded polypropylene (EPP) material, or another suitable shock absorbing material). The shock absorbing liner includes one or more cavities (e.g., openings, recesses, etc.) having a shape to receive a shock absorbing insert formed from a second shock absorbing material (e.g., a honeycomb material).” Ex. 1001 at 1:57-65. The honeycomb material is disclosed to have open ends such that air from ventilation ports on the helmet may flow through into the interior of the helmet to cool the wearer’s head. *See id.* at 2:18-27. Such a helmet balances various “competing factors” in creation of a desirable helmet product set forth in the introduction to the ’373 patent:

Consumers measure the desirability of a helmet based on various criteria. For example, helmets should provide good protection to the head in the event of an impact, but should also be relatively light in weight and provide sufficient ventilation when worn. Helmets should also be affordable and have a design that facilitates manufacturability. Additionally, a helmet should be esthetically pleasing.

Often, these various criteria compete with one another. For example, a helmet that is light in weight and provides adequate ventilation is generally less impact resistant than one that has a heavier design. That is, a helmet can be designed with a harder shell material that is generally heavier than other lighter shell materials resulting in a helmet that provides greater protection but is not as light as desirable. A helmet may be designed to have less ventilation cavities to improve coverage of the head in the event of an impact, but this results in a helmet having less ventilation than is desirable. Additionally, a helmet providing good head protection and is light in weight may be complicated to manufacture and can be expensive.

Ex. 1001 at 1:11-30. Examples of this helmet are shown at Figures 1 and 2 of the '373 patent.



32. In Figures 1 and 2, helmet 100 comprises a shell 110 that “generally forms a bowl-shape,” through which vents 109 are formed “to provide ventilation to the head of a wearer.” Ex. 1001, 2:10-14. As further illustrated in FIG. 2, a “shock absorbing liner 130 lines at least a portion of the interior of the shell 110” and comprises cavities into which shock absorbing inserts (e.g., inserts 122 and 124, illustrated in FIG. 2) are positioned. *Id.* at 2:10-40. In Figure 2, one of the inserts 126, depicted in FIG. 3, is removed “to show a cavity (e.g., an opening, recess, etc.,) 170 of the shock absorbing liner 130.” *Id.* at 2:35-37.

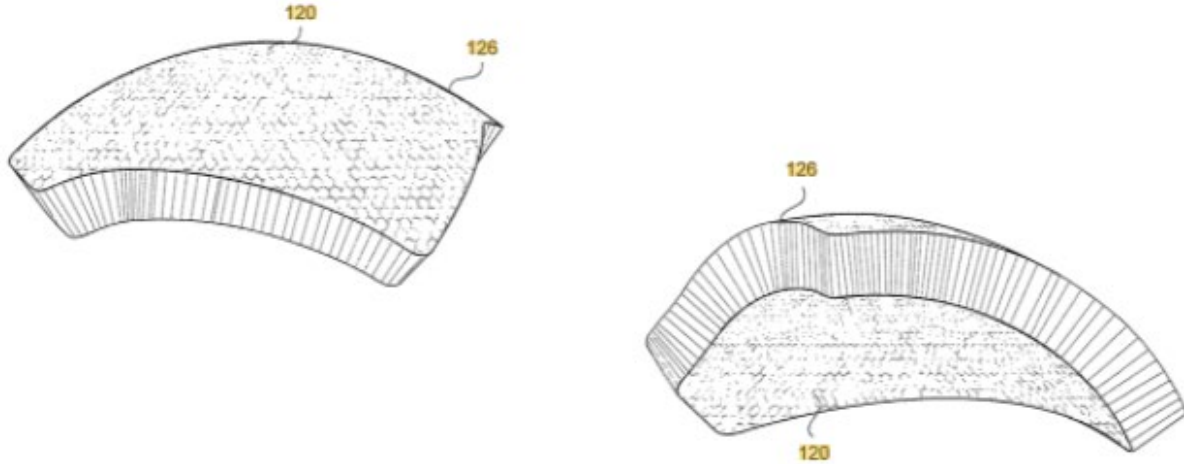


FIG. 3

33. The shock absorbing liner 130 and the inserts 122, 124, and 126 collectively form the bowl shape of the helmet “having a concave portion that is configured to receive a wearer’s head.” *Id.* at 2:37-40.

34. Figures 4 and 5, reproduced below, illustrate a vertical cross section and a front-to-back vertical cross section of helmet 100. *Id.* at 4:40-5:30.

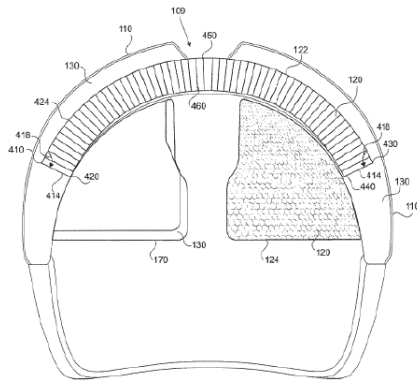


FIG. 4

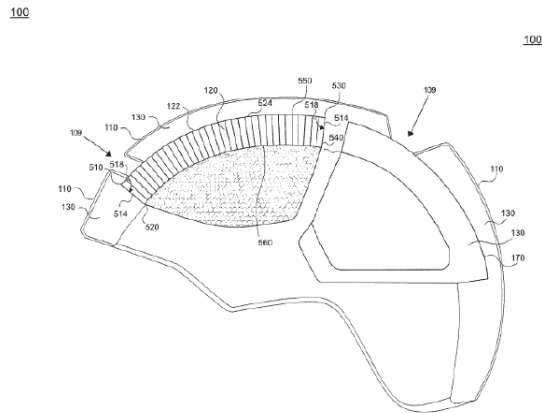


FIG. 5

B. Claims of the '373 Patent

35. The '373 Patent has 17 claims with claims 1, 9, and 12 being independent claims. Claim 1 is representative of the subject matter of the other claims.

1. A helmet, comprising:

a shell comprising a plurality of vents including a first vent defining a first opening and a second vent defining a second opening;

a shock absorbing liner adjacent to and attached to the shell and comprising a cavity at least partially aligned with the plurality of vents; and

a shock absorbing insert positioned in and substantially filling the cavity such that the shock absorbing insert is visible through and spans across at least a portion of each of the plurality of vents, wherein at least a portion of the shock absorbing liner is positioned between the shell and the shock absorbing insert, wherein the shock absorbing insert comprises an array of energy absorbing cells, each having respective open first longitudinal ends and open second longitudinal ends, wherein the first longitudinal ends of a first plurality of adjacent cells of the

array of energy absorbing cells are positioned within a perimeter of the first opening and the first longitudinal ends of a second plurality of adjacent cells of the array of energy absorbing cells are positioned within a perimeter of the second opening such that air is able to flow from an exterior side of the helmet through each of the first and second vents and through a respective one of the first and second plurality of adjacent cells toward an interior of the helmet.

36. I was informed that the United States Patent and Trademark Office (USPTO) examiner and the patent applicant engaged in a protracted, seven-year prosecution of the application leading to the issued claims of the '373 patent. *See* Ex. 1002.

C. References and Technology Related to the '373 Patent

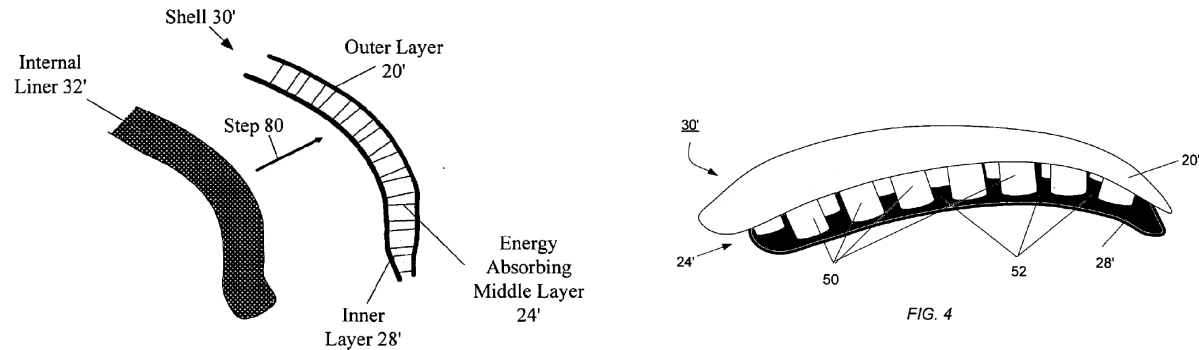
37. I will address certain references discussed by Mr. Copeland here, then other references not discussed Mr. Copeland.

38. In my opinion, as explained in more detail below, the references Mr. Copeland cites *do not* suggest the use of an open honeycomb structure in a cavity of an EPS foam liner in in the manner claimed in the '373 patent. Rather, these references as well as other prior art references demonstrate that at the time of the '373 patent application (*i.e.*, August 2013), honeycomb structures should not be placed across open vents but rather, should be sandwiched or bounded by other layers when used to improve impact attenuation in safety helmets and to protect the wearer from sharp, rigid cell walls. These conclusions are supported by the

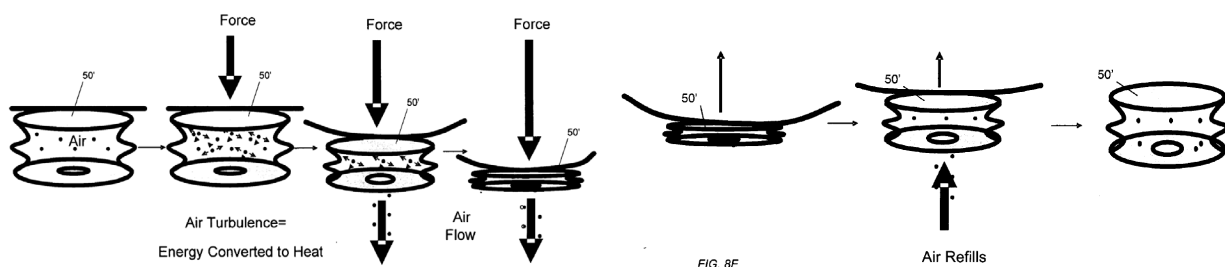
references below, my related analysis of these references, and the file history for the '373 Patent.

1. Ferrara

39. Ferrara was cited by the examiner during prosecution of the '373 patent claims. *See, e.g.*, Ex. 1002 at 413. Ferrara teaches that the *outer shell* of a sports helmet can be formed using a three-layer construction using an outer shell layer [20], a compressible middle layer [24], and an inner shell layer [28].



40. The middle layer is made up of small compressible tubes [50], which can have an air hole on the interior side for air to escape between the outer and inner shell layers of the helmet when the tubes are compressed rapidly and for air to reenter when the tubes bounce back to their uncompressed form. Ex. 1011 ¶¶ [0036], [0065]; *see also* FIGS. 4, 6, and 8b-f.

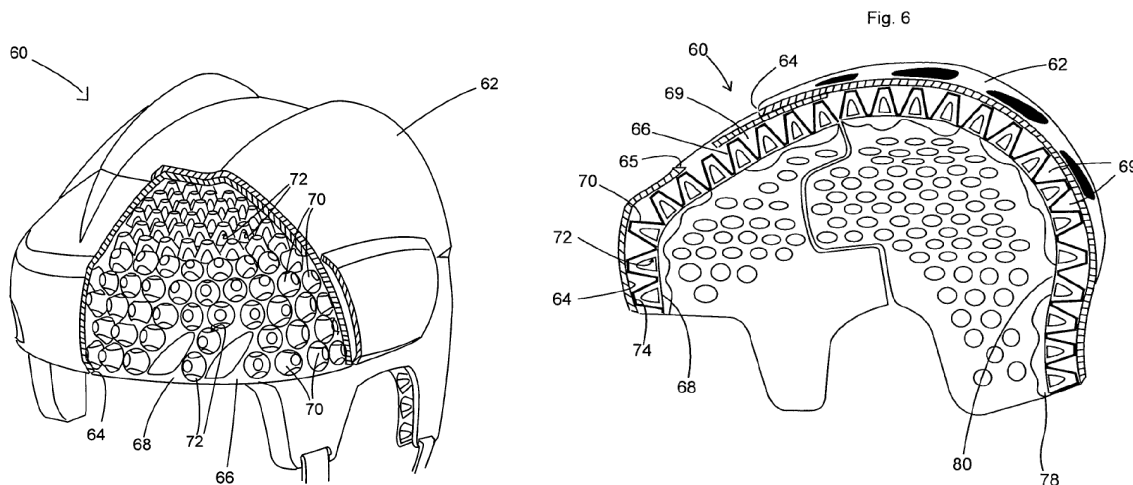


41. Ferrara does not teach or suggest the use of a shock-absorbing insert to be placed within a cavity of a foam liner, nor does it suggest using an array of open energy absorbing cells that span across the vent openings of the helmet. Ferrara does not teach using the tubular structure to cool a wearer's head. In fact, it teaches that air escapes the tubes when a helmet shell is struck, and doing so converts the impact energy to heat as the air escapes the narrow openings in the tubes. *See id.* at [0066] (“The size of the opening 136, which is small relative to the volume of air moved by the force, restricts the emission of the turbulent or laminar air from the chamber 132 and thus causes resistance within the chamber 132. Eventually the resistance is overcome and air flows out, but during this process, the impact energy is thus converted to heat.”). Thus, for a wearer to achieve airflow from a tube in the Ferrara helmet, they would have to hit the helmet (the resulting airflow being correlated to the force of the impact). According to Ferrara, this heats the ambient air, which is the opposite of the purpose of airflow from the '373 patent, which is to allow airflow to cool the wearer or for perspiration to escape the helmet. Furthermore, due to the dual-layered shell, the escaped air is not capable of flowing onto the wearer's head.

2. Copeland

42. The Copeland reference proposes a shock absorbing structure “used to *replace* foams or other impact absorption devices[.]” Ex. 1014 5:29-30 (emphasis added). The invention of Copeland is made by “removing [the] standard foam liner”

of a helmet and *replacing* it with a different shock absorbing liner [66] that allows better internal circulation of air to reduce heat. *See id.* at 4:52-5:8. Copeland discloses testing results showing “that using the shock absorbing structure of the present invention results in consistently lower temperatures than using the standard foam liner.” *Id.*



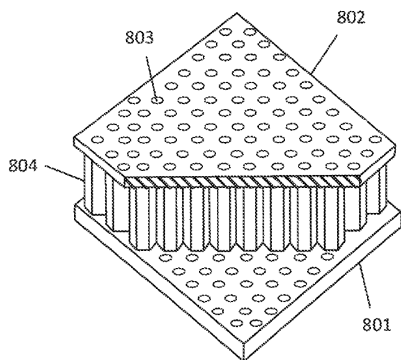
43. Thus, a POSITA reading Copeland would be discouraged from combining the new shock-absorbing liner with a traditional foam liner, as that would defeat the purpose of Copeland’s invention—which is to lower the temperature within the helmet by *removing* and replacing the foam liner with the new shock-absorbing of liner.

44. Furthermore, that the conical structures of the Copeland helmet abut the rigid shell of the helmet on one side, and are connected via a planar lower surface that abuts a wearer’s head, similar to the sandwich structures described elsewhere in the art. *See, e.g., id.* at FIGS. 1, 5-7.

3. Bottlang (Ex. 1008)

45. Bottlang was cited by the examiner during prosecution of the '373 patent claims. *See, e.g.*, Ex. 1002 at 726. Bottlang teaches the conventional use of a honeycomb structure coupled to an outer and inner layer. *See* Ex. 1008 at Abstract; Figs. 1-2, 6-7; [0024]. Although Bottlang teaches the use of small perforations through the outer and inner layers to allow air to flow through the cells, depicted below, Bottlang expressly *discourages* the use of larger ventilation holes that may result in gaps in protection.

Figure 8



“FIG. 8 illustrates a cross-sectional view of a section of another embodiment, wherein the outer layer 801 and inner layer 802 are perforated with a multitude of holes 803, which may allow for ventilation through the honeycomb cells in intermediate layer 804. ... It will be appreciated that it may be advantageous to supply the helmet with a multitude of small ventilation holes ***in order to prevent the gaps in protection*** that may result from the larger ventilation holes used in most conventional helmets.”

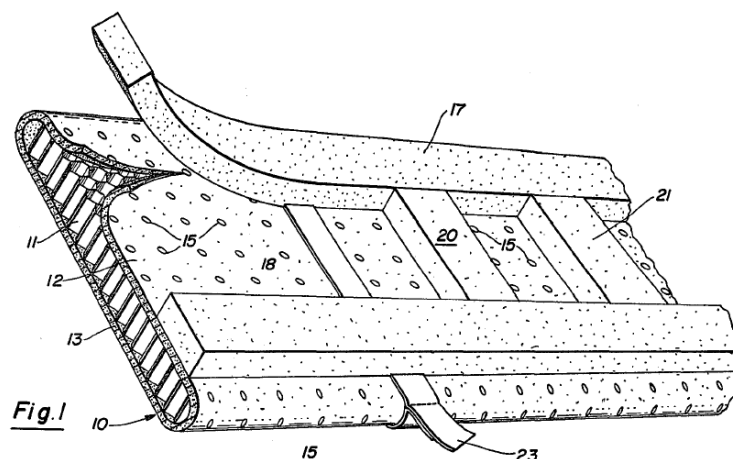
Id. at Fig. 8, [0036] (emphases added).

46. A POSITA reading Bottlang would be *disinclined* to allow a plurality of open cells to span across the open space of a conventional helmet vent, but rather would understand that the intermediate honeycomb structure maintains an upper and lower layer that may include small ventilation holes. A POSITA reading Bottlang would understand the reference to avoid using an unbounded and open-ended

honeycomb core, as openings larger than a small perforation are expressly discouraged because they can result in a “gap in protection”.

4. Landi (Ex. 1010)

47. Landi teaches the use of a honeycomb structure sandwiched between layers of elastomeric foam in the context of a protective pad for a user’s body. Ex. 1010 at 1:48-60, 2:30-40. Landi does not suggest using this structure in a helmet. Although Landi teaches the use of small “perforations” to allow air flow through select cells of the honeycomb structure, Landi, consistent with Bottlang, expressly discourages the use of open, unbounded honeycomb cells in body protective gear and indicates that a boundary layer at each end bonded to the edges of the cell walls preserves the cells from destruction while they absorb the impact force.



“The device of this invention also includes a resilient layer over both ends of the cells. ... The foam elastomer adjacent the body of wearer protects the body from the sharp, rigid cell walls, and the resilient material on the outside of the device of this invention protects another player of a contact sport from injury from the sharp, rigid

cell walls. However, *the resilient layers perform another, extremely important function, namely, to preserve the cells from destruction while they are absorbing the force of an impact.* ...The resilient material reinforces only the edges of the cell walls and tends to restore them to their original shape when they have been buckled by being subjected to an impact. This effect increases the useful life of a shield made in accordance with the present invention, better distributes the force to be absorbed throughout the cells, and avoids formation of crushed and accordingly thinner portions of the protective shield which would absorb the energy of impact less effectively. ... *If the protective shield is to be worn directly, bonding the resilient material to the cell edges is essential.*”

Id. at 2:30-57 (emphases added).

48. A POSITA reading Landi would be *disinclined* to allow an open cell structure to be used in protective gear worn adjacent the body, but rather would understand that the intermediate honeycomb structure maintains an upper and lower layer. Removing the upper and lower layer across the intermediated honeycomb structure would go against what Landi discloses as “essential” and “extremely important functions” performed by those outer sandwich layers.

5. Talluri (Ex. 1009)

49. The parent patent to Talluri (U.S. Patent No. 7,089,602) was cited by the examiner during prosecution of the '373 patent claims. *See, e.g.,* Ex. 1002 at 724. Talluri (Ex. 1009) teaches the use of a honeycomb structure on the *outside* of the hard shell of the helmet, and does not suggest that honeycomb cells could be used to facilitate ventilation to the interior of the helmet. Instead, Talluri indicates

the use of perforations in the walls of the honeycomb [20] is to allow air to flow *between cells*, but the ends of the honeycomb structure are sealed by a rigid outer layer [30] on top and the hard casing [10] at the bottom. Ex. 1009 at 2:64-3:3. Talluri explains that using sandwiched honeycomb structure on the outside of the hard shell casing of a motorcycle helmet “reduces the shockwave generation” of the initial impact “before passing on the impact force to the hard casing of the helmet.” Ex. 1009 at 1:66-2:3, 3:16-30.

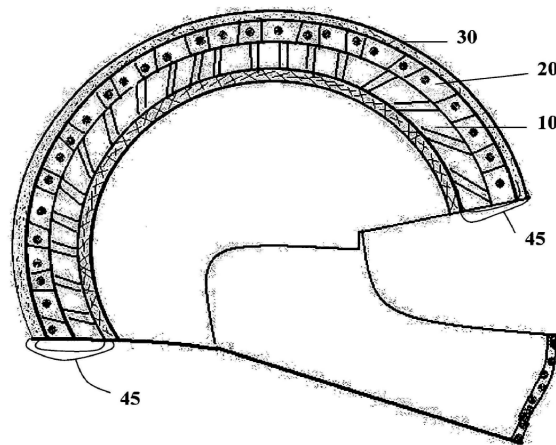


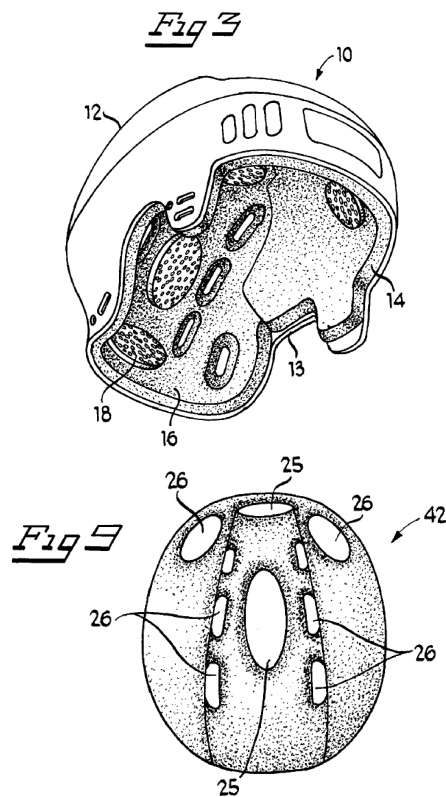
FIG. 4

50. A POSITA reading Talluri would understand the conventional use of honeycomb structures sandwiched between an upper and lower layer and would be *disinclined* to use an open cell structure beneath the hard shell and spanning across open vents in a helmet.

6. Fournier (Ex. 1012)

51. Fournier was cited by the examiner during prosecution of the '373 patent claims. *See, e.g.*, Ex. 1002 at 424-29, 488-90. Fournier teaches the use of

plugs that fit within “plug holes” in the foam liner of a helmet, but expressly states that these holes and plug **do not** align with or span the helmet vents in the outer shell.



“At least one hole 25 extends through the thickness 24 of the first material 16, although a series of holes 25 are preferred. In a preferred embodiment, there are two different types of holes, plug holes 25 and ventilation holes 26. Plug holes 25 receive plugs 19 fabricated from the second material 18 (hereinafter referred to as second materials plugs), ***while ventilation holes 26 remain open and are aligned with ventilation holes 45 in the outer shell 12.*** Alignment of ventilation holes 26 in the first material 18 with ventilation holes 45 in the outer shell 12 facilitates air flow through the helmet 11, to, in turn, cool a wearer’s head.

Ex. 1012 at Figs. 3-10, 4:16-31 (emphases added).

52. Fournier teaches that the plugs and liner should be made of different impact-absorbing material but does not teach using a honeycomb material for the plugs. *See id.* at 4:3-31. Thus, Fournier teaches a POSITA that impact-absorbing inserts or plug should be placed at locations other than the locations of the helmet vents, which should “remain open.””

53. During prosecution of the '373 patent claims, the patent examiner asserted a combination of Fournier with the teachings of the Sajic Patent¹ (U.S. Patent No. 8,082,599; Ex. 1020) to argue “[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Fournier’s teaching of an insert to include Sajic’s teaching of an insert with a honeycomb shape since doing so would give rise to increased energy absorbing performance, and would therefore improve the safety of the device.” Ex. 1002 at 717.

54. I consider this combination of Fournier and the Sajic Patent to be substantively the same as the combination of Muskovitz and the Sajic Application asserted by Mr. Copeland and the Petitioner.² Like Fournier, Muskovitz teaches the use of an insert or plug [26] into a recess within the foam liner [18], but in a manner that it would not span across the vent openings in the helmet, as shown below using the illustration from Mr. Copeland (Ex. 1003 ¶41 (annotating Ex. 1005 FIG. 10)).

¹ The Sajic Patent and the Sajic Application both name Peter Sajic as the inventor, but the Sajic Patent claims priority to a Patent Cooperation Treaty (PCT) application filed almost two years earlier than the Sajic Application’s PCT priority application. *See* Ex. 1020 at 1 and Ex. 1006 at 1.

² I discuss the contents of the Muskovitz and Sajic References more fully below.

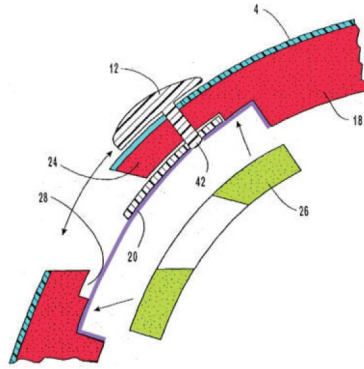


FIG. 10

55. Muskovitz can be considered less relevant to the Challenged Claims than Fournier, because Muskovitz (a) does not describe the insert 26 as improving the impact resistance of the helmet (instead it is used simply to help define a space for the adjustable vent actuator to slide), (b) encourages using the *same material* for the insert 26 as the liner 18, and (c) teaches that the insert [26] should *not* fill the cavity space in the liner. Ex. 1005 at Fig. 10, [0087]-[0088]. In contrast, Fournier teaches the use of different material for the plugs, explains that the plugs are designed to *improve* impact-resistance, and describes the plugs as filling the plug holes because they can be designed to create an “interference fit” within the liner so adhesive is not needed. Ex. 1012 at 5:1-13. If the examiner concluded the Challenged Claims were patentable after considering obviousness by combining Fournier and the Sajic Patent, it seems the combination of Muskovitz and Sajic would likewise not have prevented allowance of the ’373 patent claims.

7. Ferguson (Ex. 1013)

56. Ferguson was cited by the examiner during prosecution. *See, e.g.*, Ex. 1002 at 38. Ferguson teaches the use of a “layered impact shock-absorbing material” made of a first layer of shock-absorbing material that can be a honeycomb material [2] and a second layer of “shear-thickening or dilatant material” [4] across the first layer. *See* Ex. 1013 at 2:1-38; *see also id.* Fig. 1.

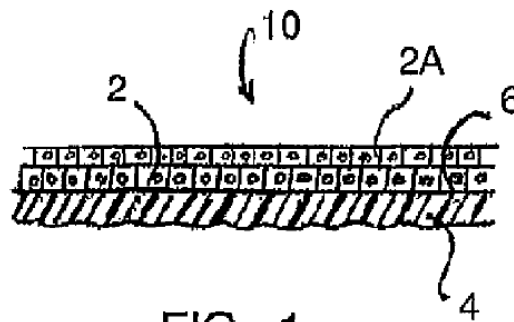


FIG. 1

57. Ferguson explains that the “shear-thickening or second layer 4 serves to shunt impact forces exerted by an external object over a greater surface area, thereby reducing the local forces that are passed on to the shock absorbing layer 2.” *Id.* at 5:16-25. Ferguson also teaches that perforations can be made in the “vertical honeycomb cell walls” to “allow the honeycomb to buckle, i.e., the vertical walls deflect away from their vertical orientation.” *Id.* at 5:66-6:6. Ferguson teaches perforation in side walls rather than the use of an open-ended, unbounded cellular structure across helmet vents to facilitate venting. Additionally, a POSITA reading

Ferguson would understand a honeycomb structure is used with the additional shear-thickening layer attached.

8. Fox Striker (Ex. 1015)

58. The Fox Striker bicycle helmet contains many vents, including two venting grids in the lower rear portion of the helmet. The “structural honeycomb venting inserts” in the Fox Striker helmets are not shock-absorbing inserts as a POSITA would understand that term in the context of the ’373 patent. Mr. Copeland is wrong to cite the Fox Striker helmet as an example of using energy-absorbing hexagonal cells “like the honeycomb configuration of Landi.” Ex. 1003 ¶32. These rigid plastic vents provide structural stability to the helmet, but do not *absorb* energy, or attenuate head acceleration during a head impact as would an EPS foam liner or honeycomb structure with walls that buckle and crush. The prior art teaches that energy-absorbing honeycomb cells used to absorb impacts are longitudinal cells that are designed to absorb energy via the buckling of the cell walls. Landi explains this as follows:

Force applied to a honeycomb material in the direction parallel to the axes of the cells is resisted by the stiffness of the honeycomb material and **such forces are absorbed and widely distributed by the buckling of the side walls of the cells.** When one wall of a cell buckles, the other walls of the same cell must also buckle because they are all connected to one another, and since all walls of the cell are also walls of adjacent cells, the walls of adjacent cells also buckle under the effect of a force. **This effect gives the honeycomb core of this invention the ability to**

absorb a great deal of energy from an impact and in addition the energy of impact that is not absorbed is distributed over a wide area beneath the core even though it may be focused on a small area where it occurs.

Ex. 1010 (Landi) at 2:14-29 (emphasis added).

59. Other prior art describes the energy absorbing function of honeycomb cells the same way. *See, e.g.*, Ex. 1006 (Sajic Application) at ¶¶ 7-9 (“Columns tend to produce a relatively constant level of energy absorption as the column is progressively buckled or crushed.”). The plastic vents of the Fox Striker helmet are not an example of using energy absorbing cellular structures to improve impact-absorption in a helmet as they do not absorb energy by buckling and crushing.

60. Based on the foregoing prior art teachings, a POSITA would know that safety helmets use outer rigid shells, foam liners, and vents. A POSITA would also know that cellular honeycomb materials can also be used in a helmet when combined with another layer across the honeycomb to ensure more uniform impact force distribution as taught in various references that discuss the use of honeycomb cellular materials. *See, e.g.*, Ex. 2008 (US Patent 3,447,163) at 1:53 (“The double-skinned outer shell . . . provides a further force-attenuating barrier in addition to the normal shock-absorbing material within its inner shell.”); Ex. 2007 (WO 1994/00031) (“the outer membrane serves to transmit and spread the load of any impact to the honeycomb...”); Ex. 1011 (Ferrera) (“A semi-rigid outer shell distributes the force of impact over a wide area...”); Ex. 1007 (Sajic International

Application) at 2:1-4 (disclosing “outer skin of tough plastics material . . . transmits an impact load more evenly to the inner skin which absorbs the energy imparted by the impact load”; 4:7-13 (reciting prior art honeycomb sandwich panels with “tough outer skins”); 13:8-14:6 (disclosing inventive helmet liner with honeycomb core between outer and inner skins)); *see also* Ex. 2002 (Caserta Thesis) at 13 (disclosing a main function of a helmet shell to be “distribution of the impact load along a wider surface, which also results in an increase of the energy absorption capability offered by the underlying polymeric liner.”). References that disclose honeycomb cores overwhelmingly do so by teaching the importance of the outer layers to the performance of the honeycomb cores. *See id.* This is consistent with the state of the art and the knowledge of a POSITA in 2013—honeycomb materials were historically used in sandwich panel orientations (with or without perforation), to achieve the maximum benefits of honeycomb materials. A POSITA would have known that removing these outer layers would create known and foreseeable performance downsides (e.g., injury to a user based on exposure to rigid cell walls, and less impact force dispersion through the honeycomb material) without a reasonable expectation of increased performance of the honeycomb core resulting from abandoning the prior art’s consistent sandwiching approach.

9. Caserta Thesis (Ex. 2002)

61. Mr. Copeland's analysis of the state of the art did not include the studies of using honeycomb panels in helmets by Gaetano Caserta. Ex. 2002. Mr. Copeland was certainly aware of Mr. Caserta's research, as he cited it in the related district court litigation. *See* Ex. 2003 at 40-42. In Caserta's 2012 Ph.D. thesis titled, "The Use of Honeycomb in the Design of Innovative Helmets," he related that "[h]oneycomb materials have been used extensively in a wide range of applications as core of sandwich panels, . . . due to their exceptional energy absorption capabilities combined with light weight." Ex. 2002 at 23. As part of his research, Mr. Caserta created prototype motorcycle helmets by including honeycomb panels that were sandwiched between the foam liner on the one side and the helmet's rigid shell on the other; Mr. Caserta did so at three locations—in the front, at the top, and in the rear of the helmets. *See id.* 106-107. While Caserta concluded that using *sandwiched* honeycomb panels can improve impact absorption, his test results actually suggest that using honeycomb material *at the location of vents* will have the opposite effect.

62. Specifically, Caserta's testing data "suggested that the introduction of the honeycombs in the rear region led to a worsening of the protective performances of the helmet." *Id.* at 121-22. After observing the rear regions, Caserta concluded that "the contact between shell and honeycombs was not uniform at the time of

impact” in the rear region and that this was “probably caused by the contact between the rear ventilation area and the honeycombs.” *Id.*

63. Thus, immediately prior to the time of the '373 patent invention, Caserta's testing indicated that using honeycomb in the ventilation areas of a helmet could actually *diminish* the protective performance of the helmet. In other words, evidence known to Petitioner and Mr. Copeland, which they did not include in their Petition materials, shows that the claimed invention of the '373 patent utilizes an energy absorbing cellular material (like honeycomb) in a helmet in a manner that is contrary to conventional wisdom at the time, which held that honeycomb inserts near vent ports would result in diminished impact performance relative to conventional foam liners with vent ports. In other words, the way Mr. Copeland proposes to combine the Sajic Application and Muskovitz would not have been obvious but would have been contrary to the state of the art, including the express teachings of Muskovitz and Sajic themselves.

VII. CLAIM CONSTRUCTION

64. It has been explained to me that terms of a patent are presumptively afforded their plain and ordinary meaning, as they would be understood in light of (and without importing teachings from) the patent specification and file history. *See* 37 C.F.R. § 42.100(b). I further understand that exceptions to this presumption include instances where the patentee has clearly and unequivocally disclaimed the

full scope of a given term or where the patentee has acted as a lexicographer and assigned a term a clear scope.

65. I apply the plain and ordinary meaning of claim terms throughout this declaration.

66. However, there are portions of the Petition that rely on implicit claim constructions that are not consistent with the plain and ordinary meaning of claim terms, as a POSITA would understand the terms in view of the patent specification and file history.

67. For example, Petitioner's comparisons of Muskovitz and Sundahl suggest that the "shock absorbing liner" limitations of the challenged claims are limited to liners made of a single material or component. *See* Pet. at 80-81. But a POSITA reading the patent file history would not understand 'shock absorbing liner' to exclude liners made of multiple materials or components. During prosecution, at Ex. 1002, pages 567-68, the examiner rejected this argument, noting that the claim language was broad enough to capture liners comprised of multiple materials or composites. A POSITA reading the prosecution history would not conclude that a single component/material is required by the claim language "shock absorbing liner."

68. The Petitioner also implies that the term "liner adjacent to and attached to the shell" from claim 1 requires a liner which *directly* abuts and which *directly*

attaches to the shell. Pet. at 80-81. But, again, the examiner rejected this interpretation of the claims. Ex. 1002 at 567-68: “In response the application argument that padding 49 is not positioned in a cavity in a material that is adjacent to the shell (see Page 8), the examiner respectfully disagrees. The term ‘adjacent’ has been interpreted according to the definition by Merriam-Webster, i.e. adjacent: ‘close or near.’”. The plain meaning of the term adjacent to a POSITA is not as narrow as Petitioner implicitly reads it. Instead, a liner that is “close or near” to the shell and that is attached (directly or indirectly) to the shell would, under the plain and ordinary meaning of the terms, satisfy the “adjacent to and attached to the shell” limitations.

VIII. PETITIONER’S PROPOSED COMBINATION REFERENCES

69. I have evaluated the proposed combination of Muskovitz and the Sajic Application found in Ground 1 of Mr. Copeland’s declaration. I briefly summarize relevant teachings of these references below.

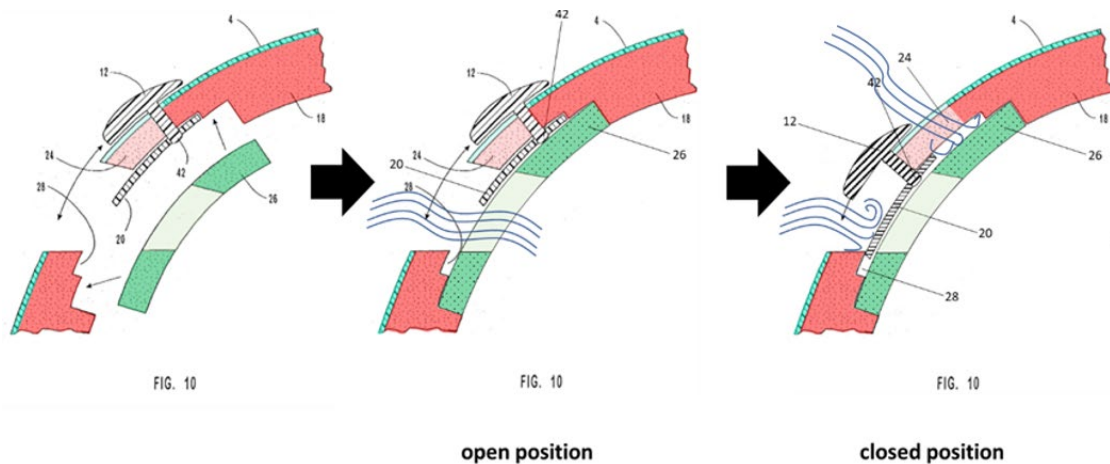
1. Muskovitz (Ex. 1005)

70. Muskovitz teaches that its innovative disclosure is “an improved ventilation system” (Ex. 1005 at [0013]) with a vent space having an enclosed vent shield “to control ambient air flow into and out of the helmet.” *Id.* at [0021]. The vent shield, element 20 in the annotated image *infra*, is situated beneath the helmet’s shell and connected through slotted portion 14 via elongated member 42 to a fluid

airflow actuator 12 that sits above the shell. *Id.* at [0075, 0078]. A helmet wearer can operate the vent shield by pushing down or up on the fluid airflow actuator, causing the vent shield to move into an “open” or “closed” position. These positions enable the user to selectively block airflow from entering the helmet or, conversely, to allow such airflow. Ex. 1005 at [0080] (“vent shield 20 is able to slide . . . within vent box 22. As it does so, vent shield 20 either covers, uncovers, or partially covers ventilation ports 6 to control the flow of ambient air into the interior of protective helmet 10.”); [0100] (“in an open position, vent shield 20 is displaced such that ambient air may pass through aperture 108 in upper plate member 24, and aperture 112 in lower plate member 26, and subsequently through vent port 6 and into the interior of helmet 10. In a closed position, vent shield 20 is displaced such that ambient air is not allowed to flow through into the interior of protective helmet 10.”); [0112] (“vent shield 20 may be displaced or slide in a bi-directional manner relative vent port 6. This relationship creates a dynamic vent system in which the wearer may regulate ventilation into helmet 10.”)

71. Thus, the purpose of the vent shield 20 is to allow the user to close or open the helmet to allow airflow into and/or out of the helmet. This is depicted below in an annotated depiction of Muskovitz FIG. 10. Further, in some embodiments, insert member 26 is taught to occupy space behind slotted member 14, and any air that might enter through slotted portion 14 when the vent shield 20

is in the closed position (and neither the elongated member 42 nor fluid airflow actuator 12 block the open, upper portion of the slot) would be blocked by the insert member 26, thereby preserving the user's ability to close the interior of the helmet to ambient air flow. This is depicted through the use of the wavy blue lines I've added to FIG. 10, and which represent air flow.



72. Insert member 26 functions as a backstop for the vent shield, being shaped to create a vent space that holds the vent shield in place, to allow for actuation of the vent shield, and to include a large aperture aligned with the ventilation port to allow air flow when the vent shield is in the “open position”. Ex. 1005 at [0088-89]. The insert member 26 is taught to preferably be constructed of the same or similar material as the helmet's liner. *Id.* at [0087]. The helmet's liner is disclosed to be composed of, for example, EPS foam, or a closed-cell and foamed polymeric material (which may be a polyethylene foam). *Id.* at [0119-0120]. Muskovitz does not disclose the beneficial use of honeycomb materials for either the liner or the

insert member, nor does it suggest that such materials are similar to the EPS foam and polyethylene foam suggested for the liner. *Id.*

73. Other disclosures of the Muskovitz helmet are largely consistent with other helmets of the time—the use of a foam liner, chin straps, vent ports, and a rigid shell. Importantly, the Muskovitz helmet is not disclosed as a safety advancement on other helmets in the art (for example, Muskovitz discloses not data showing improved impact performance relative to other helmets), but rather as an improved way to include actuating ventilation mechanisms into a helmet. In this context, insert 26 is not taught as improving impact performance and is taught as a “removable” feature that the user can remove at its discretion. *Id.* at [0087-0088].

2. The Sajic Application (Ex. 1006)

a) Procedural Context

74. The Sajic Application (Ex. 1006) should be understood in context, both in relation to the '373 patent and in the context of other disclosures by the same inventor, Mr. Peter Sajic.

75. During prosecution of the '373 patent, in its first information disclosure statement, the Applicant disclosed one patent and one patent application, both of which named Peter Sajic as the inventor, and both pertained to advances in the construction of body protecting devices utilizing energy absorbing honeycomb cells. *See* Ex. 1002 at 738-39; *see generally* Ex. 1020 (the “Sajic Patent”); Ex. 1006 (the

“Sajic Application”). The latter of these references is the same Sajic Application asserted as the minor reference in Ground 1 of the Petition. Both the Sajic Patent and the Sajic Application cite the same international patent application (WO 2005/060778; Ex. 1007) as disclosing certain advances in the same technology (*see* Ex. 1006 at [0005]; Ex. 1020 at face (disclosing PCT filing)), both share figures (*compare* Ex. 1020 Figures 1 and 5 *with* Ex. 1006 Figures 1a and 2) and specification disclosures (*compare* Ex. 1020 at 6:1-12 *with* Ex. 1006 at [0104], and both references disclose advances in the art of energy absorbing cell design in helmets.

76. The examiner cited the Sajic Patent as an obviousness reference in denying certain pending claims. *See* Ex. 1002 at 717-21, 666-68, 616-21; 563-69; 480-98.

77. The examiner also listed the Sajic Application as a reference cited and considered (*Id.* at 725) and today, the Sajic Application appears on the face of the ’373 patent as a reference cited by the examiner. Ex. 1001 at 2.

b) Analysis

78. I begin my discussion of the Sajic Application by discussing its related predecessor patent applications. The Sajic International Application discloses “energy absorbing materials used in devices having a relatively large curvature such

as safety helmets...”. Ex. 1007 at 1:5-7.³ The Sajic International Application teaches that helmets conventionally have a tough plastic spheroidal shell with a hard foam liner. *Id.* at 2. The shell is taught to transmit a load generally evenly to the foam layer which absorbs the energy imparted by the impact. *Id.* The Sajic International Application teaches that it might be advantageous to reduce the mass of a helmet and it discloses axially-loaded columns would achieve this goal while also improving the energy absorbing performance of the helmet, relative to conventional foam liners. *Id.* at 2-4. The Sajic International Application recognizes, however, that independent columns suffer drawbacks including “a localized load can cause an undesirable global failure of columns which have axis which is offset from the axis of the applied load” which should be avoided because “a global buckling failure mode (or a local failure which leads to failure of the whole column) is to be avoided as this does not efficiently absorb impact energy.” *Id.* at 2-4. Consequently, independent columns “are formed to be relatively thick to avoid instability during loading.” *Id.* at 3-4.

79. The Sajic International Application teaches an alternative to axial loading of thick, independent columns, and which perform a similar beneficial function but do not suffer this same set of drawbacks:

³ Citations to the Sajic International Application are to the pagination found in that document.

Sandwich panels, consisting of two tough outer skins separated by a core material having a lower stiffness, have been used in many applications such as building components and structural panels for road vehicles and aircraft. A popular core consists of a honeycomb structure, that is an array of cells, each cell having a hexagonal cross-section. However, these cells, or cells of other cross-sections cannot be regarded as connected columns since each side wall is shared with the neighbouring cells. If one cell experiences local failure or instability then this will affect the neighbouring cells.

Id. at 4.

80. The Sajic International Application teaches that these sandwich panels having honeycomb cores and similar core materials have been used in various energy-absorbing applications over time, but “problems arise when the material is used in items having a large curvature” like helmets. *Id.* at 5. The Sajic International Application therefore discloses an energy absorbing sandwich panel with a honeycomb core that is designed to allow for the panel to be heated, transferred to a mold, molded (allowing for slippage between the outer skins and the honeycomb core), cooled, and placed inside a rigid shell of a helmet. *Id.* at 17-18. This arrangement is taught to be an improvement on conventional foam and column impact absorbing materials for use in helmets.

81. The hexagonal and tubular cores of the Sajic International Application are viewed from above in Figures 4 and 5 below, and a profile view of the core material sandwiched between outer skins is seen in Figure 3. The patent teaches that

the honeycomb core may be manufactured of various materials but would preferably be a plastic or composite material. *See id.* at 10.

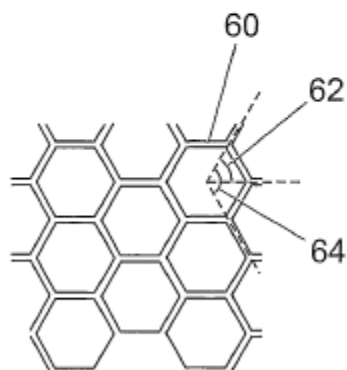
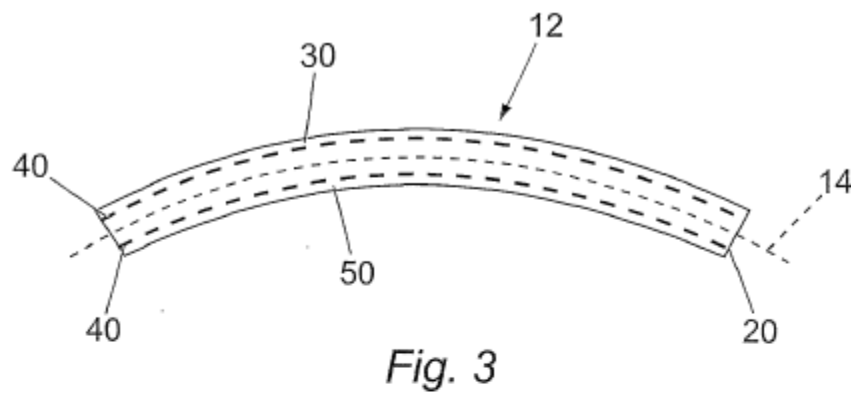


Fig. 4

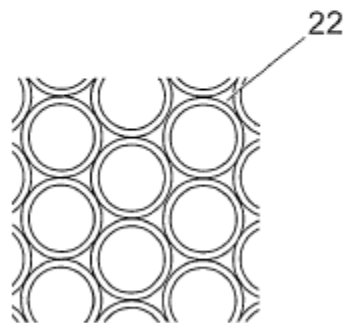


Fig. 5

82. The Sajic Patent, which was asserted by the examiner during prosecution, claims priority to the Sajic International Patent (Ex. 1020 at 1). The Sajic Patent has the same figures as the Sajic International Application (*compare* Ex. 1007 at FIGS 1-10 *with* Ex. 1020 at FIGS 1-10), and it shares a substantively similar patent specification. For example, the Sajic Patent teaches the benefits and

drawbacks of axially loaded columns to absorb energy (Ex. 1020 at 1:46-2:14), the beneficial use of honeycomb sandwich panels to avoid these drawbacks (*Id.* at 2:14-30), the preferred plastics to use to manufacture the honeycomb materials (*Id.* at 3:57-60), and how to form a honeycomb sandwich panel that may be molded and used in a helmet. *Id.* at 6:27-67.

83. The Sajic Application, like the Sajic Patent, references the teachings of the Sajic International Application as disclosing the beneficial use of energy absorbing tubes that are axially loaded and which outperform conventional foam materials to absorb energy. Ex. 1006 at [0005]. The Sajic Application repeats the understanding that instability is to be avoided during impact loading and teaches that interconnection of the core material components can avoid a “global buckling failure mode.” *Id.* at 103. Like the other Sajic References, the Sajic Application discloses the beneficial use of sandwich panels with honeycomb cores to absorb impacts:

FIGS. 1 (a) and (b) shows a first embodiment of a body protecting device in the form of a safety helmet 10. The helmet 10 comprises a first material or core 20 which is sandwiched between a second material or outer layer 30 and a third material or inner layer 40. The outer layer 30 provides an impact surface. Each of the outer 30 and inner 40 layer are bonded to the core using an adhesive. In this embodiment, each of the first, second and third materials are continuous throughout the (arcuate) major plane of the helmet 10.

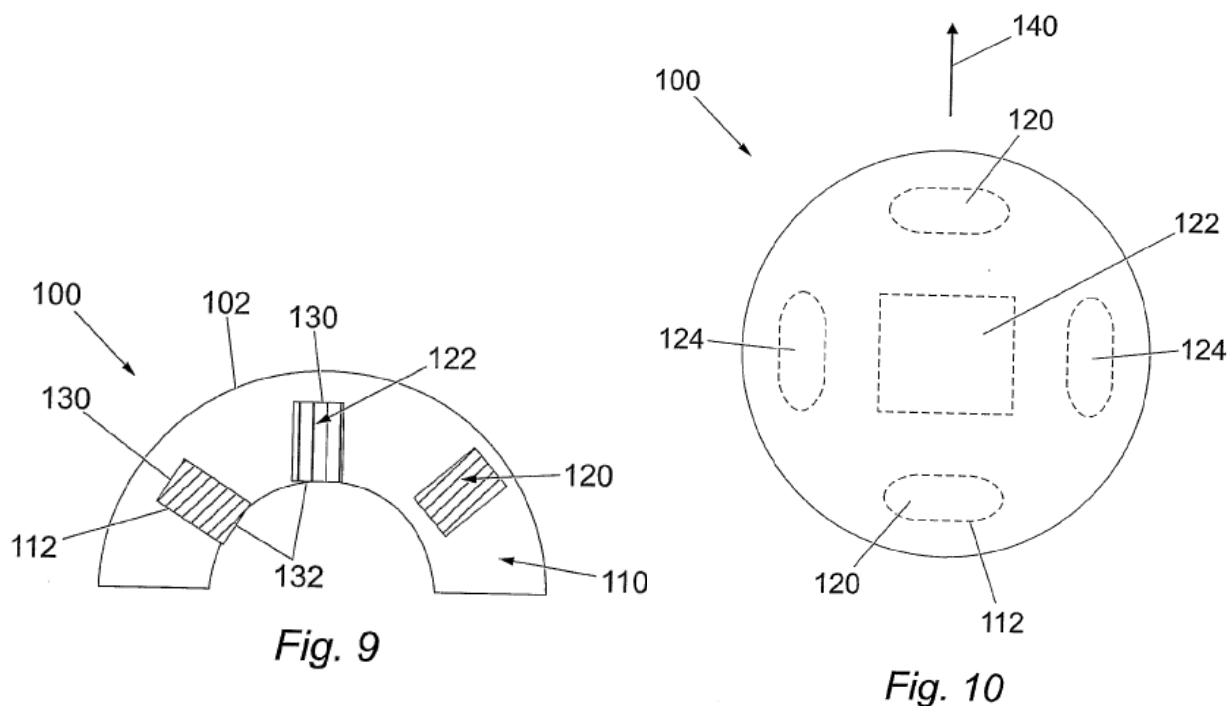
Ex. 1006 at [0097].

84. Where the Sajic Application differs from the other Sajic references is its teaching that the orientation of the honeycomb tubes in the core of the panel need not uniformly be normal to the expected impact force. *See* Ex. 1006 [0010] (disclosing lateral loading of the honeycomb structures in the prior art). Instead, the Sajic Application teaches that one can create a helmet “in which the stiffness or energy absorbing response can be easily varied” and that one may achieve this end by “provid[ing] a liner which uses different material or different geometrical arrangements at different locations.” *Id.* at [0003]. This liner is taught to be situated inside a rigid shell, to have an outer and inner layer (i.e., sandwich layers) on either side of “an intermediate layer providing the array of energy absorbing cells [and] [p]referably a plurality of arrays are provided at discrete locations of the body protecting device.” *Id.* at [0020-21]. These arrays are taught to be “orientated at a different oblique angle to the tubes of the other of the plurality of arrays.” *Id.* at [0022]. Varying the orientation of the tube/honeycomb array relative to expected impacts is taught to increase or decrease the impact force transmitted to a helmet wearer “in a controlled, steady manner.” *Id.* at [0003, 0109-0110].

85. Notably, Mr. Sajic does not disclose a novel or improved material composition for this intermediate tube/honeycomb layer. Rather, the innovation of the Sajic Application appears to be that an intermediate layer of a sandwich panel may be oriented such that the walls of the array are oriented obliquely (rather than

normally or axially to the applied load) so as to provide varying rates of impact absorption without reengineering the thickness or chemical makeup of the array.

86. Petitioner does not focus on the sandwich panel teachings of the Sajic Application and the oblique orientation teachings of that reference do not provide a substantive foundation for their invalidity arguments. Instead, Petitioner focuses on a final an embodiment of the Sajic Application in which the core material 20 is encapsulated or otherwise placed within the foam spacing member 110 of a helmet. This embodiment is illustrated by Figures 9 and 10 of the Sajic Application.



87. These figures show inserts 120, 122, and 124 made of an energy absorbing material comprising energy absorbing tubes “as described in the first embodiment of the invention” (Ex. 1006 at [0115])—i.e., the same sandwich

paneling disclosed in the Sajic Patent and cited by the examiner during prosecution, albeit with some of the tubes oriented obliquely to the impact load instead of parallel. Ex. 1006 [0114-0117].

88. In every disclosed use of inserts 120, 122, and 124 of the Sajic Application, the tube arrays are positioned between resilient outer layers just as in the sandwich panel embodiments. For example, the inserts are taught to be “encapsulated” within the expanded polystyrene foam of spacing member 110 “during forming of the spacing member 110.” Ex. 1006 at [0115-0116]. A POSITA would understand this embodiment to describe a tubular/honeycomb insert that is surrounded on all sides by energy absorbing foam, and further understand that the foam is placed within a rigid shell abutting the foam. *See id.* at Fig. 9.

89. In other embodiments, the insert is placed into “pockets in the spacing member 110.” Ex. 1006 at [0116]. A POSITA would understand the term “pocket” to describe an embodiment where a space in the foam spacing member 110 is hollowed out from an exposed edge of the foam, thereby creating a hollow receptacle or pocket in the foam into which the energy absorbing array is inserted. In this embodiment, all sides of the array are surrounded by the foam spacing member 110 except the side nearest the pocket’s opening.

90. In another embodiment, the inserts are placed in receptacles or cavities in the major plane of the spacing member 110. Ex. 1006 at [0114]. In this

embodiment, a tubular/honeycomb insert is placed in the cavity or receptacle such that the outer discontinuous surface of the tube array is abutted by the foam liner 110 which is, itself abutted by the helmet's rigid shell. *Id.* This may be seen in Figure 9 *supra*, where the center and left inserts are placed in cavities defined by the foam spacing member 110 which surrounds the insert on all but one side (e.g., the concave inner face of the foam spacing member 110).

91. In every embodiment disclosed in the Sajic Application, just as in every embodiment disclosed in the Sajic Patent and Sajic International Application, the same honeycomb core is taught to be used in conjunction with a layer between the honeycomb core and the rigid shell—the energy absorbing foam liner. Stated differently, there is no embodiment in either the Sajic Patent or the Sajic Application in which the honeycomb core absorbs an impact that did not first travel through the helmet's shell and another layer (foam and/or some other outer layer material) that is placed between the shell and the honeycomb core. A POSITA would understand the rigid shell and this layer (called an “impact surface” in the Sajic Application (Ex. 1006 at [0097])) to serve to more evenly deliver impact forces across the honeycomb core, thereby avoiding the deleterious failure warned of columns described in all Sajic References.

92. In all but one embodiment of these two references (i.e., the embodiment wherein an insert is placed in a receptacle or cavity of the foam spacing member

110), the honeycomb core is explicitly taught to be used with an inner layer between the honeycomb core and the user's head (e.g., either the inner layer 50 (Ex. 1006 at [0097]) or the encapsulating foam).

93. The Sajic Application also teaches that a “sealing material . . . is provided at both of these discontinuous surfaces [i.e., the ends of the tubes/honeycombs] . . . This prevents the foam material from entering the open ends of the tubes.” Ex. 1006 at [0122]. Mr. Copeland contends that this would only apply to embodiments in which the tubes/honeycomb are used as an encapsulated insert. Ex. 1003 ¶116. However, the Sajic Application (like all the Sajic References) teaches that the “performance and failure mode of plastic and composite columns depends on a complex interaction of a number of different parameters including the material used, the geometry (shape and thickness), fibre alignment in composites, the use of triggers, and the loading conditions.” Ex. 1006 at [0008] (emphasis added). Excluding the use of a sealant at the ends of the tubular/honeycomb array will invariably affect the complex interaction described above, with unknown performance consequences in the August 2013 timeframe. This may be seen in the Landi reference. In Landi, it is taught that a bonding material that connects the sandwich layer to the honeycomb core “is advantageous in that the continuous collar-like piece of adhesive reinforce[s] the edges of the core cells and blunts them.” Ex. 1010 at 4:5-7. Thus, the bonding material, which would operate similar to a

sealant, achieves benefits that would be desired by someone employing Sajic's teachings—a reinforced core material that does not have sharp and potentially painful/harmful edges when in contact with a wearer's skin as is found in Petitioner's proposed combination. Mr. Copeland's conclusion that there is "no need to prevent foam from entering the EAT-Insert-Member" in the proposed combination of Muskovitz and Sajic ignores the performance benefits of sealing, and the fact that the Sajic Application does not distinguish between encapsulated and non-encapsulated embodiments when it teaches that the ends of the array should be sealed.

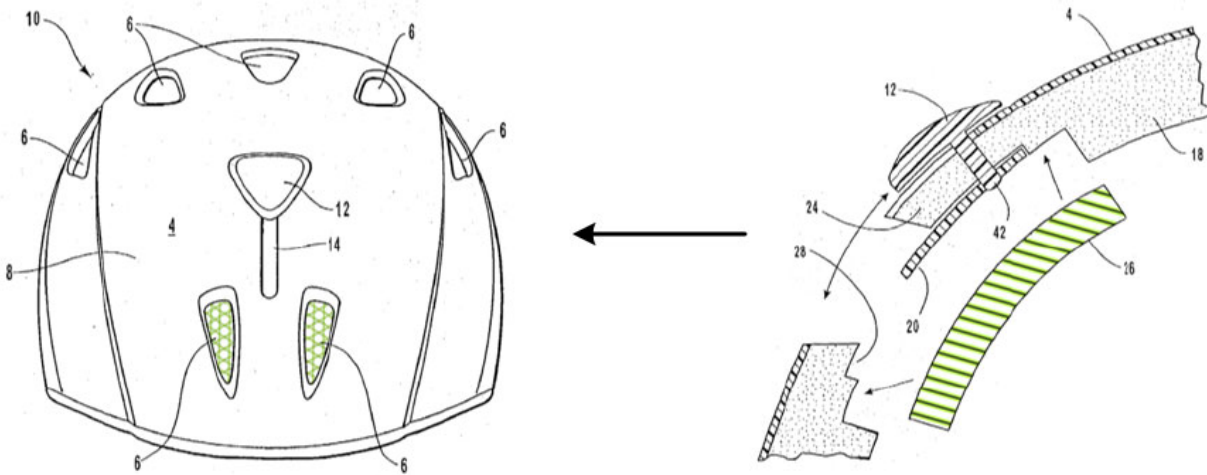
IX. THE COMBINATION OF MUSKOVITZ AND THE SAJIC APPLICATION FAILS TO ESTABLISH THE OBVIOUSNESS OF THE CHALLENGED CLAIMS

94. Because this declaration is submitted at a preliminary response stage, and at the direction of counsel, I limit my analysis of Petitioner's proposed combination in Ground 1 to certain issues and claim elements of the Challenged Claims. I reserve the right to opine on other issues should the Board institute the Petition.

A. Ground 1 Fails to Achieve A Central Purpose of Muskovitz

95. As previously stated, a central purpose of Muskovitz is to provide a helmet with a vent shield that allows a user to selectively permit or prevent airflow into and out of the helmet. *See supra* Section VIII.1. Petitioner alleges that a

POSITA would find it obvious to take the honeycomb core of the Sajic references, size it to fit a recess in Muskovitz, then replace insert member 26 with Sajic's honeycomb core. *See* Pet. at 29-30. This hypothetical is depicted below:



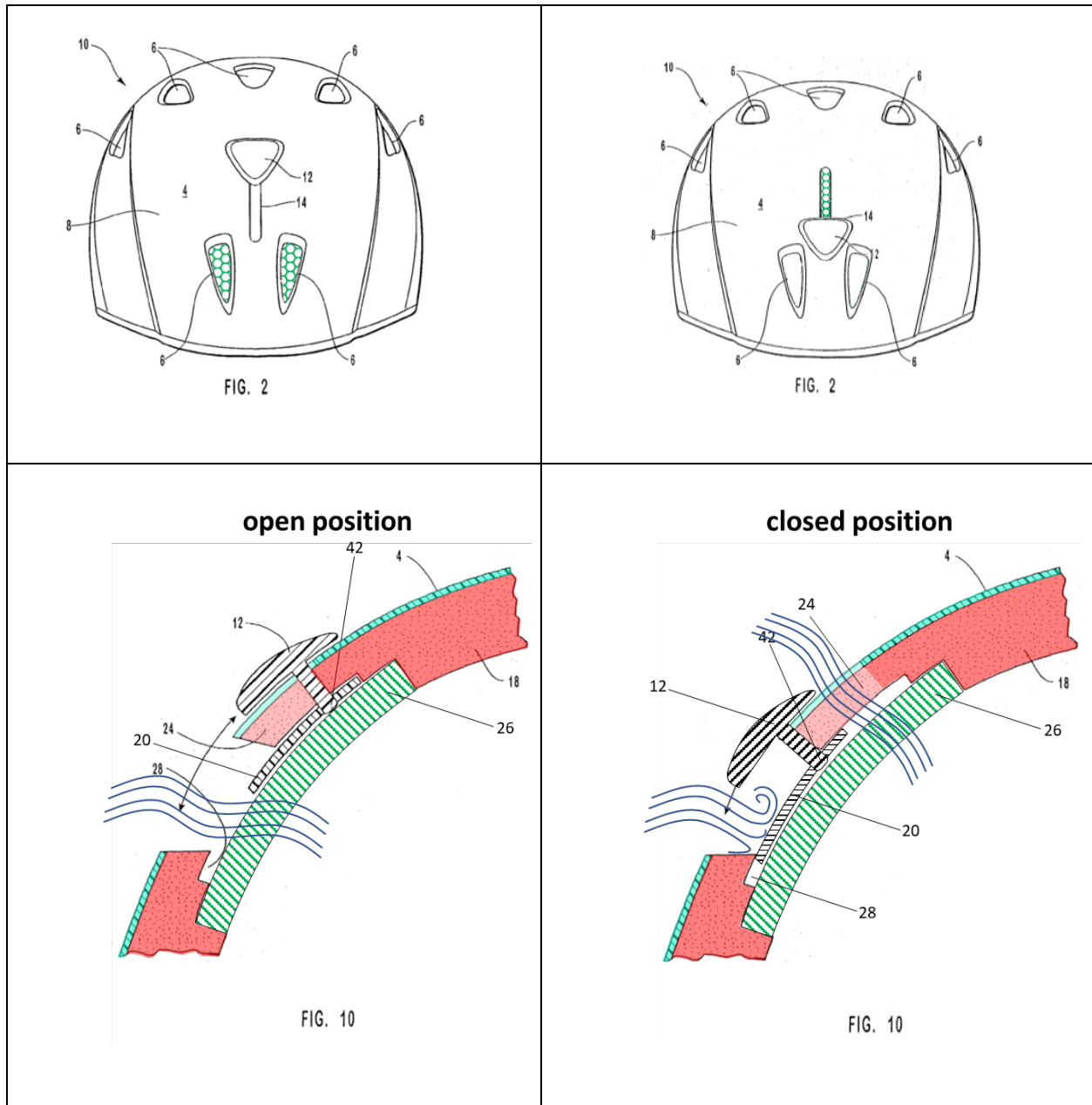
Muskovitz-Sajic-Helmet-1 (Modified FIGS. 2 and 10, Muskovitz)

Pet at 35.

96. A POSITA, however, would recognize that Petitioner’s proposed combination defeats a central purpose of Muskovitz—to provide a user with a vent shield capable of opening and closing the helmet to ambient air flow. For this reason, as explained below, a POSITA would not find it obvious to make that combination.

97. Petitioner contends that a POSITA would not seal the ends of the Sajic honeycomb insert (contrary to the express teachings of the Sajic Application (Ex. 1006 at [0122])) in order to allow airflow into the helmet and to avoid the cost of an additional manufacturing step. Pet. at 30. Failure to seal the ends of the honeycomb

core, however, causes Petitioner’s proposed combination to fail to prevent airflow into the helmet when the vent actuator is closed. This is depicted below.



98. If Mr. Copeland’s modification were implemented, as a user slides vent shield 20 into what is supposed to be the “closed” position such that “ambient air is not allowed to flow through into the interior of protective helmet 10” (*id.* at [0112]),

the slotted portion 14 through which elongated member 42 travels is unoccupied by any component or material that would block airflow. In Petitioner's proposed combination of Muskovitz and Sajic's modified honeycomb core, the Sajic honeycomb core material is situated behind the slotted portion 14 for the express purpose of allowing air to flow through the insert and into the helmet's interior. Pet. at 30. This is depicted in the images to the right, *supra*, and renders Muskovitz incapable of performing one of its central purposes. That is, under Petitioner's proposed combination, a user is prevented from sealing off ambient airflow irrespective of the position of the vent shield, which Muskovitz teaches is a serious concern on cold ski/snowboard/snowmobile days, with helmet wearers traveling at high speeds in frigid conditions. *See* Ex. 1005 at [0003] (helmets used in snow sports), [0010] ("The invention also discloses a device that can be rotated to the back to prevent cold air from flowing into the helmet in winter..."). In my opinion, a POSITA would not find it obvious to make a combination which defeats a central purpose of Muskovitz, as Petitioner proposes in Ground 1.

B. Petitioner's Alleged Motivations to Combine Muskovitz and Sajic Are Inconsistent and Inadequate

99. I have reviewed Petitioner's and Mr. Copeland's stated reasons for combining the Muskovitz and Sajic Application references in the manner depicted in the Petition. As summarized below, each of them is contrary to the understanding of a POSITA at the relevant time before the claimed invention.

100. *Petitioner claims a POSITA would have recognized the benefit of using Sajic's honeycomb core to improve impact attenuation of Muskovitz' insert member 26.* Pet at 18, 20, 24. This argument suggests that Petitioner misunderstands the function of insert member 26 and, as a result, it makes unsupported inferences about how a POSITA might modify this component.

101. Muskovitz does not teach the use of insert 26 for purposes of improving or even contributing to the shock absorbing performance of the helmet. Instead, Muskovitz teaches that the insert 26 is “removable . . . allowing the user to place or displace insert member 26 as desired,” and used primarily to define a “vent space” that houses an adjustable vent shield component in the foam liner [Ex. 1005 at 0087]. Because the insert is removable at the discretion of the user and taught to primarily act as a backstop for a vent shield 20, a POSITA would not look to the insert as a way to enhance the impact absorbing performance of the helmet by introducing a new material, as argued by Petitioner. And because it is intended as a backstop to the adjustable vent shield, a POSITA would not consider porous materials that allowed airflow as explained above. To the extent a POSITA wanted to improve the impact absorption characteristics of the helmet, including around the vent areas, a POSITA would look to *permanent* components that attenuate an impact, which a user cannot remove at their discretion.

102. *Petitioner claims use of Sajic's honeycomb core in place of Muskovitz' insert member 26 is merely the use of a known material for its intended function with a predictable result.* Pet at 19. As discussed more fully below, Petitioner does not use Sajic's honeycomb core according to its intended function. Honeycomb cores have been used for decades as the core of a sandwich panel bonded to outer layers providing more predictable buckling of the honeycomb walls and avoiding localized failure in the core. This may be seen in, for example, the following references:

- WO 94/00031, Ex. 2007 at 1 (a 1993 international patent application cited by the Sajic Patent and which discloses a “safety helmet . . . has its outer shell formed as a sandwich comprising outer and inner composite layers each of resin and impact-resistant material separated by an intermediate layer of resilient material.. . . The resilient material . . . is preferably honeycomb material of paper or aluminium.”)
- U.S. Pat. No. 3,447,163, Ex. 2008 at 1:30-37 (a 1969 patent disclosing “a safety helmet comprises an outer shell formed as a double-skinned member . . . and the interspace between the skins containing a material capable of absorbing impact energy on deformation. This material preferably comprises a layer of a honeycomb type of material. . .”)

103. Every Sajic reference discloses this same use of honeycomb sandwich panels. *See* Ex. 1007 at 13:10-13; Ex. 1020 at 5:17-21; Ex. 1006 at [0097]. In addition, according to the Sajic Application, when a honeycomb core is used as an insert in a foam liner, it is either entirely encapsulated by an EPS foam liner or abutted by an EPS foam liner on all but one side. *See* Ex. 1006 at [0113-0117]. This is consistent with use of honeycomb sandwich materials in the art—one places a

honeycomb core relative to outer layers such that the outer layers can more evenly spread impact forces across the honeycomb to achieve more uniform shock absorbance by the honeycomb and to avoid localized failure of the core.

104. Thus, Petitioner’s contention that an intended function of the honeycomb core in the Sajic Application is to span a vent opening with no abutting foam or shell on either side, for the purpose of absorbing impacts and facilitating ventilation – is without basis in the Sajic References or anywhere else in the prior art that I have seen. At the time of the invention, honeycomb shock absorbing material was not used in the manner argued by Petitioner; it was consistently used as the intermediate layer of a sandwich panel of resilient outer layers, or at least used inside of or abutting shock absorbing foam which was in turn placed inside a rigid shell.

105. I note that the examiner withdrew her assertion of Sajic’s honeycomb core as an obviousness reference when this was pointed out to her with regard to the Sajic Patent, and I find the examiner’s withdrawal in view of this observation reasonable. *See* Ex. 1002 at 466.

106. Petitioner’s assertion that the beneficial result of using Sajic’s honeycomb core as asserted to span open vents is “predictable” is also belied by Caserta, who found that honeycomb cores underperformed relative to EPS foam near vent ports (Ex. 2002 at 113, 120-21), and the teachings of the Sajic Application itself:

“The performance and failure mode of plastic and composite columns depends on a complex interaction of a number of different parameters including the material used, the geometry (shape and thickness), fibre alignment in composites, the use of triggers, and the loading conditions. . . . careful selection of these parameters” is therefore required. Ex. 1006 at [0008] (emphasis added). Petitioner’s proposed use of the Sajic honeycomb core is inconsistent with its intended use as disclosed in the prior art.

107. *Petitioner claims incorporation of Sajic’s honeycomb core may improve protection in areas of the helmet without the honeycomb core.* Pet. at 22. This is a misapprehension of the Sajic Application. The Sajic Application teaches that where no honeycomb is used in a helmet, the foam liner 110 will still be used and thereby provide a “level of protection [] at least equal to that of conventional helmets which use only a foam core.” Ex. 1006 at [0126]. A POSITA would not read this disclosure to suggest that the use of a honeycomb core in one section of a helmet somehow improves the impact absorbing qualities of foam in another portion of the helmet, and there is no disclosure or data in the Sajic Application to that effect. Therefore, I disagree that a POSITA would use a honeycomb core to change the impact absorbing qualities of foam found in another location, as Petitioner states.

108. *Petitioner claims Muskovitz discloses that the insert member is preferably the same material as the liner, but contemplates other materials.* Pet. 22-

23. While this is true about what Muskovitz teaches, it does not suggest the use of a honeycomb material as the insert. Muskovitz is explicit that he contemplated the insert member 26 is preferably the same material as the liner, and the liner is not taught to be a honeycomb material. *See* Ex. 1005 at [0087]. Nor does Muskovitz teach that a honeycomb material is “similar” to the material is suggests for the liner, which would ordinarily be EPS foam or the like. *See id.* at [0119].

109. Petitioner focuses on Muskovitz’s allowance of various materials for insert member 26 and on that basis concludes that the honeycomb core of the Sajic Application would be an acceptable substitute for the EPS foam contemplated in Muskovitz. Pet. at 22-23. But Petitioner’s failure to acknowledge the stated purpose of the Muskovitz insert member 26 (as explained above) causes them to adopt the wrong test for an acceptable alternative insert material to the preferred material—i.e., Petitioner alleges that any material that is the same or similar as the liner would be acceptable to a POSITA, without regard to the functions to be performed by the insert. The Muskovitz insert is removable at the discretion of the user, so it is not intended to reliably contribute to the impact absorption. Instead, this Muskovitz insert is used to define the vent space (Ex. 1006 at [0087]), not interfere with the movement of vent shield 20 (*id.*), be easily removed at the discretion of a user (*id.*), act as a wind block for air trying to enter through slotted area 14 when the actuator is closed, and a POSITA would understand that such an insert should not present a

comfort/injury risk to the user's head in ordinary use, nor add unnecessary material or assembly cost to the helmet. I note that Petitioner also cites practical and cost considerations when making manufacturing decisions at pages 17 and 30 of the Petition.

110. Petitioner provides no evidence that a POSITA would have found it obvious to use Sajic's honeycomb core to meet these design criteria. Muskovitz teaches that the insert is "preferably the same or a similar impact absorbing material as [the] liner. Ex. 1005 at [0087]. A manufacturer with equipment to shape an EPS foam liner could likely easily shape an EPS foam insert member to fit in a recess of the liner. However, manufacturing and shaping a honeycomb insert introduces additional complexities including different material inputs, manufacturing step(s), curing step(s), and shaping step(s), required equipment, and time concerns, all of which add cost to a helmet that must be justified over a cheaper alternative taught in Muskovitz (e.g., use the same foam as the liner). In my view, Petitioner sets forth no adequate reason that would justify navigating these practical deterrents to try to improve the impact absorption qualities of an insert that is not taught to enhance impact absorption, and which may be removed at a user's discretion.

111. Other considerations teach against use of the Sajic Application's Honeycomb core in place of Muskovitz' insert member. For example, Landi teaches that when a honeycomb core "is to be worn directly" by a person, as proposed by

Petitioner, “bonding a resilient material to the cell edges is essential,” further adding expense to the helmet. *See* Ex. 1010 at 2:30-3:3. A POSITA would not think this additional complexity and expense are justified for a component that is not taught to meaningfully contribute to the impact absorption performance of the helmet.

112. Even if a POSITA were to look for an alternative material for insert member 26 of Muskovitz, he/she would do so within the context of the teachings in Muskovitz, which does not suggest the use of a honeycomb core. At paragraph [0120], Muskovitz suggests how one might “provide improved protection and greater or increased impact attenuation” relative to EPS foams, which are taught to permanently deform and thereafter have decreased impact attenuation and energy absorption performance. Ex. 1005 at [0120]. Honeycomb materials are not suggested by Muskovitz as a material that might improve on standard EPS foams. This is likely because the Sajic Application itself teaches that cellular honeycomb materials suffer similar limitations to those taught by Muskovitz regarding EPS foam—permanent deformation and reduced ability to attenuate impacts after an initial blow or repeated impacts. *See, e.g.*, Ex. 1006 at [0007-0009] (describing progressive failure, buckling, and crushing of columns of various core materials, which a POSITA would understand to result in diminished impact attenuation on subsequent impacts in those same locations).

C. Ground 1 Fails to Properly Demonstrate the “Substantially Filling the Cavity” Limitations of Claims 1 and 12

113. Claims 1 and 12 recite that a shock absorbing insert is “positioned in and substantially fill[s] the cavity” in the shock absorbing liner. Ex. 1001 cls. 1, 12 (the “Substantially Filling limitations”). This is shown in, for example, Figure 2 of the ’373 patent.

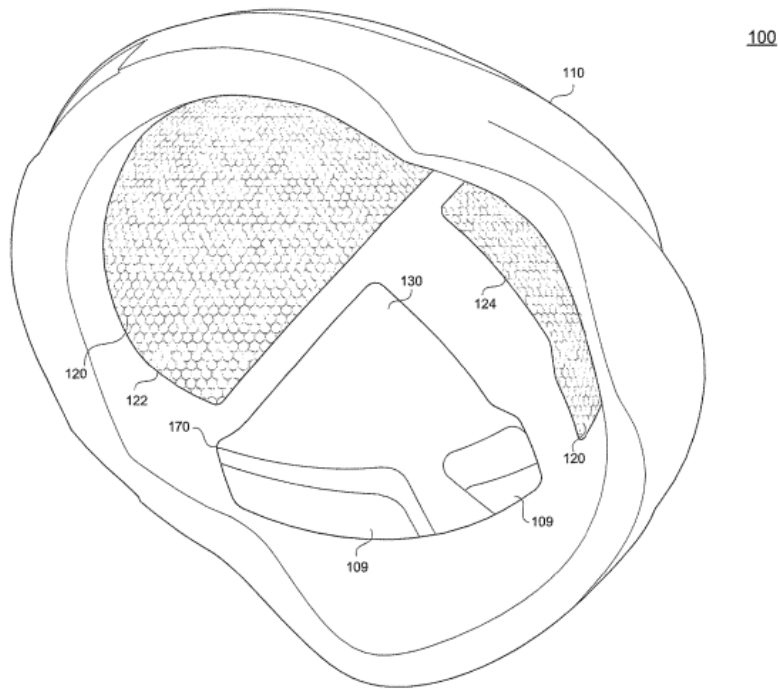


FIG. 2

114. Petitioner cites two paragraphs of Muskovitz and two paragraphs of the Copeland declaration to argue that their proposed combination meets the “Substantially Filling” limitations. *See* Pet. at 49. But Muskovitz expressly teaches

the opposite of “Substantially Filling,” and this is ignored or misportrayed in the Petition.

115. Muskovitz teaches that the insert member 26 “is not sized to fill the entire recessed portion of inner liner 18 in order to allow for and provide for the creation of vent space 28.” Ex. 1005 at [0088]. A POSITA would understand that Muskovitz teaches that insert member 26 cannot occupy the recess used for the vent shield 20 and should have a sufficient aperture in the insert with a vent such that vent shield 20 can perform its useful function—to selectively prevent or allow airflow through the ventilation port. This may be seen below in Muskovitz Figure 10.

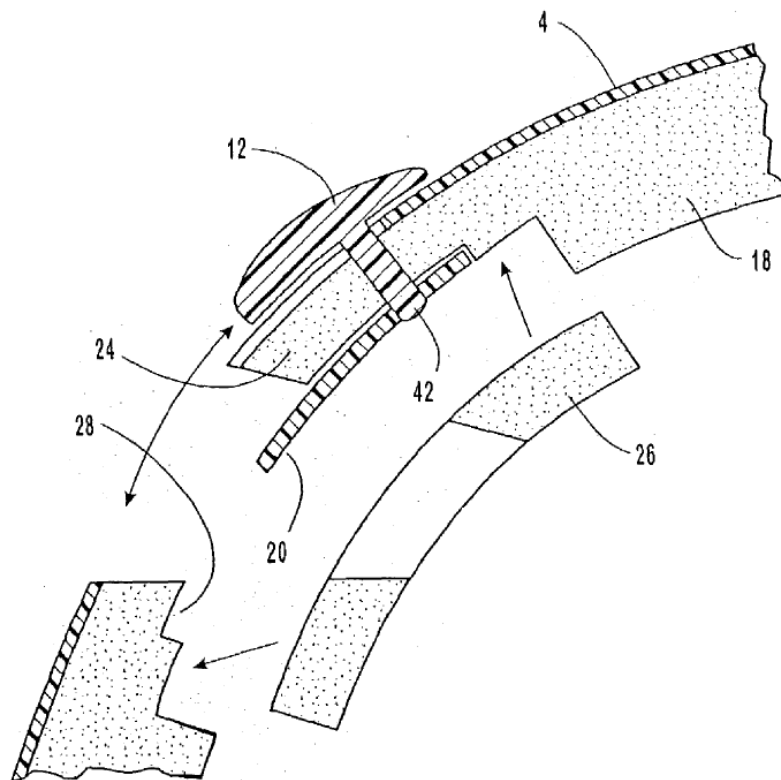


FIG. 10

116. Insert member 26 is taught not to fill the vent space, which is part of the cavity in the liner, and it is shown as having an aperture aligned with the ventilation port. If insert member 26 substantially filled the cavity in Muskovitz, as Petitioner argues, it would seal the ventilation port 6 regardless of the position of the vent shield 20, and thereby defeat a primary function of the Muskovitz helmet design. In other words, Muskovitz teaches that insert 26 should not substantially fill the alleged cavity of the liner as required by the Challenged Claims.

117. I disagree with Petitioner, then, when they conclude that Muskovitz teaches that insert member 26 “entirely fills the insert-space.” Pet. at 49. Mr. Copeland’s declaration shares Petitioner’s misapprehension of Muskovitz (*compare* Pet. at 49 *with* Ex. 1003 ¶¶164-65). Accordingly, neither Petitioner nor Mr. Copeland provide an explanation why a POSITA would depart from these characteristics of the Muskovitz insert member 26 in order to meet the “substantially filling” limitation in the claims.

D. Ground 1 Fails to Properly Demonstrate the “Spanning” and “Positioning” Limitations of Claims 1 and 12

118. Claim 1 recites that the shock absorbing insert “spans across at least a portion of each of the plurality of vents,” and later recites that a first and second plurality of energy absorbing cells of the insert will be “positioned within a perimeter of” first and second openings in vents in the shell, respectively. Claim 12 similarly recites that the shock absorbing insert “spans across at least a portion of each of the

first and second openings” in vents in the shell, and goes on to recite that the insert will have groups “of hollow structures defining a plurality of adjacent through-passages” which “overlap[]” with the first and second openings in the shell, respectively. *See* Ex. 1001 at cls. 1, 12. I refer to these limitations below as the “Spanning and Positioning” limitations.

119. Muskovitz alone does not meet the Spanning and Positioning limitations for a number of reasons. Primarily, insert member 26 of Muskovitz has no energy absorbing cells or arrays of hollow structures, and it has an aperture aligned with the vent openings instead of an array of energy absorbing cells. This is shown in Muskovitz Figure 10.

120. Petitioner seems to agree on this point, so they argue that a POSITA would find it obvious to substitute Muskovitz’ insert member 26 with a honeycomb core from the Sajic Application to achieve the Spanning and Positioning limitations of claims 1 and 12. I disagree.

a. The Examiner Already Rejected a Combination of Sajic’s Honeycomb Core With an Ordinary Helmet in the Manner Proposed by Petitioner

121. Based on my review of the file history, it is apparent that the examiner was persuaded that using the honeycomb core of the Sajic Patent without the resilient outer and inner layers as taught by Sajic was incompatible with the teachings of the Sajic Patent, and therefore inappropriate. The Applicant stated the following:

Sajic discloses a core material, which is specifically designed to avoid the risk of global buckling (i.e., compression) because such global buckling would be detrimental to the functioning of the core material. *See e.g.*, Col 5, ll. 59-65 In this regard, Sajic describes a specific method of forming a sandwich panel which sandwiches the core material (i.e., the array of hollow tubes) between two skins that are bonded to the upper and lower surface of the core material. *See* Col. 6, ll. 48-67. There is no evidence in Sajic, that it would be advisable or practical to use only the core material 20 without it being sandwiched between the skins 40 and 50 or that the core material 20 would provide a useful function if placed in a cavity with the upper and lower sides of the core not being supported by a skin. . . .

Accordingly, Applicant submits that because the references teach away from the purported combination and because the Office Action fails to provide a motivation for combining the reference based on the facts of record, a prima facie case of obviousness has not been established and the 35 U.S.C. 103 rejection of claim 1 should be withdrawn.

Ex. 1002 at 466-67 (emphasis added). In my view, the Applicant's argument was a reasonable portrayal of the teachings of the Sajic Patent, the corresponding Sajic International Application (Ex. 1007 at 3:21-4:19), and the Sajic Application asserted by Petitioner (Ex. 1006 at [0103-0105]). The examiner subsequently withdrew the rejection. *See* Ex. 1002 at 466, 430.

122. The Sajic References are consistent with the state of the art at the time of the invention in the '373 patent, which understood honeycomb structures to be usefully applied when sandwiched between resilient outer layers that would serve to

attenuate impact forces across multiple cells and thereby avoid detrimental localized buckling of the honeycomb core. Ex. 1010 at 2:30-3:3 (disclosing the “extremely important functions performed by “resilient layer[s] over both open ends of” the disclosed honeycomb core); Ex. 1011 at [0036] (disclosing that the “outer shell layer 20” of the sandwich panel is a “hard layer” placed atop a “compressible internal liner 32” such that an impact on the outer shell layer results in compression of the core layer of the sandwich); Ex. 2002 at 3 (“Honeycomb materials have been used extensively in a wide range of applications as [sic] core of sandwich panels...”); Ex. 2007 at 1 (disclosing historical use of honeycomb core as a beneficial impact absorber when sandwiched by resilient outer layers); Ex. 2008 at 1:30-37. Stated another way, I am not aware of contemporary or historical disclosure of honeycomb core material like that found in the Sajic References used in the manner claimed in the Spanning and Positioning limitations of the ’373 patent—stripped of its outer layers and unabutted by a helmet liner and/or shell.

123. I believe Petitioner’s Ground 1 allegations fail for the same reason that the examiner withdrew the rejection using the Sajic Patent. Petitioner’s proposed combination of Muskovitz and the Sajic honeycomb core contradicts the teachings of Sajic. It would not have been obvious to a POSITA to use Sajic to modify the Muskovitz helmet as Mr. Copeland suggests in August 2013.

124. The Sajic Application asserts that that it would be an improvement on the art to provide a helmet with varying energy absorbing responsiveness at different locations and that this might be achieved through “different materials or different geometrical arrangements at different locations” in the helmet. Ex. 1006 at [0003]. The Sajic Application then discloses embodiments to achieve this purported advancement. The first embodiment is “a first material or core 20 which is sandwiched between a second material or outer layer 30 and a third material or inner layer 40. The outer layer 30 provides an impact surface. Each of the outer 30 and inner 50 layer are bonded to the core using an adhesive.” Ex. 1006 at [0097] (emphasis added). This is the same disclosure as the sandwich panel of the Sajic Patent, though the Sajic Application teaches that one might alter the orientation of the honeycomb tubes from a parallel orientation relative to an expected impact to an oblique orientation to achieve a desired level impact energy absorption. *See* Ex. 1006 at [0106].

125. Petitioner’s Ground 1 argument is built on a final embodiment disclosed in the Sajic Application where the honeycomb core is encapsulated or otherwise placed within the foam spacing member 110 of a helmet. This embodiment is illustrated by Figures 9 and 10 of the Sajic Application.

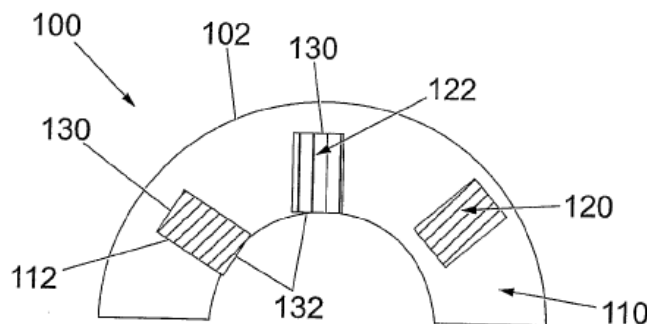


Fig. 9

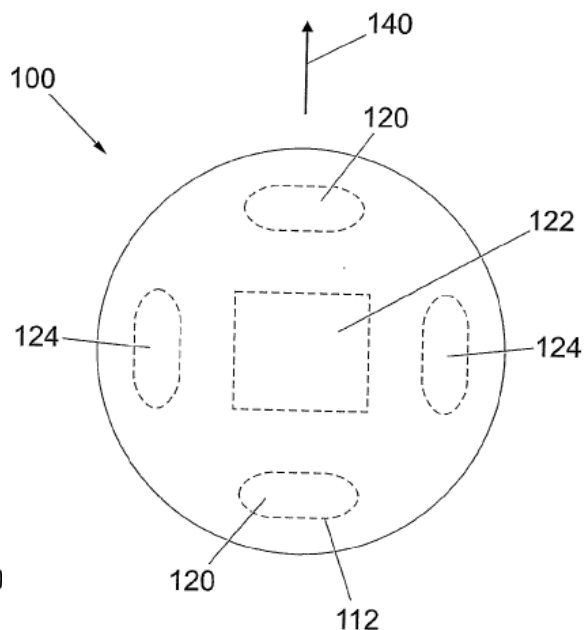


Fig. 10

126. As already discussed (*see infra* paragraphs 92 and 92), the Sajic References consistently disclose the same honeycomb core used in conjunction with a layer between the honeycomb core and the rigid shell. There is no embodiment in the Sajic References in which the honeycomb core absorbs an impact that did not first travel through the helmet's shell and another layer (whether foam or some other outer "impact layer" material) that is placed between the shell and the honeycomb core. *See supra* Section VIII.2.(b).

127. The Sajic Application does not state that there has been some advancement on the state of the art related to the composition or manufacture of honeycomb arrays, so a POSITA would expect to cover the inner discontinuous surface of the honeycomb array with a soft and resilient material of some type, to

achieve the comfort and durability benefits provided thereby. *See, e.g.*, Ex. 1010 2:29-37 (explaining importance of “soft, flexible, resilient material . . . adjacent the body of the wearer [to] protect the body from the sharp, rigid cell walls...”); Ex. 1008 (disclosing conventional use of “padding layer” adjacent to the wearer’s head “to improve comfort” for the wearer); Ex. 2008 (“In order to obtain a close and comfortable fit to the wearer's head, a series of thin liners of soft polyurethane material, such as those shown at 22 and 23, are supplied and the requisite number to suit the particular wearer...”).

128. These disclosures of the Sajic Application demonstrate that the reasons given during prosecution for the Sajic Patent not supporting an obviousness conclusion apply equally to Petitioner’s proposed combination of Mukovitz with the Sajic Application—the lack of a teaching, suggestion, or motivation to use Sajic’s honeycomb cores without external layers (e.g., a resilient layer, foam and/or a rigid shell) to help attenuate localized impact forces and avoid undesirable buckling of the core, and a lack of any evidence on which a POSITA would reasonably believe that they might be beneficially used in that manner.

**(1) A POSITA Would Not Combine Sajic’s
Honeycomb Core in the Manner Proposed by
Petitioner**

129. I have reviewed selected materials from Patent Owner’s concurrent district court preliminary injunction proceedings provided to me by counsel.

Specifically, during the preliminary injunction proceedings, Petitioner and Mr. Copeland submitted academic research on the use of honeycomb core material as an impact absorption medium in helmets. This research, entitled “The Use of Honeycomb in the Design of Innovative Helmets,” was published the year before the Applicant filed their patent application, and it summarizes the author’s attempt to analyze the benefits to a helmet wearer through “the coupling of hexagonal aluminum honeycomb with polymeric foams for the design of innovative and safer motorbike helmets.” Ex. 2002 at 3; Ex. 2003 at 40-42 (Mr. Copeland submitting the Caserta Thesis in the District Court Litigation). The study’s author, Mr. Gaetano Caserta, purchased commercial helmets and then modified the liners of those helmets to include recesses into which he inserted honeycomb cores and conducted impact testing. *See* Ex. 2002 at 106, 113.

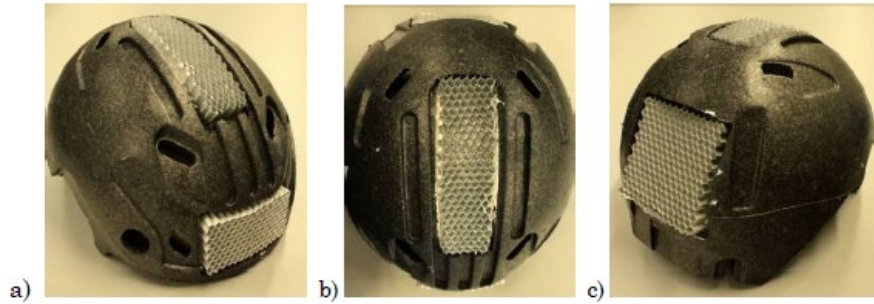


Figure 6.2 - Helmet prototype liner; a) perspective front view; b) top view; c) perspective rear view

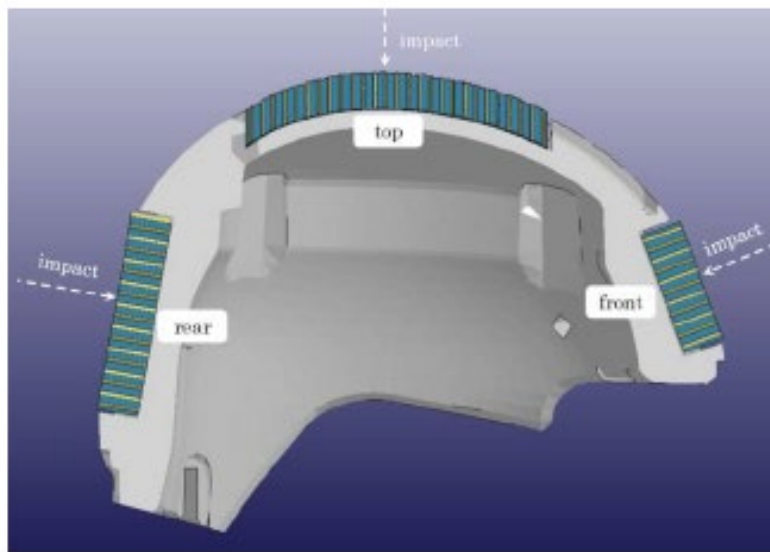


Figure 6.3 - Schematic section of the prototype liner

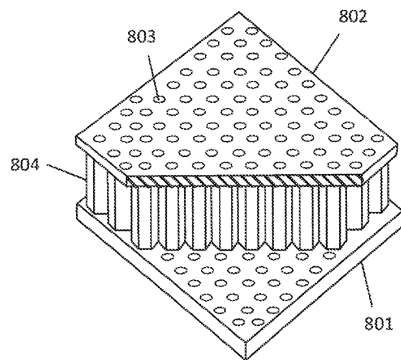
130. The results of the testing indicated that “introduction of the honeycombs in the rear region led to a worsening of the protective performances of the helmet” and “it was concluded that the contact between shell and honeycombs was not uniform at the time of the impact, as indicated by the presence of a u-shaped deformation region localized on the top of the layer, probably caused by the contact between the rear ventilation area and the honeycombs.” *Id.* at 121-22 (emphasis

added). Thus, Caserta informed the industry that placing honeycomb material at the location of ventilation openings results in non-uniform load transfer to the honeycomb, causing deleterious performance of the foam liner as the honeycomb core transferred impacts to the foam.

131. Caserta is relevant evidence of the state of the art on a critical issue that supports and is consistent with the novelty and non-obviousness of the invention claimed in the ‘373 patent. That is, Caserta demonstrates that at the time of the filing of the application that became the ‘373 patent, a POSITA would not expect to achieve improved impact performance by positioning open cell honeycomb cores at the location of vents in an EPS foam liner. This teaching known to Petitioner when they drafted the Petition and would have been known to POSITAs at the time the application leading to the disputed patent was filed. Ex. 2002 at 6 (“The research presented in this thesis has continuously been disseminated within the scientific as well as industrial community during the course of the project.”)

132. Caserta’s data and its corresponding concern about placing honeycomb structures proximate to vent ports is also reflected by Bottlang (Ex. 1008), which was considered by the examiner during prosecution. Ex. 1002 at 726. Bottlang teaches that honeycomb cores should be used with a conventional compliment of outer and inner layers, but that one might perforate those layers to promote breathability of the shock absorber. This is pictured below (Ex 1008 at FIG. 8):

Figure 8



133. Bottlang states that perforation is preferred to avoid a known hazard: “It will be appreciated that it may be advantageous to supply the helmet with a multitude of small ventilation holes *in order to prevent the gaps in protection that may result from the larger ventilation holes used in most conventional helmets.*” Ex. 1008 at [0036] (emphases added). Thus, Bottlang teaches that maintaining outer paneling bonded to the cell walls with small perforations is the desired way to achieve a breathable honeycomb shock absorbing component, and expressly discourages the use of larger holes in the paneling that would cause “gaps in protection” for the honeycomb core. In my opinion, a POSITA, with knowledge of Caserta and Bottlang, would not find it obvious to strip a honeycomb core of its outer layers, then place that core proximate to gaps in the helmet at ventilation ports and expect beneficial performance in so doing (as Petitioner contends in its Ground 1 combination).

E. Ground 1 Fails to Properly Demonstrate Openings in the Inserts Allowing for Airflow

134. Claim 1 states that the shock absorbing insert will have open first and second longitudinal ends positioned “such that air is able to flow from an exterior side of the helmet through each of the first and second vents and through a respective one of the first and second plurality of adjacent cells toward an interior of the helmet.” Ex. 1001 at cl. 1. Claim 12 states “an array of hollow structures defining a plurality of adjacent through-passages . . . wherein . . . adjacent through-passages . . . allow air to enter through . . . to an interior of the helmet...”. *Id.* at cl. 12. I refer to these limitations as the “Airflow” limitations.

135. Petitioner asserts that a POSITA would take only the honeycomb core disclosed in the Sajic references, size it to fit a cavity of the Muskovitz helmet, and thereby attain the Airflow limitations. I disagree that a POSITA would find this course of action obvious for many reasons.

136. First, as discussed *supra*, there is no indication that a POSITA would expect beneficial performance of the honeycomb core in vented areas of a helmet without using abutment layers across one or more of the longitudinal ends. *See supra* Section IX.D. No reference supplied by Petitioner provides any such teaching in the prior art.

137. Second, despite the use of honeycomb cores sandwiched between outer layers in helmets dating back as far as the 1960s (*see* Ex. 2008) Petitioner does not

cite any prior art reference which corroborates their argument that it would be obvious to strip the honeycomb core of its outer panels/layers and then place that core material such that it spans an open space, unabutted by any foam liner or shell, to take advantage of the purportedly airflow benefits provided by the open spaces in the hollow cores. Were this as obvious as Petitioner claims, it stands to reason that they could select from many decades of prior art some reference depicting this. Petitioner provides no such reference. Instead, my review of references establishes the opposite. In fact, numerous references submitted by Petitioner explicitly teach away from this:

- The Sajic International Application, Sajic Patent, and Sajic Application all disclose the use of outside layers and adhesive on both sides of a honeycomb core which would prevent airflow. Ex. 1007 at 13:10-15; Ex. 1020 at 5:17-23; Ex. 1006 at [0097].
- The Sajic Application teaches that its honeycomb core must be used entirely “encapsulated” by foam or positioned in foam such that all sides but one abut foam. Ex. 1006 at [0015-0117], Fig. 9. This would prevent airflow through the honeycomb core.
- The Sajic Application teaches that the encapsulated/inserted embodiments require sealing of the ends of the honeycomb core. *Id.* at [0122]. This would prevent airflow through the honeycomb core.
- Landi teaches the importance of sealing honeycomb ends to resilient outer layers to improve the safety, structural integrity, and performance of honeycomb cores. Ex. 1010 at 2:29-3:3 (explaining the “extremely important function” provided by the resilient outer layer and adhesive applied to the ends of a honeycomb core operate to “prevent edges of the cell walls from crumbling,” “reinforce[] only the edges of the cell walls and tends to restore them to their original shape when they have been buckled by being subjected to an impact.

This effect increases the useful life” of the product and “better distributes the force to be absorbed throughout the cells” to “resist[] crushing of the edges of the cell walls.”)

- The Bottlang reference, which was cited by the examiner during prosecution, discloses a honeycomb core in between outer layers, and teaches against naked use of the honeycomb core in the manner advocated by Petitioner. Ex. 1008 at [0036], *see also* Fig. 8 (“It will be appreciated that it may be advantageous to supply the helmet with a multitude of small ventilation holes *in order to prevent the gaps in protection that may result from the larger ventilation holes used in most conventional helmets.*”) (emphases added).
- Fournier was asserted by the examiner as a basis to reject pending claims in prosecution, and it teaches plug holes in a foam liner into which a second shock absorbing material is placed. Ex. 1012 at 4:17-31. Fournier is explicit that this second material should not be placed into holes which align with ventilation holes. Ex. 1012 at Figs 3-10, 4:15-31. Placement of an insert in the ventilation holes would prevent airflow.

138. Thus, Petitioner’s assertion that it would be obvious to put open-ended honeycomb cores in an opening to allow air to flow through those open ends is (1) absent in any reference offered by Petitioner and (2) a principle refuted in multiple references cited by Petitioner and the Examiner. In my opinion, the conclusions of Petitioner and Dr. Copeland in this regard can only be made using hindsight with the teachings of the ’373 patent guiding the way.

X. Conclusion

139. In view of the foregoing, I disagree with Petitioner’s contentions found in the Petition. Namely, a POSITA would not find it obvious to combine Muskovitz

and Sajic in the manner proposed in Ground 1, nor would a POSITA have had an expectation of success in so combining the references.

I have prepared this Declaration based upon my review of the materials referenced, consultation with counsel, and my own personal knowledge, education, skill and experience. I declare, under penalty of perjury under the laws of the United States of America, that the foregoing is true and correct.

[SIGNATURE ON FOLLOWING PAGE]

Dated: April 12, 2022

/s/ Stephanie Bonin
Stephanie Bonin PhD, PE



APPENDIX A

STEPHANIE BONIN, PhD PE
SENIOR BIOMECHANICAL ENGINEER

EDUCATION

Doctor of Philosophy, Industrial Engineering, University of Miami, 2017.
Master of Science, Mechanical Engineering, Michigan State University, 2001.
Bachelor of Science, Engineering Mechanics, Michigan State University, 1997.
Bachelor of Science, Physiology, Michigan State University, 1997.

PROFESSIONAL STATUS

Registered Professional Engineer, State of California, since 2017. License Number 38652.
Certified Playground Safety Inspector, since 2017. Certification Number 40179-1220.
Certified Child Safety Passenger Technician, since 2018. Certification ID T781193.

PROFESSIONAL ASSOCIATIONS

Association for the Advancement of Automotive Medicine, Policy Committee Member, since 2017.
American Society of Mechanical Engineers, since 2013.
ASTM International F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, voting committee member, since 2015.
Co-chair of the ASTM Equestrian Helmet Task Group, since 2019.
Gait and Clinical Movement Analysis Society, since 2011.

SCHOLARLY ACTIVITIES

Adjunct Professor, Department of Biosystems and Agricultural Engineering, University of Kentucky
Conducts research on equestrian-related injuries, supervises students on capstone design projects.
Scientific Review Committee, International Research Council on Biomechanics of Injury.
University of Kentucky, Sports Medicine Research Institute: Jockey & Equestrian, Advisory Board Member
Peer Reviews for the following academic journals: Journal of Biomechanical Engineering, Computer Methods in Biomechanics and Biomedical Engineering, Annals of Biomedical Engineering, BMJ Open Sport & Exercise Medicine, Materials and Design, Journal of Materials and Design.

PROFESSIONAL EXPERIENCE

MEA FORENSIC ENGINEERS & SCIENTISTS, LAGUNA HILLS, CA

Biomechanical Engineer, January 2012 to present
Conducts biomechanical analyses to assess the relationship between injuries and applied forces in cases involving automobile collisions, pedestrian impacts, slip/trip and fall, and sports injuries. Analyzes effectiveness of protective devices including seat belts and helmets. Conducts research on motorcycle helmet response during impacts using cadaver heads and instrumented headforms. Investigates impact performance of helmets on, above, and below the test line specified in helmet certification standards.

INSTITUTE FOR MOBILITY AND LONGEVITY, JUPITER, FL

Biomechanist, 2009 to 2012
Evaluated the efficacy of the 3D Knee ® implant by coordinating, leading and reporting on a 5-year follow-up study for device manufacturer, observed surgeries and followed patients by monitoring clinical outcome measures, conducted and reported on clinical gait analyses using 3-D motion capture.

PRATT & WHITNEY – EAST HARTFORD, CT

Ergonomic and Repair Development Engineer, 2005 to 2009
Assessed operator/equipment interface, designed and implemented manufacturing solutions to reduce ergonomic risks. Led effort to incorporate ergonomics into the design control process, collaborated across business units and technical disciplines for process improvements, conducted injury investigations, led continuous improvement initiatives, and completed 2 years of courses in Physical Therapy.

Developed technical data and conducted structural analysis of turbine airfoils, conducted root cause and corrective action investigations.

DOCTOR'S RESEARCH GROUP, INC., PLYMOUTH, CT

Product Development Engineer, 2001 to 2002

Developed dental devices from concept to manufacturing including design, prototyping, vendor sourcing, patent reviews, supported 510(k) and patent submissions, established assembly processes, observed surgical procedures, provided training, and integrated surgeon feedback into designs, responded to technical inquiries.

MICHIGAN STATE UNIVERSITY, EAST LANSING, MI

Research Assistant, 1997 to 2001

McPhail Equine Performance Center: Performed three-dimensional modeling and analysis of the equine temporomandibular joint, conducted gait analysis of performance horses including kinematic, kinetic, and electromyographic data collection.

College of Veterinary Medicine, Laboratory for Comparative Orthopaedic Research: Performed finite element and photoelastic stress analysis of equine hooves in-vitro.

Biomechanics Evaluation Laboratory, Department of Engineering Mechanics: Patient preparation, kinematic, kinetic, and electromyographic data collection.

Veterinary Assistant – College of Veterinary Medicine, Equine Hospital, 1999: Provided routine services to equine hospital patients, assisted with examinations, rehabilitation, and surgeries.

BREED TECHNOLOGIES, STERLING HEIGHTS, MI

Seat Belt and System Performance Engineer, 1997 to 1998

Modeled the biomechanical response of passengers in order to design safety restraint systems, experimentally verified simulations, and incorporated a rear-center retractor into Chrysler 300M vehicles.

EQUESTRIAN EXPERIENCE

Trainer and competitor in dressage and eventing disciplines, 1990 to present.

Assess saddle fit on horse and rider performance.

TEACHING EXPERIENCE**TEACHING ASSISTANT, MICHIGAN STATE UNIVERSITY, 1998 TO 2001****DEPARTMENT OF MECHANICAL ENGINEERING**

Fluid Mechanics Laboratory, Heat Transfer Laboratory

DEPARTMENT OF PHYSIOLOGY

Capstone Laboratory in Physiology

Weekly laboratory lecture, assisted students with experiments, graded laboratory reports.

PUBLICATIONS**PEER-REVIEWED PUBLICATIONS**

Bonin SJ, DeMarco AL, Siegmund GP (2022). The effect of MIPS, headform condition, and impact orientation on headform kinematics across a range of impact speeds during oblique bicycle helmet impacts. *Annals of Biomedical Engineering*, in press.

Kroeker SG, Özkul MC, DeMarco AL, Bonin SJ, Siegmund GP (2020). Density variation in the expanded polystyrene (EPS) foam of bicycle helmets and its influence on impact performance. *Journal of Biomechanical Engineering* 142, 041012, pp. 1-11. doi: 10.1115/1.4045709.

DeMarco AL, Chimich DD, Bonin SJ, Siegmund GP (2020). Impact performance of certified bicycle helmets below, on and above the test line. *Annals of Biomedical Engineering* 48(1), pp. 58-67. doi: 10.1007/s10439-019-02422-x.

Mattacola CG, Quintana C, Cross J, Tumlin KI, Bonin S (2019). Repeated impacts diminish the impact performance of equestrian helmets. *J Sport Rehabil.* 15:1-5.

Bonin SJ, Gardiner JC, Onar-Thomas A, Asfour SS, Siegmund GP (2017). The effect of motorcycle helmet fit on estimating head impact kinematics from residual liner crush. *Accident Analysis and Prevention* 106, doi:10.1016/j.aap.20107.06.015

Bonin SJ, Luck JF, Bass CR, Gardiner JC, Onar-Thomas A, Asfour SS, Siegmund GP (2016). Dynamic response and residual helmet liner crush using cadaver heads and standard headforms *Annals of Biomedical Engineering*, doi: 10.1007/s10439-016-1712-5.

Kroeker SG, Bonin SJ, DeMarco AL, Good CA, Siegmund GP (2016). Age does not affect the material properties of expanded polystyrene liners in field-used bicycle helmets. *Journal of Biomechanical Engineering* 138(4), doi: 10.1115/1.4032804.

Siegmund GP, Guskiewicz KM, Marshall SW, DeMarco AL, Bonin SJ (2015). Laboratory validation of two wearable sensor systems for measuring head impact severity in football players. *Annals of Biomedical Engineering*, doi: 10.1007/s10439-015-1420-6.

Harman MK, Bonin SJ, Leslie C, Banks SA, Hodge WA (2014). Total knee arthroplasty designed to accommodate the presence or absence of the posterior cruciate ligament. *Advances in Orthopedics*. Volume 2014, Article ID 178156.

Siegmund GP, Guskiewicz KM, Marshall SW, DeMarco AL, Bonin SJ (2014). A headform for testing helmet and mouthguard sensors that measure head impact severity in football players. *Annals of Biomedical Engineering* 42(9) pp.1834-1845.

Bonin SJ, Eltoukhy M, Asfour SS, Hodge WA (2012). Conversion of fused hip to total hip replacement with presurgical and postsurgical gait studies. *The Journal of Arthroplasty*, 27(3) pp. 493.e9-493.e12.

Stambolian D, Eltoukhy M, Asfour S, Bonin S (2011) Investigation of avionics box precision placement using motion capturing and thermal imaging techniques. *International Journal of Scientific and Engineering Research* 2(12) pp. 1-6.

Bonin SJ, Lanovaz JL, Johnston T, and Clayton HM (2007). Comparison of mandibular motion in horses chewing hay and pellets. *Equine Veterinary Journal* 39, pp. 258-262.

Bonin SJ, Clayton HM, Lanovaz JL, Johnston T (2006). Kinematics of the equine temporomandibular joint. *American Journal of Veterinary Research* 67, pp. 423-428.

PEER-REVIEWED CONFERENCE PROCEEDINGS

Bonin SJ, Siegmund GP. MIPS reduces headform kinematics across a range of impact speeds and anvil angles. *International Research Council of Biomechanics of Injury Conference*, September 8-10, 2021. Accepted.

Bonin SJ, DeMarco AL, Siegmund GP. MIPS reduces headform kinematics across a range of impact speeds. *International Research Council of Biomechanics of Injury Conference*, Munich Germany, September 9-11, 2020.

DeMarco AL, Chimich DD, Bonin SJ, Siegmund GP. Impact performance of certified bicycle helmets below, on and above the test line. *Brain Injury Across the Age Spectrum: Improving Outcomes for Children and Adults*, Houston, Texas, March 14-17, 2018.

Bonin SJ, DeMarco AL, Siegmund GP. The Effect of Hair and Football Helmet Fit on Headform Kinematics. *International Research Council of Biomechanics of Injury Conference*, Athens, Greece, September 12-14, 2014.

Siegmund GP, Bonin SJ, Luck JF, Bass CR. Validation of a Skin-Mounted Sensor for Measuring In-Vivo Head Impacts, *International Research Council on Biomechanics of Injury Conference*, Lyon, France, September 9-11, 2015.

Stambolian DB, Asfour SS, Eltoukhy M, Bonin SJ. Avionics box precision placement in restricted space, XXIII Annual International Occupational Ergonomics and Safety Conference, Baltimore, MD, June 9-10, 2011.

Ozkaramanli D, Asfour SS, Eltoukhy M, Stambolian DB, Bonin SJ. Effect of high-heeled shoes design on gait pattern, XXIII Annual International Occupational Ergonomics and Safety Conference, Baltimore, MD, June 9-10, 2011.

Bonin SJ, Eltoukhy M, Asfour SS. Use of motion capturing systems in the evaluation of joint replacement surgeries, case study: total hip replacement, Eleventh International Symposium on the 3D Analysis of Human Movement, San Francisco, CA, July 14-16, 2010.

Clayton HM, Bonin SJ, Johnson T, Lanovaz JL, Mullineaux DR (2003) Three-dimensional movements in the temporomandibular joint in horses chewing hay and pellets. Proceedings of the 18th Equine Nutrition and Physiology Society Symposium, Michigan State University, East Lansing, 4–7 June 2003.

ABSTRACTS/POSTERS

Gardiner JC, Van Toen C, Mang DWH, DeMarco AL, Bonin SJ, Siegmund GP (2019). The effects of foam thickness and impact velocity in padded falls onto the buttocks. XXVII Congress of the International Society of Biomechanics, Calgary, AB, July 31 - August 4, 2019.

Bonin SJ, Luck JF, Bass CR, Gardiner JC, Onar-Thomas A, Asfour SS, Siegmund GP (2014). A comparison of cadaver heads and standard headforms in helmet testing. 42nd International Workshop on Human Subjects for Biomechanical Research, San Diego, CA, November 9, 2014.

Siegmund GP, Guskiewicz KM, Marshall SW, DeMarco AL, Bonin SJ (2014). Validation of head impact sensors for football. 42nd International Workshop on Human Subjects for Biomechanical Research, San Diego, CA, November 9, 2014.

Bonin SJ, Luck JF, Bass CR, Gardiner JC, Onar-Thomas A, Asfour SS, Siegmund GP (2014). A comparison of cadaver heads and standard headforms in helmet testing. World Congress of Biomechanics, Boston, MA, July 6-11, 2014.

Siegmund GP, Guskiewicz KM, Marshall SW, DeMarco AL, Bonin SJ (2014). Validation of wearable sensors for measuring football head impacts. World Congress of Biomechanics, Boston, MA, July 6-11, 2014.

Kroeker SG, Bonin SJ, DeMarco AL, Good CA, Siegmund GP (2014). Does age affect the impact properties of helmet foam liners? World Congress of Biomechanics, Boston, MA, July 6-11, 2014.

OTHER PUBLICATIONS

Bonin SJ, Gardiner JC (2018). Biomechanics of head injuries and helmet protection. Advocate, June, pp. 44-52.

Bonin SJ (2017). Dynamic response and residual helmet liner crush using cadaver heads and standard headforms. Doctor of Philosophy Dissertation, Department of Industrial Engineering, University of Miami, Coral Gables, FL.

Bonin SJ (2001). Three-dimensional kinematics of the equine temporal mandibular joint. Masters Thesis, Department of Mechanical Engineering, Michigan State University, East Lansing, MI.

LECTURES AND PRESENTATIONS

April 14, 2021 – Motorcycle accident reconstruction and helmet analysis webinar.

February 8, 2021 – Helmet safety and concussions – how is your helmet working for you? Ontario Hunter Jumper Association webinar.

July 29, 2020 – Helmets and the biomechanics of head injury webinar.

October 17, 2019 - Injury biomechanics in personal injury cases. MEA Seminar, Los Angeles, CA.

October 16, 2019 - Injury biomechanics in personal injury cases. MEA Seminar, Riverside, CA.

April 23, 2019 – How helmets protect your head, Horse Industry Safety Summit, University of Kentucky, Lexington, KY.

April 5-6, 2019 – Brain injury biomechanics, TBI Med-Legal Conference, San Diego, CA.

November 8, 2018 – The Effect of Hair and Football Helmet Fit on Headform Kinematics – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Washington D.C.

February 24, 2018 – Assessing concussion risk: What your Biomechanical Expert should know, TBI Medlegal Conference, San Diego, CA.

November 15, 2017 – Expanded polystyrene (EPS) foam density varies within and between bicycle helmets - ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Atlanta, GA.

November 13, 2014 – A Comparison of Cadaver Heads and Standard Headforms in Helmet Testing – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, New Orleans, LA.

November 9, 2014 – A Comparison of Cadaver Heads and Standard Headforms in Helmet Testing – 42nd International Workshop on Human Subjects for Biomechanical Research, San Diego, CA.

TRAINING AND PROFESSIONAL DEVELOPMENT

March 22–25, 2021 – INPUT-ACE Video Evidence Symposium 2021, Online.

November 6-7, 2019 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Houston, TX.

September 11-13, 2019 – International Research Council on Biomechanics of Injury, Florence, Italy.

September 10, 2019 – Workshops on Virtual Testing and Open-Source Human Body Models AND Powered Two Wheelers (PTW), Florence, Italy.

November 15, 2018 – Principles of Dynamic Data Collection, DTS Training, Seal Beach, CA.

November 7-8, 2018 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Washington D.C.

September 26-29, 2018 – NHTSA National Standardized Child Passenger Safety Training, Pomona, CA.

September 12-14, 2018 – International Research Council on Biomechanics of Injury Conference, Athens, Greece.

November 15-17, 2017 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Atlanta, GA.

November 7-8, 2017 – Playground Safety Inspector Certification Course. Riverside, CA.

September 13-15, 2017 – International Research Council on Biomechanics of Injury, Antwerp, Belgium.

September 12, 2017 – Workshop on Safety of Automated Vehicles, Antwerp, Belgium.

September 14-16, 2016 – International Research Council on Biomechanics of Injury, Malaga, Spain.

September 13, 2016 – Workshop on Crash Reconstruction, Malaga, Spain.

May 3-4, 2016 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, San Antonio, TX.

July 6, 2015 – Building Code Overview, Ontario Society of Professional Engineers, Mississauga, ON.

November 18-19, 2015 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Tampa, FL.

November 9-11, 2015 – 59th Stapp Car Crash Conference, New Orleans, LA.

November 8, 2015 – 43rd International Workshop on Human Subjects for Biomechanical Research, New Orleans, LA.

September 9-11, 2015 – International Research Council on Biomechanics of Injury Conference, Lyon, France.

May 20-21, 2015 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Anaheim, CA.

November 13, 2014 – ASTM Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, New Orleans, LA.

November 10-12, 2014 – 58th Stapp Car Crash Conference, San Diego, CA.

November 9, 2014 – 42nd International Workshop on Human Subjects for Biomechanical Research, San Diego, CA.

July 6-9, 2014 – 7th World Congress of Biomechanics, Boston, MA.

June 9-10, 2014 – Commanding Presence Workshop, Toronto, ON.

November 13-15, 2013 – ASTM International Standards Development Meeting of Committee F08 - Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Jacksonville, FL.

November 11-13, 2013 – 57th Stapp Car Crash Conference, Orlando, FL.

November 10, 2013 – 41st International Workshop on Human Subjects for Biomechanical Research, Orlando, FL.

June 26-29, 2013 – ASME Summer Bioengineering Conference, Sunriver, OR.

November 14-16, 2012 – ASTM International Standards Development Meeting of Committee F08 - Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Atlanta, GA.

November 13, 2012 – ASTM International Symposium on the Mechanism of Concussion in Sports, Atlanta, GA.

January 7-8, 2012 – National Academy of Forensic Engineers bi-annual meeting, Miami, FL.

November 15-17, 2011 – MADYMO Introductory Course, Livonia, MI.

April 26-29, 2011 – Gait and Clinical Movement Analysis Society Annual Meeting, Bethesda, MD. August 5-9, 2008 – North American Congress on Biomechanics, Ann Arbor, MI.

May 28-31, 2008 – Clinical Gait Analysis: A Focus on Interpretation. Connecticut Children's Medical Center, Hartford, Connecticut.

March 19-22, 2006 – 52nd Annual Meeting of the Orthopaedic Research Society, Chicago, IL.

*04/2022

APPENDIX B

Stephanie Bonin, PhD PE

Trial Testimony

| <u>Date</u> | <u>Case Name</u> | <u>Law Office</u> | <u>Attorney</u> | <u>Venue (in CA unless noted)</u> |
|-------------|--|---|------------------|-----------------------------------|
| 06/18/18 | State of California v. Dietrich Canterbury | Jenner & Block | Nayiri Pilikyan | Los Angeles |
| 07/18/18 | State of California v. Vincent Do | Stanislaus County Office of the Public Defender | Donnell Snipes | Modesto |
| 08/27/18 | Chavez v. Kouchi | Law Office of George Arvanitis | George Arvanitis | San Diego |
| 10/11/18 | Furgatch v. Learning with a Difference, Inc. dba Westmakr School | Norton & Melnik | Maryam Danishwar | Los Angeles |
| 03/25/19 | State of California v. Caleb Burrett | Ventura County Public Defender's Office | Russell Baker | Ventura |
| 02/07/20 | Hatter v. Causey | Law Office of Chester Bennett | Lisa Patrick | Los Angeles |
| 01/07/21 | Alex v. Zenith Insurance | Zenith Insurance | James Layden | Sacramento |
| 02/08/21 | Commonwealth of Massachusetts v. Abichaker | Committee for Public Counsel Services | Robert Ryan | Brockton, MA |
| 07/28/21 | Browne v. Foxfield Riding School | Selman Breitman, LLP | Melanie Smith | Ventura |
| 8/26/21 | Cruz v. Desilva | Biesty Garretty & Wagner | Sean Garretty | San Diego |
| 10/21/21 | Adger v. LA36 / Loyola Marymount University | Skane Mills | Heather Mills | Los Angeles |
| 11/22/21 | Martinez / Aleman v. Graff / Curten | Law Office of Steven Ibarra | Steven Ibarra | Bakersfield |
| 12/17/21 | Mendoza v. Omnitrans / Mercado-Mandojano | Johnson & Shinton | Rocky Johnson | San Bernardino |
| 3/10/22 | Ziyang v. Liu | RHTLaw Asia LLP | Renee Sim | Republic of Singapore |

Deposition Testimony

| <u>Date</u> | <u>Case Name</u> | <u>Law Office</u> | <u>Attorney</u> | <u>Venue (in CA unless noted)</u> |
|-------------|--|---------------------------------|------------------|-----------------------------------|
| 4/7/16 | Berishaj v. Chaffey Joint Union High School District | Law Offices of Tiffany Chung | Tiffany Chung | San Bernardino |
| 1/9/18 | Mayshack v. Walter Hotel Corps. | Law Office of Kenechi R. Agu | Kenechi Agu | Palm Springs |
| 2/9/18 | Yniguez v. Star Driving School | Law Office of Savin & Bursk | Adam Savin | Los Angeles |
| 7/24/18 | Furgatch v. Learning with a Difference, Inc. dba Westmark School | Norton & Melnik | Maryam Danishwar | Los Angeles |
| 8/21/18 | Chavez v. Kouchi | Law Office of George Arvanitis | George Arvanitis | Santa Ana |
| 9/19/18 | Furgatch v. Learning with a Difference, Inc. dba Westmark School | Norton & Melnik | Maryam Danishwar | Los Angeles |
| 3/13/19 | Singer v. D and D Concrete Construction | Law Offices of Robert Karwin | Robert Karwin | Riverside |
| 3/20/19 | Gray v. Gudino | Homan & Stone | Gene Stone | San Bernardino |
| 5/23/19 | Grant v. American Business Group, et al | Panish Shea & Boyle | Deborah Chang | Los Angeles |
| 7/25/19 | Browne v. Foxfield Riding School | Selman Breitman, LLP | Kaitlin Preston | Ventura |
| 10/2/19 | Reggio v. Drell | Trauma Law Center | Karen Gold | Los Angeles |
| 11/5/19 | Bathini v. Lower / Robles | Ricks & Associates | Kenneth Ricks | San Bernardino |
| 5/27/20 | Barot v. JMC Homes | Porter Scott | Carl Calnero | Sacramento |
| 2/16/21 | De Cuevas v. Torres | Biesty Garretty & Wagner | Sean Garretty | San Diego |
| 7/15/21 | Cruz v. Desilva | Biesty Garretty & Wagner | Sean Garretty | San Diego |
| 7/20/21 | Martinez / Aleman v. Graff / Curten | Law Office of Steven Ibarra | Steven Ibarra | Bakersfield |
| 9/13/21 | Diez v. Oro Grande School District | Thompson & Colegate LLP | Daniel Faustino | San Bernardino |
| 10/29/21 | Flaherty v. USA | United States Attorney's Office | Jasmin Yang | Central District (Los Angeles) |
| 11/2/21 | Mendoza v. Omnitrans / Mercado-Mandojano | Johnson & Shinton | Rocky Johnson | San Bernardino |
| 11/23/21 | White v. USA | United States Attorney's Office | Paul Green | Central District (Los Angeles) |

| | | | | |
|----------|-------------------------------|--|------------------|-----------------|
| 12/6/21 | Quezada v. Gewickey | Javaheri & Yahoudai | R. Bret Beattie | Santa Barbara |
| 12/9/21 | Duran v. Padilla | Swanson O'Dell APC | Seth O'Dell | Bakersfield |
| 12/28/21 | Wickerd v. KB Home / Monsour | Wood Smith Henning & Berman | Christina Loni | Antelope Valley |
| 1/13/22 | Wickerd v. KB Home / Monsour | Wood Smith Henning & Berman | Christina Loni | Antelope Valley |
| 2/16/22 | Christy v. Storm | Law Office of Victor L. George | Victor George | Los Angeles |
| 2/23/22 | Doherty v. Danmar Products | Quintairos, Prieto, Wood & Boyer, P.A. | Colleen Schuetz | Memphis, TN |
| 3/7/22 | Stjerne v. Eldorado Polo Club | LippSmith LLP | Graham LippSmith | Riverside |
| 3/15/22 | Sierra v. Hernandez | Shernoff Bidart Echeverria LLP | Kristin Hobbs | Los Angeles |

Arbitration Hearings

| <u>Date</u> | <u>Case Name</u> | <u>Law Office</u> | <u>Attorney</u> | <u>Venue (in CA unless noted)</u> |
|--------------------|--|-------------------------------|------------------------|--|
| 6/25/15 | Valencia v. State Farm | Steven Lerman & Associates | Steven Lerman | Los Angeles |
| 7/21/16 | Flores v. Protective Insurance Company | Law Offices of Richard Foster | Richard Foster | Los Angeles |