

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 Owner.

Case No. TBD
Patent No. 10,736,373

DECLARATION OF STEVE COPELAND

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I, Steven Copeland, declare:

1. I have been retained by Wolf, Greenfield & Sacks, P.C., counsel for The Burton Corporation, to assess claims 1-5, 7, 12-13, 15-17 (the “challenged claims”) of U.S. Patent No. 10,736,373 (“the ’373 patent”). I am being compensated for my time at my standard rate of \$275 per hour, plus actual expenses. My compensation is not dependent in any way upon the outcome of the *inter partes* review of the ’373 patent.

I. PERSONAL AND PROFESSIONAL BACKGROUND

2. I am the founder and director of Humanscope, a position I have held since 2011. Humanscope is a product development company that helps its customers grow into major market leaders in their respective categories. We have a proven track record of experience in the use of broad variety of materials and processes from plastics to metal and moulding to electronics. In addition to our specialization in product development, we have designed, prototyped, tested, manufactured, marketed, and sold our own lines of consumer products which include Menopod, a cooling device for hot flashes (<https://menopod.com>), and our own conceptualized search and rescue (SAR) helmet, which was designed to pass SAR, Tactical, and Industrial hardhat standards.

3. Before taking the position of founder and director at Humanscope, I held multiple designer positions, such as: the design director and partner at Spark

Innovations Inc., where we developed numerous products for companies such as Adidas, Amertac, and Eikon and startup companies such as Brunton Innovations; the founder and president of Paradox Design, where we developed, manufactured, tested, and conceptualized products for many North American manufacturers including Bauer/Nike Hockey and Bell Sports, which involved concept drawing, CAD modeling, rapid prototyping, packaging, sourcing of tooling, applying for patents and documentation, testing, certifying, and integrating new technology; the president of Velosea Inc.; and the design supervisor for Cooper Canada from 1980 to 1985, where I led a team of twelve designers responsible for designing, developing, implementing, and testing new helmets and protective products for contact sports such as hockey, baseball, lacrosse, and football. I earned my four-year degree in Industrial Design from Ontario College of Art. In addition, I have been a professional member of the Association of Industrial Designers of Ontario since 1986, a senior member of the Society of Plastics Engineers since 1987, and a member of the Technical Committee for Ice Hockey Equipment and Facilities of the Canadian Standards Association since 1996.

4. In addition to my experiences as a leading designer and partner in product development, I have numerous teaching experiences as: a part-time professor at George Brown College, where I taught postgraduate Design Management and Design Strategy; a part-time instructor at Humber College, where

I taught industrial design, design presentation, and materials and processes; and a part-time instructor at Fanshawe College, where I taught industrial design, design presentation, and design studio.

5. I have vast experience conceptualizing and designing helmets. I have been a professional industrial designer for almost 40 years and have received numerous awards for designing unique consumer products. Some of my design experience includes the creation of original designs for helmets, which includes model making and prototyping for protective sports equipment and components and designing head protection for Canadian, American, and European testing and certification. I have created CAD models for the facially figured headforms that are used by the Canadian Standards Association, which are now mandated in several standards for impact testing of protective facemasks and eyewear. In addition, I have been involved in designing six snowboard helmets for Burton, and have been involved in the design of (and have been consulted) other sports helmets/components for companies such as Bauer, Bell, Brine, CCM, Cooper, Fisher Price, Hatco, Hespeler, Itech, Nike, MSA, Troxel, Reebok, and Warrior.

6. I am also the named inventor of over 60 patents, including several headgear-related patents that are of particular relevant to the '373 patent. Some of these headgear-related patents include U.S. Patent No. 5,093,936 titled "Protective Headgear and Detachable Face Protector," which relates to a protective sports

headgear with a rigid outer shell and an inner protective lining of shock absorbing material, and U.S. Patent No. 7,673,351 titled “Shock Absorbing Structure,” which relates to shock absorbing structure with upstanding, hollow support members that allow air passage, to be used in helmets and protective wear.

7. My curriculum vitae is provided as Exhibit 1004.

II. MATERIALS REVIEWED AND CONSIDERED

8. My findings, as explained below, are based on my years of education, research, experience, and background in the field of protective helmet design, as well as my investigation and study of relevant materials for this declaration. When developing the opinions set forth in this declaration, I assumed the perspective of a person having ordinary skill in the art, as set forth in Section IV below. In forming my opinions, I have studied and considered the materials identified in the list below. I have also reviewed relevant portions of the file history of the '373 patent.

Exhibit	Description
1001	U.S. Patent No. 10,736,373 (“the 373 patent”)
1005	U.S. Publication No. 2004/0064873 (“Muskovitz”)
1006	U.S. Publication No. 2008/0307568 (“Sajic”)
1007	WO 2005/060778 (“Sajic-WO”)
1008	U.S. Publication No. 2014/0013492 (“Bottlang”)
1009	U.S. Patent No. 7,254,843 (“Talluri”)
1010	U.S. Patent No. 4,422,183 (“Landi”)
1011	U.S. Publication No. 2006/0059606 (“Ferrara”)
1012	U.S. Patent No. 5,950,244 (“Fournier”)
1013	U.S. Patent No. 8,087,101 (“Ferguson”)
1014	U.S. Patent No. 7,673,351 (“Copeland”)

Exhibit	Description
1015	Fox MTB 2011 Collection – Product Catalog Published January 5, 2011. Archived: https://issuu.com/monzaimports/docs/fox_mtb_2011-catalog (“Fox-2011-Catalog”)
1016	U.S. Patent No. 8,069,498 (“Maddux”)
1017	U.S. Publication No. 2002/0124298 (“Muskovitz-Prior”)
1018	U.S. Provisional Application No. 60/274447 (“Muskovitz-Prior-Provisional”)
1019	U.S. Patent No. 4,434,514 (“Sundahl”)
1020	U.S. Pat. No. 8,082,599 (“Sajic-599”)

III. MY UNDERSTANDING OF PATENT LAW

9. In developing my opinions, I discussed various relevant legal principles with Petitioner’s attorneys. Though I do not purport to have prior knowledge of such principles, I understood them when they were explained to me and have relied upon such legal principles, as explained to me, in the course of forming the opinions set forth in this declaration. My understanding in this respect is as follows:

10. I understand that “*inter partes* review” (IPR) is a proceeding before the United States Patent & Trademark Office for evaluating the patentability of an issued patent’s claims based on prior-art patents and printed publications.

11. I understand that, in this proceeding, Petitioner has the burden of proving that the challenged claims of the ’373 patent are unpatentable by a preponderance of the evidence. I understand that “preponderance of the evidence” means that a fact or conclusion is more likely true than not true.

12. I understand that, in IPR proceedings, claim terms in a patent are given their ordinary and customary meaning as understood by a person of ordinary skill in the art (“POSA”) in the context of the entire patent and the prosecution history pertaining to the patent. If the specification provides a special definition for a claim term that differs from the meaning the term would otherwise possess, the specification’s special definition controls. If a claim element is expressed as a “means” for performing a specified function, I understand that it covers the corresponding structure described in the specification and equivalents of the described structure. I have applied these standards in preparing the opinions in this declaration.

13. I understand that determining whether a particular patent or printed publication constitutes prior art to a challenged patent claim can require determining the effective filing date (also known as the priority date) to which the challenged claim is entitled. I understand that for a patent claim to be entitled to the benefit of the filing date of an earlier application to which the patent claims priority, the earlier application must have described the claimed invention in sufficient detail to convey with reasonable clarity to the POSA that the inventor had possession of the claimed invention as of the earlier application’s filing date. I understand that a disclosure that merely renders the claimed invention obvious is

not sufficient written description for the claim to be entitled to the benefit of the filing date of the application containing that disclosure.

14. I understand that for an invention claimed in a patent to be patentable, it must be, among other things, new (novel—*i.e.*, not anticipated) and not obvious from the prior art. My understanding of these two legal standards is set forth below.

A. Anticipation

15. I understand that, for a patent claim to be “anticipated” by the prior art (and therefore not novel), each and every limitation of the claim must be found, expressly or inherently, in a single prior-art reference. I understand that a claim limitation is disclosed for the purpose of anticipation if a POSA would have understood the reference to disclose the limitation based on inferences that a POSA would reasonably be expected to draw from the explicit teachings in the reference when read in light of the POSA’s knowledge and experience.

16. I understand that a claim limitation is inherent in a prior art reference if that limitation is necessarily present when practicing the teachings of the reference, regardless of whether a person of ordinary skill recognized the presence of that limitation in the prior art.

B. Obviousness

17. I understand that a patent claim may be unpatentable if it would have been obvious in view of a single prior-art reference or a combination of prior-art references.

18. I understand that a patent claim is obvious if the differences between the subject matter of the claim and the prior art are such that the subject matter as a whole would have been obvious to a person of ordinary skill in the relevant field at the time the invention was made. Specifically, I understand that the obviousness question involves a consideration of:

- the scope and content of the prior art;
- the differences between the prior art and the claims at issue;
- the knowledge of a person of ordinary skill in the pertinent art; and
- if present, objective factors indicative of non-obviousness, sometimes referred to as “secondary considerations.”

19. I understand that in order for a claimed invention to be considered obvious, a POSA must have had a reason for combining teachings from multiple prior-art references (or for altering a single prior-art reference, in the case of obviousness in view of a single reference) in the fashion proposed.

20. I further understand that in determining whether a prior-art reference would have been combined with other prior art or with other information within

the knowledge of a POSA, the following are examples of approaches and rationales that may be considered:

- combining prior-art elements according to known methods to yield predictable results;
- simple substitution of one known element for another to obtain predictable results;
- use of a known technique to improve similar devices in the same way;
- applying a known technique to a known device ready for improvement to yield predictable results;
- applying a technique or approach that would have been “obvious to try,” *i.e.*, choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success.
- known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;
- some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior-art reference or to combine prior-art reference teachings to arrive at the claimed invention. I understand that this teaching, suggestion or

motivation may come from a prior-art reference or from the knowledge or common sense of one of ordinary skill in the art.

21. I understand that for a single reference or a combination of references to render the claimed invention obvious, a POSA must have been able to arrive at the claimed invention by altering or combining the applied references.

IV. PERSON OF ORDINARY SKILL IN THE ART (“POSA”)

22. I have been informed and understand that for purposes of assessing whether prior-art references disclose every element of a patent claim (thus “anticipating” the claim) and/or would have rendered the claim obvious, the patent and the prior-art references must be assessed from the perspective of a person having ordinary skill in the art (“POSA”) 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 POSA is presumed to be aware of all pertinent prior art and the conventional wisdom in the art, and is a person of ordinary creativity. I have applied this standard throughout my declaration.

23. The ’373 patent involves technology in the field of protective helmets. I have been asked to provide my opinions as to the state of the art in this field by August 2013. I use this timeframe because the face of the ’373 patent indicates an earliest claimed priority date of August 13, 2013. Whenever I offer an opinion in this declaration about the knowledge of a POSA, the manner in which a POSA

would have understood the claims of the '373 patent or its description, the manner in which a POSA would have understood the prior art, or what a POSA would have been led to do based on the prior art, I am referencing the August 2013 timeframe, even if I do not say so specifically in each case.

24. In my opinion, a person of ordinary skill in the art in the August 2013 timeframe ("POSA") 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.

25. By 2013, I held a degree in Industrial Design, and I had decades of experience with helmet design. Therefore, I was a person of more than ordinary skill in the art during the relevant timeframe. However, I worked with many people who fit the characteristics of the POSA, and I am familiar with their level of skill. When developing the opinions set forth in this declaration, I assumed the perspective of a person having ordinary skill in the art, as set forth above.

V. THE '373 PATENT

26. The '373 patent's background explains that "[h]elmets are used in many outdoor activities to protect the wearer from head injuries that may occur during the activity." '373 patent (Ex. 1001), 1:6-7. Provided below is a brief

discussion of conventional helmet design and the state of the art at the time of the ‘373 patent.

A. Technology Background

27. Conventional protective helmets commonly employed a hard outer shell, typically of molded plastic, and an inner-liner formed of an impact-absorbing material bonded or molded to the outer shell. Muskovitz (Ex. 1005), [0075], [0081]; Ex. 1011, [0005]-[0007]. To provide ventilation to the wearer, protective helmets were provided with vents formed through the shell/liner to allow air to flow into and out of the interior of the helmet. *See e.g.*, Muskovitz, [0075]; Ferrara (Ex. 1011), [0035], [0052].

28. Protective helmets employed a variety of impact absorbing material for the inner-liner of helmet, including a variety of plastic foam materials such as an expanded polystyrene (EPS) foam (*see e.g.*, Muskovitz, [0019], Ferrara, [0006]), and materials comprising arrays of hollow energy absorbing cells (*see e.g.*, Fig. 5 of Copeland (Ex. 1014), below left), often arranged in a “honeycomb” configuration (*see e.g.*, Fig. 1b of Talluri (Ex. 1009), below right). *See also* Sajic (Ex. 1006), [0097]-[0101], Bottlang (Ex. 1008), [0003], [0019]-[0023]).

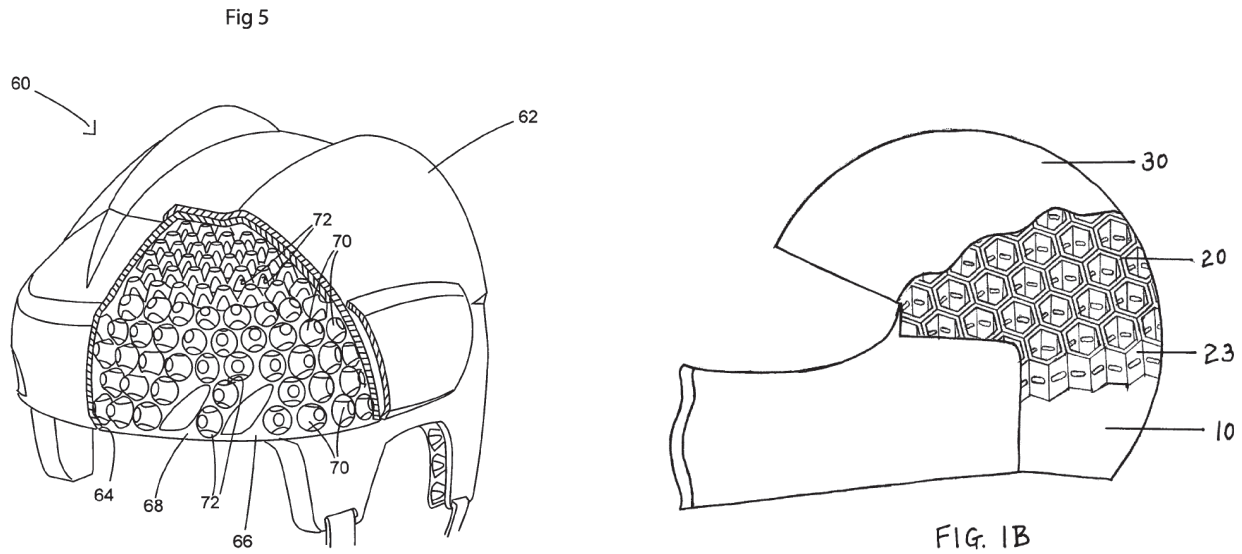


Fig. 5, Copeland (Left) and Fig. 1B, Talluri (Right)

29. Protective helmets also employed impact absorbing inserts provided in the inner liner of the protective helmet to improve impact absorption, absorb a varying range of impacts, extend the interval of time for impact absorption, etc. *See e.g.*, Sajic, [0106]-[0107], [0113]-[0123]; Fournier (Ex. 1012), 4:17-36). In the same way that shock absorbing inner liners were formed from both foam materials and materials comprising energy absorbing cells, impact absorbing inserts positioned in the inner liner were similarly constructed using foam materials, as illustrated by foam inserts 19 in Fig. 4 of Fournier (below left), and materials comprising energy absorbing cells, as illustrated by inserts 130 (arrays of “energy absorbing tubes”) in Fig. 9 of Sajic (below right).

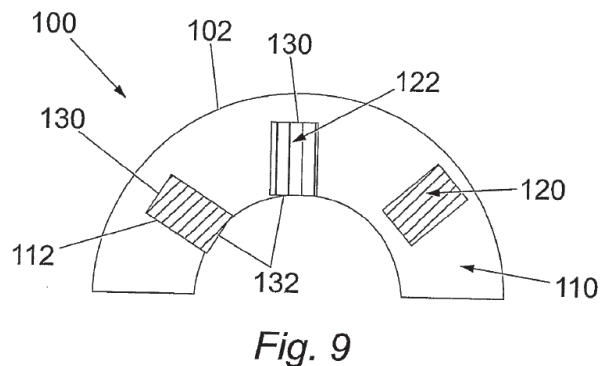
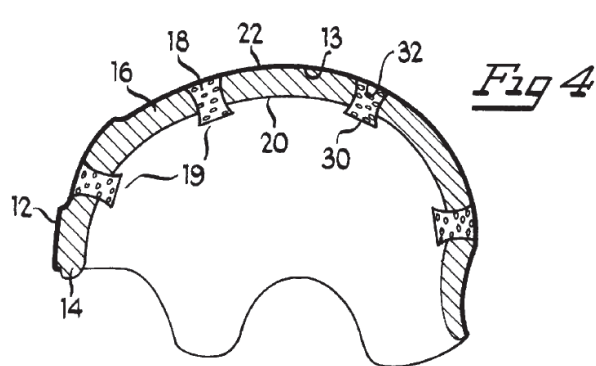
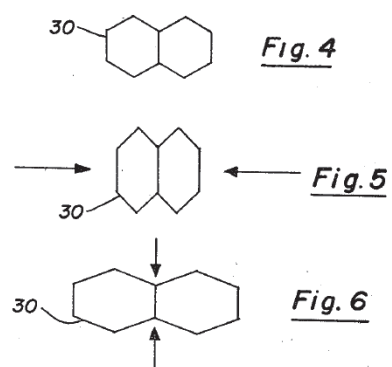
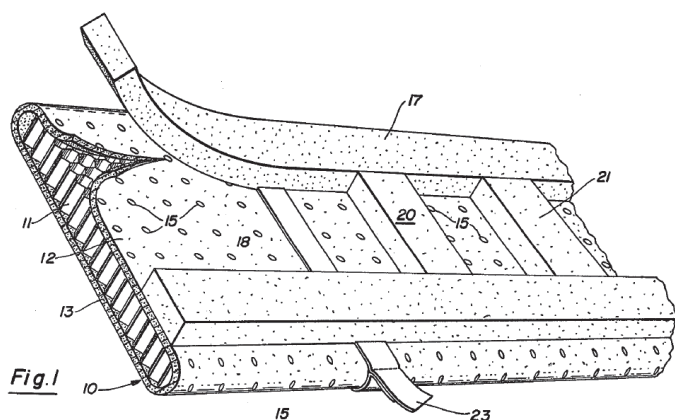


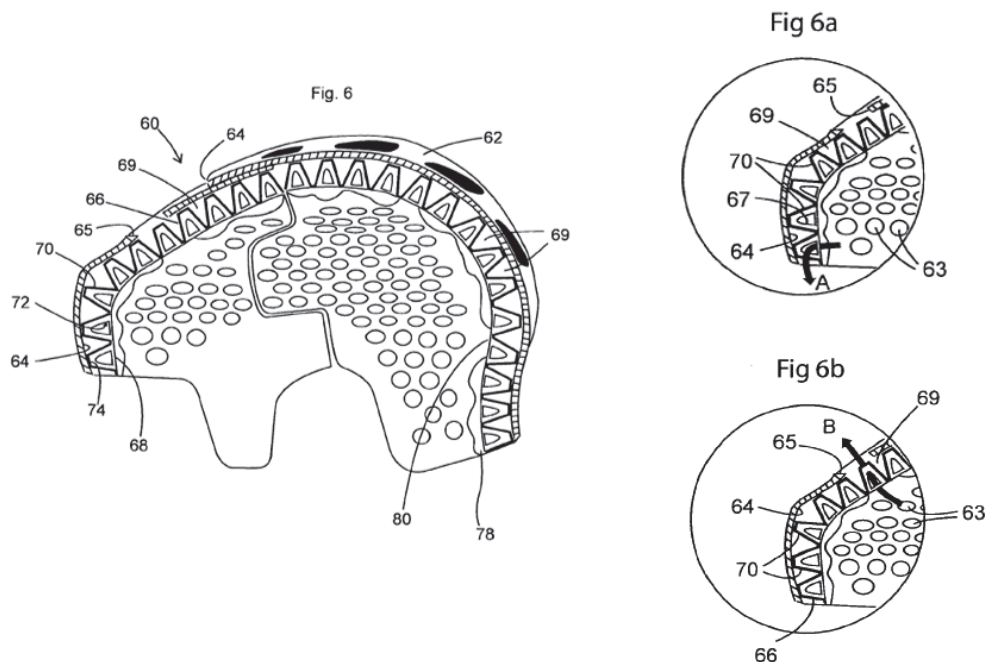
Fig. 4, Fournier (Left) and Fig. 9, Sajic (Right)

30. Materials comprising energy absorbing cells provided both impact absorption and ventilation via air flow through the material. *See e.g.*, Landi (Ex. 1010), 1:61-3:33; Copeland (Ex. 1014), 4:9-24; Ferrara, [0035], [0050], [0052]; Ferguson (Ex. 1013), 2:31-34, 6:4-7; Ex. 1015, 7). For example, Landi discloses using a hexagonal honeycomb structure for impact absorption and ventilation in protective devices, that due to “the open nature” of the structure, there “no impediment to air flow no matter how thick it is, (3:21-22). Landi, 1:61-3:33, 4:54-5:29.



Figs. 1 and 4-6, Landi

31. Copeland employed open-ended hollow conical structures for impact absorption in a protective helmet with side openings in the conical structures to provide both circulation of air through the shock absorbing structure itself (Fig. 6a below) and air flow through openings provided in the outer shell (see Fig. 6b below). Copeland, ¶¶ X. *See also* Ferrara, [0035], [0050], [0052]; Ferguson (Ex. 1013), 2:31-24, 6:4-7.



Figs. 6, 6a-6b of Copeland

32. As another example, using hexagonal cylindrical energy absorbing cells (e.g., like the honeycomb configuration of Landi) in a protective helmet, “Structural Honeycomb venting inserts” were employed in the rear vents of the Fox 2011 “Striker” helmet, as shown in the image below provided in the “Fox

MTB 2011 Collection” catalog published on January 5, 2011. Ex. 1015, 7
(archived at https://issuu.com/monzaimports/docs/fox_mtb_2011-catalog).



2011 Striker Helmet, Ex. 1015

33. The ‘373 patent discloses protective helmets comprising components constructed of the same materials and used in the same way as the prior art helmets discussed above. Specifically, the protective helmets disclosed in the ‘373 patent use a conventional outer shell with a conventional foam material (e.g., EPS or EPP) bonded to the interior of the outer shell and inserts made of known “honeycomb material” for impact absorption and ventilation (*see e.g.*, ‘373 patent, 1:57-2:27), the same techniques employed by the prior art helmet discussed above.

B. Overview of the '373 Patent Disclosure and Embodiments

34. The '373 patent is directed to a helmet designed to protect a wearer's head and provide ventilation during a sport or outdoor activity. '373 patent, 1:6-34, 1:57-2:65. The disclosed helmet comprise an outer shell, a shock absorbing liner made from shock absorbing material such as “expanded polystyrene (EPS) material, expanded polypropylene (EPP), or another suitable shock absorbing material,” and a shock absorbing insert positioned within a cavity formed in the shock absorbing liner, an example of which is illustrated in FIGS. 1 and 2 reproduced below. *Id.*

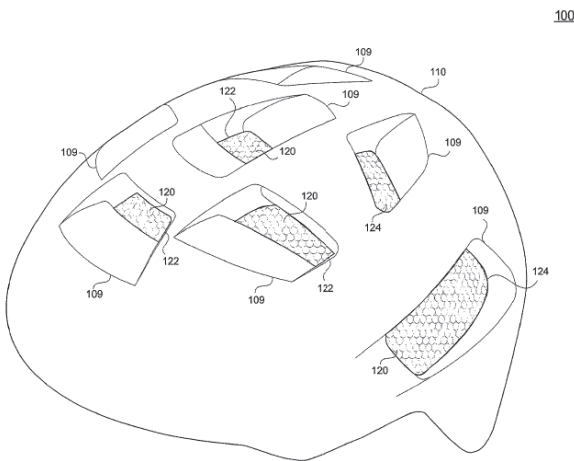


FIG. 1

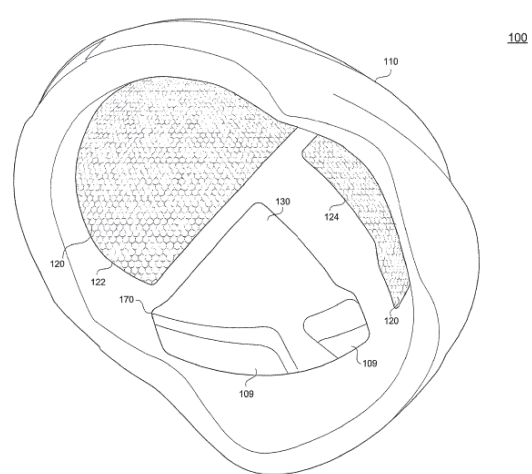


FIG. 2

35. In FIG. 1, 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. '373 patent , 2:10-40. In FIG. 2, one of the inserts 126 is removed “to show a cavity (e.g., an opening, recess, etc.) 170 of the shock absorbing liner 130.” '373 patent, 2:35-37.

36. 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.” '373 patent, 2:37-40. FIGS. 4 and 5, reproduced below, illustrate a vertical cross section and a front-to-back vertical cross section of helmet 100. '373 patent, 4:40-5:30.

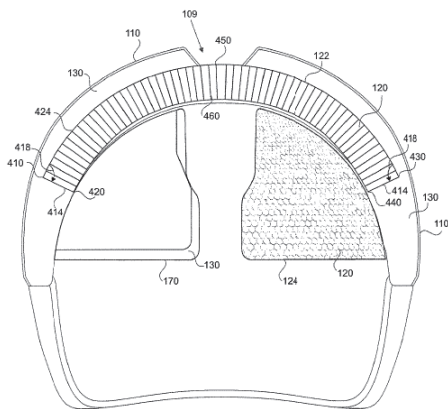


FIG. 4

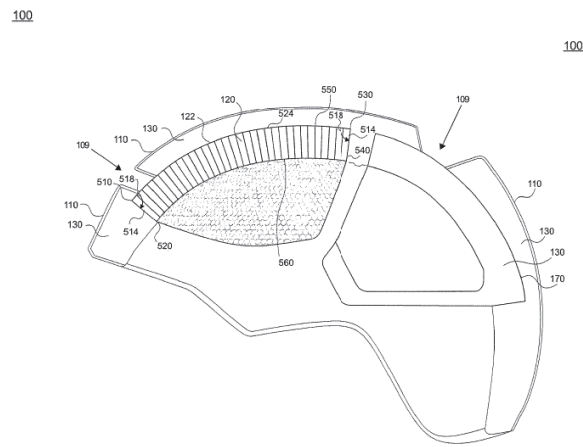


FIG. 5

37. The '373 patent discloses that the inserts may be made of a “honeycomb material” to “provide impact absorption and have tubes with open longitudinal ends that allow air to freely flow through the tubes in the shell 110 to the head of the wearer.” '373 patent, 2:15-23; *see also* Ex. 1001, 2:48-51, stating “insert 126 may include a honeycomb material that includes an array of energy absorbing cells. In addition to providing impact absorption, each of the cells may

include a tube, which may allow air to pass through, providing ventilation to the head of the wearer of the helmet 100.”).

C. The Challenged Claims

1. Independent Claim 1

38. Independent claim 1 is reproduced below with labels added before each limitation for reference:

[1PR] A helmet, comprising:

[1A] a shell comprising a plurality of vents including a first vent defining a first opening and a second vent defining a second opening;

[1B] 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

[1C] a shock absorbing insert positioned in and substantially filling the cavity

[1C1] such that the shock absorbing insert is visible through and spans across at least a portion of each of the plurality of vents,

[1C2] wherein at least a portion of the shock absorbing liner is positioned between the shell and the shock absorbing insert,

[1C3] wherein the shock absorbing insert comprises an array of energy absorbing cells, each having respective open first longitudinal ends and open second longitudinal ends,

[1C4] 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

[1C5] 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.

39. Claim 1 recites three components labeled [1A]-[1C], namely, a shell with vents, a shock absorbing liner with a cavity, and a shock absorbing insert positioned in the cavity. The three components of claim 1 are shown with coloring in the cross-section of helmet 100 of FIG. 1 illustrated in FIG. 5 of the '373 patent reproduced below.

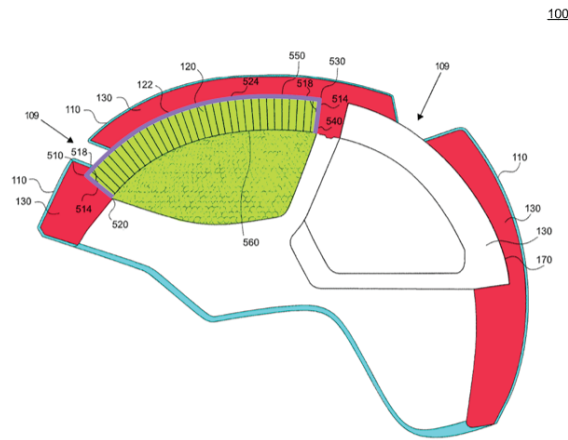


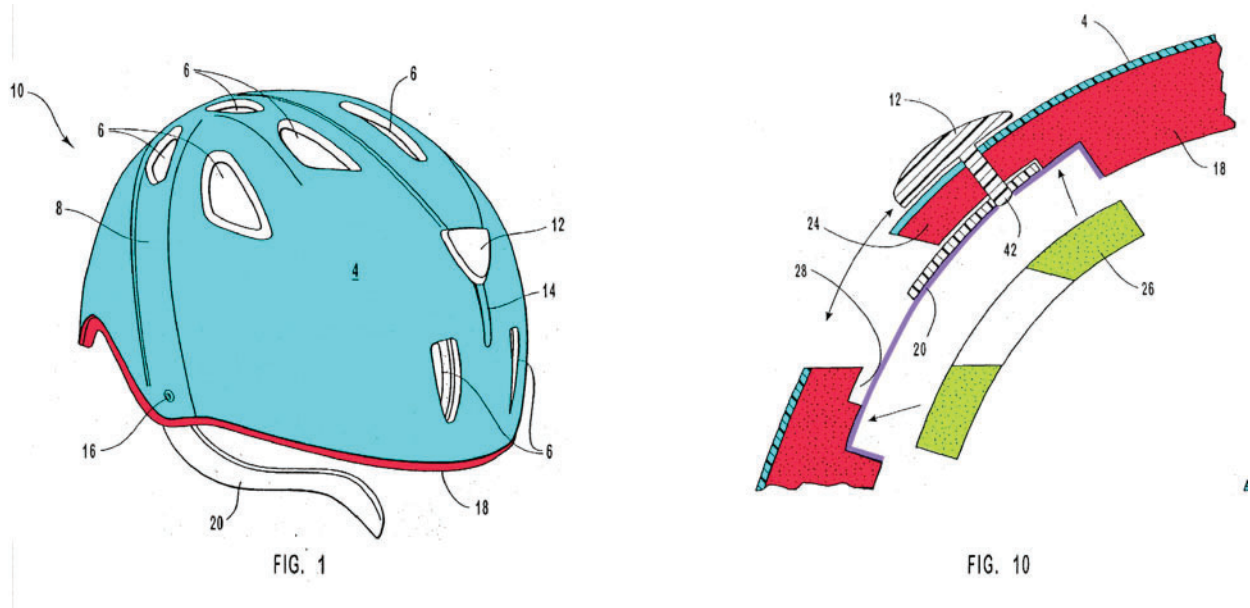
FIG. 5

Fig. 5, 373 patent (Annotated)

40. In particular, helmet 100 illustrated in FIG. 5 above includes “a shell 110 having vents 109” (shown in aqua coloring) (Ex. 1001, 2:11-12) as recited in [1A], a “shocking absorbing liner 130” (shown in red coloring) that “lines at least a portion of the interior of shell 110” and has “a cavity (e.g., an opening, a recess, etc.) 170” (outlined in purple) formed therein (*id.* 2:30-36) as recited in [1B], and “an insert 126” (green) positioned in the cavity (*id.* 2:31-33) as recited in [1C].

41. A helmet with this configuration of outer shell, shock absorbing liner and shock absorbing insert arranged in the manner recited in [1A]-[1C] is disclosed

in Muskovitz, as illustrated in FIG. 1 and FIG. 10 of Muskovitz reproduced below using the same coloring used to illustrate the same components in FIG. 5 of the ‘373 patent.



Figs. 1 and 10, Muskovitz (Annotated)

42. Muskovitz discloses that protective helmet 10 comprises “an outer shell 4” (aqua) comprising “ventilation ports 6” (only one of which is visible in the cross-section of FIG. 10) (Muskovitz, [0076], [0087]) as recited in **[1A]**, “an impact absorbing inner liner 18” (red) “joined (molded or bonded) to outer shell 4 and comprising a cavity (outlined in purple) within a recess in liner 18 aligned with corresponding ventilation ports 6 (Muskovitz, [0087]) as recited in **[1B]**, and “an insert member 26” (green) composed of “impact absorbing material” positioned in and substantially filling the cavity (*id.*) as recited in **[1C]**.

43. Thus, Muskovitz discloses limitations [1A]-[1C]. Claim limitations [1C1]-[1C5] merely recite the result of using the example “honeycomb material” disclosed the ‘373 patent (i.e., material comprising energy absorbing tubes, ‘373 patent, 2:48-51) for the shock absorbing insert in the arrangement of components recited in [1A]-[1C]. However, as discussed in § V.A above, prior protective helmets used inserts formed from material comprising impact absorbing tubes (*see e.g.*, Sajic, [0113]-[0123]) and the ventilation properties of such material was known (*see e.g.*, Landi (Ex. 1010), 3:21-22; Copeland (Ex. 1014), 4:9-24; Ferrara, [0035], [0050], [0052]; Ferguson (Ex. 1013), 2:31-34, 6:4-7; Ex. 1015, 7).

44. Thus, claim 1 recites nothing more than the result of using a known shock absorbing material with the known property of facilitating air flow helmets for Muskovitz’s insert member 26, for which Muskovitz expressly states can comprise any of “various material compositions.” Muskovitz, [0087].

45. In particular, Sajic discloses using a core material comprising an array of energy absorbing tubes as an impact absorbing liner (*see e.g.*, Sajic, [0097]-[0101], Figs. 1(a)-(b), Fig. 2, Figs. 3(a)-(b)) and as an insert in conventional foam liners (*see e.g.*, Sajic, [0113]-[0123], Figs. 9-10) to improve the impact attenuation of a safety helmet. Sajic, [0005], [0106]-[0107].

46. The simple and straightforward substitution of Sajic’s insert comprising “an array of energy absorbing tubes” (Sajic, [0117]) having “open

ends” (Sajic, [0122]) for Muskovitz’s insert member 26 (*see* FIG. 10 of Muskovitz above) renders obvious claim 1 as discussed in further detail in the analysis for each of the limitations of claim 1 below.

47. Dependent claims 2-5 and 7 are obvious for the reasons demonstrated below in §§ VII.A.2.b-VII.A.2.f.

2. Independent Claim 12

48. Claim 12 recites a shell having vents, a shock absorbing liner having a cavity and a shock absorbing insert positioned in the cavity and is similar to claim 1. The obvious use of Sajic’s insert material for the insert member of Muskovitz renders claim 12 obvious for the same reasons, as discussed in further detail in the analysis for each of the limitations of claim 12 below.

VI. PRIOR-ART REFERENCES

49. An overview of prior art references (1) U.S. Patent Application Publication No. 2004/0064873 (“Muskovitz,” Ex. 1005) and (2) U.S. Patent Application Publication No. 2008/0307568 (“Sajic,” Ex. 1006) relied upon to show the unpatentability of the challenged claims is provided below.

A. Overview of Muskovitz

50. Muskovitz, titled “In-mold protective helmet having integrated ventilation system,” published as U.S. Patent Application Publication No. 2004/0064873 on April 8, 2004. I understand that Muskovitz is prior art to the ‘373 patent based on its publication date of April 8, 2004.

51. Muskovitz describes “a lightweight protective helmet having an improved ventilation system therein.” Muskovitz, Abstract. In more detail, Muskovitz describes his inventions in the Abstract as follows:

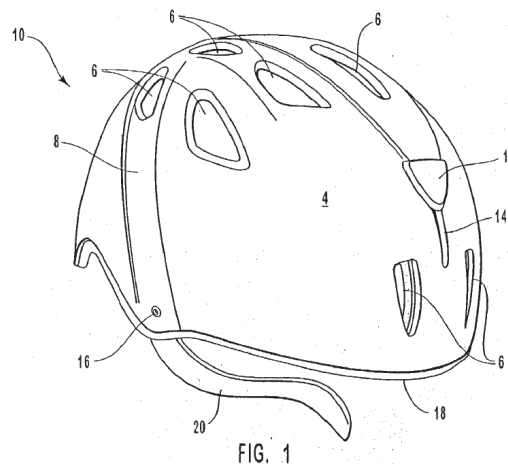
The present invention provides a lightweight protective helmet having an improved ventilation system therein. The protective helmet comprises an outer shell and an inner liner that are joined together to form a shell/liner composite. The ventilation system interacts with one or more ventilation ports in the protective helmet to control the flow of ambient air in and out of the interior of the protective helmet. The ventilation system may be integrated or encased within the shell/liner composite, or it may be adapted to be used on the exterior of the helmet. In addition, the ventilation system may include one of several types of interchangeable insert members to allow active or passive control of ambient air into the interior of the helmet.

52. Muskovitz discloses a protective helmet comprising an outer shell and an inner liner that are joined together to form a shell/liner composite and a ventilation system integrated or encased within the shell/liner composite.

Muskovitz, [0068]. As depicted in Muskovitz’s FIG. 1, the protective helmet 10 has a “plurality of ventilation ports 6,” which “are designed to facilitate ambient air flow into and out of the interior of protective helmet 10.” Muskovitz, [0075]. This integrated ventilation system is designed such that the ventilation of ambient air “through ventilation ports 6” through the shell/liner composite “may be modified and controlled by the user.” Muskovitz, [0075].

53. To allow a wearer to adjust the amount of air flow through one or more vents, Muskovitz discloses an active vent system comprising a “fluid airflow actuator 12 that is slidably coupled to protective helmet 10 and specifically outer

shell 4,” such that a wearer can “slide [the actuator] in a bi-directional manner along slotted portion 14” of the helmet. Muskovitz, [0075]. When the wearer “displace[s] fluid airflow actuator 12 in a downward direction, the ambient air flow is blocked from entering ventilation port 6 using a vent shield.” Muskovitz, [0075]. This allows the wearer to control the amount of air into and out of the helmet via one or more vent ports, which can “cool the individual or ... allow air and heat from the interior to escape, thus creating an increased efficiency cooling system.” Muskovitz, [0075]; *see also* [0023], [0032], [0076]. An example of an active vent system to control air flow through a pair of vents positioned at the front of the helmet is illustrated in FIG. 1 reproduced below.

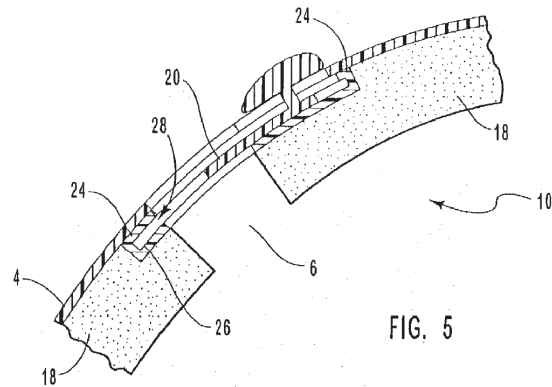
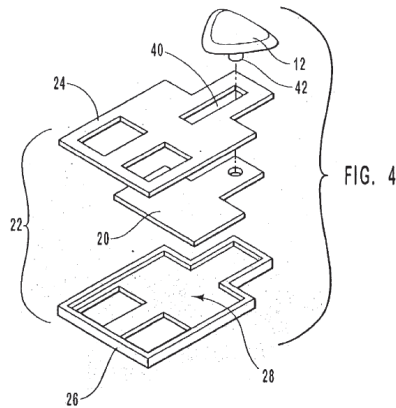


54. The protective helmet 10 in FIG. 1 is formed by an outer shell 4 and inner liner 18 through which ventilation ports 6 are provided to allow air to flow into and out of the interior of the helmet. Muskovitz, [0075]-[0076]. An active vent system comprising fluid airflow actuator 12, slotted portion 14 and a vent

shield (not visible in FIG. 1) allows a wearer to control the amount of air flow through the two vents positioned at the front of the helmet. *Id.* Vents having an associated actuator-controlled vent shield are referred to as “active vents” ([0023]) due to the wearer being able to actively adjust the amount of air flow into the interior of the helmet through those vents. Muskovitz, [0023]; *see also* [0032], [0098].

55. In FIG. 1, actuator 12 is positioned in the fully-open position so the vent shield does not block any portion of the active vents and so is not visible in FIG. 1. Actuator 12 can be lowered to adjust the vent shield as desired so that air flow through the active vents can be “total, partial or blocked.” Muskovitz, [0075].

56. Muskovitz discloses a number of techniques for creating a vent space that accommodates the vent shield and through which the vent shield can be raised and lowered to control ambient air flow into and out of the helmet. Muskovitz, [0069]-[0074]. In the embodiment illustrated in FIGS. 4 and 5 reproduced below, a vent space is defined by “an independently created vent box that works in conjunction with either the inner lining or outer shell” ([0071]). Muskovitz, [0071], [0078]-[0082].



57. Vent box 22 comprises “an upper member 24 and a lower member 26 embedded within a recess in an outer portion of liner 18 beneath outer shell 4.” Muskovitz, [0080], FIG. 5. The upper and lower members 24 and 26 “define the upper and lower surface or boundary of the vent box 22 and vent space 28,” or the “volume of space 28,” as shown in FIG. 5. Muskovitz, [0080]-[0081], FIG. 5. The vent box 20 and vent space 28 are created “to contain or house vent shield 20 therein,” wherein the vent shield, as stated previously, can be displaced via fluid airflow actuator 12 through the apertures in the upper and lower members that align with the corresponding vent ports in the protective helmet. Muskovitz, [0079]-[0081].

58. Muskovitz introduces other embodiments wherein the vent space “may be created or defined by any layer of the protective helmet,” which eliminates the need for “a separate and independently created vent box” ([0089]). Muskovitz, [0069]-[0070], [0072]-[0073], [0087]-[0090]. For example, in the embodiment illustrated in FIG. 10 (reproduced below with annotations), the upper

boundary 24 of vent space 28 is formed by liner 18 and the lower boundary is formed insert member 26, respectively, rather than creating a separate vent box to define the vent space. Muskovitz, [0087]-[0089].

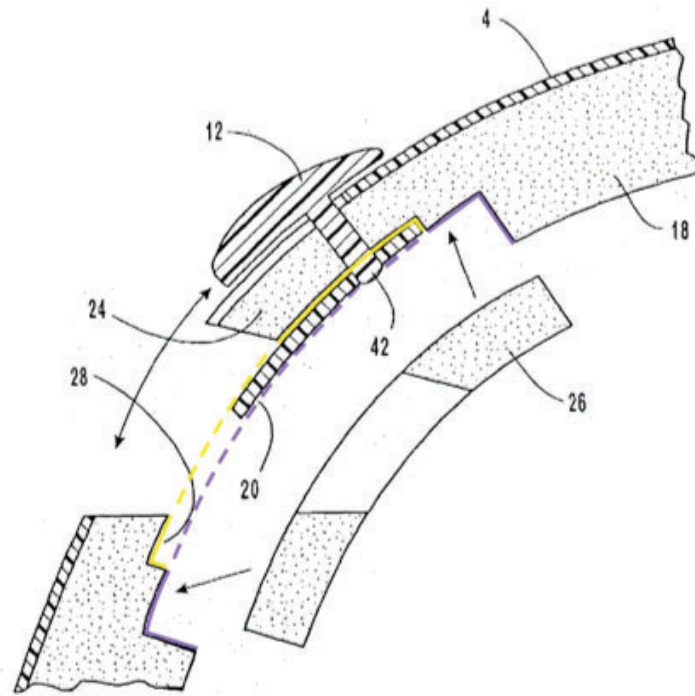


FIG. 10

Fig. 10, Muskovitz (Annotated)

59. Specifically, a portion of absorbing inner liner 18 aligned with one or more vent ports is “removed to form a recess therein,” such that the recess is stair-stepped, in order to create the vent space (outlined in yellow) that houses vent shield 20. Muskovitz, [0087]. In addition, a “[r]emovable insert member 26 is designed to fit within the recess in liner 18,” which is the larger insert space (outlined in purple) referred to hereinafter as the “insert-space.” *Id.*

60. When the insert member 26 is positioned in the insert-space, it forms the lower boundary of vent space 28. Muskovitz, [0087]-[0088] (“As removable insert 26 is fit within the recess of and coupled to inner liner 18, vent space 28 is created.”). As further illustrated in FIG. 10, insert member 26 has an aperture formed therein that aligns with the opening(s) of the one or more active vents through air flow can be controlled by raising and lowering vent shield 20. Muskovitz, FIG. 10. Muskovitz does not teach using any specific material for insert member 26 and discloses that insert member 26 may comprise “various material compositions, but is preferably the same or similar impact absorbing material as liner 18.” Muskovitz, [0087].

61. In this manner, the FIG. 10 embodiment provides an integrated active ventilation system without having to manufacture “a separate and independently created vent box.” Muskovitz, [0087]-[0089].

62. Muskovitz discloses that liner 18 may be composed of expanded polystyrene foam (EPS) to “meet the impact attenuation safety requirements” ([0119]), or alternatively, for “improved protection and greater or increased impact attenuation” ([0120]), the liner may be made of a “closed-cell, foamed polymeric material with a relatively low density for comfort, for absorption of minor impacts and for distributing the stress of a major impact over a larger surface of the wearer’s skull to lessen the likelihood of injury.” Muskovitz, [0119]-[0120].

B. Overview of Sajic

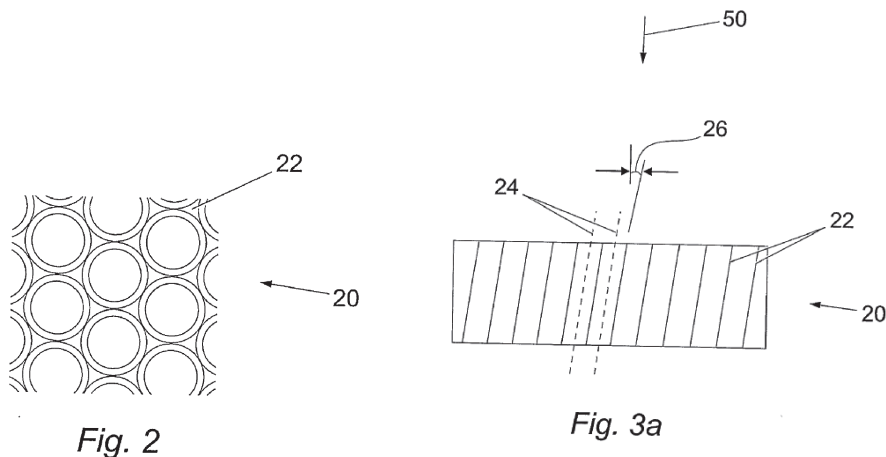
63. Sajic, titled “Body Protecting Device,” published as U.S. Patent Application Publication No. 2008/0307568 on December 18, 2008. I understand that Sajic is prior art to the ‘373 patent based on the publication date.

64. Sajic is directed to the use of a core material comprising “energy absorbing tubes” (EAT) to improve the impact absorption performance of safety helmets. Sajic, [0005], [0009], [0097]-[0101], [0106]-[0117], [0113]-[0123]. Sajic discloses that safety helmets using EAT-material were known to “outperform[] conventional devices [*i.e.*, conventional safety helmets] using a hard foam material to absorb impact energy.” Sajic, [0005]. Sajic cites to WO 2005/060778 (“Sajic-WO”, Ex. 1007), which is by the same inventor. *Id.*

65. Sajic discloses that the energy absorbing tubes in Sajic-WO are arranged to be “axially loaded.” Sajic, [0005]. Sajic discloses that “[a]xially loaded columns have been used for some time to improve the structural crashworthiness of vehicles, roadside furniture, and the like,” and further states that “[r]egardless of the material used, arrays of independent columns arranged parallel or coaxial to the load have generally been found to provide efficient energy absorbing performance and improve the stability of the safety device.” Sajic, [0005]-[0006].

66. In other words, arranging the tubes such that the direction of impact is substantially parallel to the longitudinal axis of the tubes has been found to be beneficial. *Id.*; *see also* [0106]. Sajic discloses orienting energy absorbing tubes at an oblique angle to an impact load rather than axially-oriented arrangement of the tubes disclosed in Sajic-WO.

67. More specifically, as illustrated in Sajic's FIGS. 2 and 3a below, the energy absorbing tubes 22 of core material 20 are arranged with their longitudinal axes 24 at an oblique angle 26 (e.g., between 5° and 45°) relative to an impact load 50, wherein the load 50 "is normal to the plane of the core 20." Sajic, [0017], [0098]-[0099], [0101], [0106]-[0107]. Compare this and Sajic's FIG. 1 to Sajic-WO's 6:23-9:5 and FIGS. 1, 5, which disclose the same cylindrical tubes with the same dimensions and manufactured using the same materials.



68. Sajic discloses that the angled arrangement provides "superior performance" over the "conventional arrangement" ([0107]) of tubes disclosed in

Sajic-WO due to the “angled arrangement of tubes produc[ing] a reaction load which has both a parallel and a normal component relative to the loading,” wherein “[t]he normal component causes lateral deflection of the impacting object relative to the body protecting device during deformation of the tubes” while the “deflection of the impacting object reduces the magnitude of the loading in the parallel direction.” Sajic, [0106]. In total, the “overall angled displacement of the head form results in a longer total time period for the impact event” due to the utilization of both axial and lateral impact absorption properties of the tubes. Sajic, [0106]-[0107].

69. As a way of illustration, Sajic’s FIGS. 3(a) and 3(b) are reproduced below and are cross-sectional views of core material 20 illustrating different ways of producing energy absorbing tubes that can be arranged at an oblique angle relative to an impact load 50 to absorb energy imparted by an impact. Sajic, [0099], [0100].

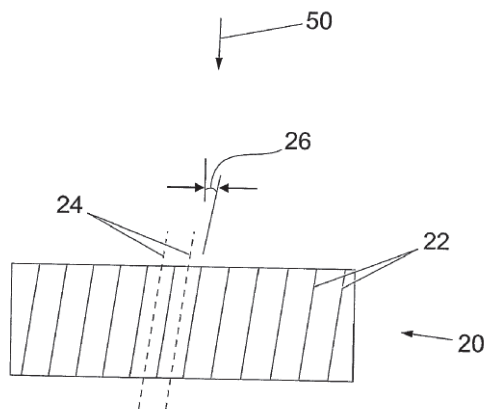


Fig. 3a

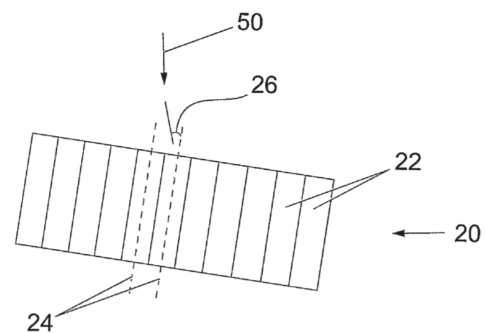


Fig. 3b

70. Specifically, FIG. 3(a) illustrates tubes in which the longitudinal axis 24 is at “an oblique angle 26 to the direction of the load 50” ([0099]) and FIG. 3(b) illustrates tubes in which the longitudinal axis 24 is “normal to the plane of the core 20” ([0100]). In both cases, the energy absorbing tubes of the core material are oriented at an oblique angle to the impact load. The same oblique arrangement is present when, for example, the core material is curved to form the core of a helmet in which the impact load tends to be normal to the tangent of the spherical shape of the helmet. Sajic, [0101].

71. Core material 20 may be fabricated by joining the side-walls of adjacent tubes (*e.g.*, the “six other tubes which are circumferentially spaced around the tube” as illustrated in FIG. 2, [0103]), wherein the “tubes may be bonded together using an adhesive,” or alternatively by “form[ing] the tubes from an inner core of a first material and an outer core of a second material” using different materials having different melting points (*e.g.*, “second material can be selected to have a lower melting temperature than the first material”). Sajic, [0104]. The cores can then be extruded together and heated to a temperature between the two melting points to weld or fuse the side walls together to allow easier forming of shapes and better consistency during formation. Sajic, [0104].

72. Sajic discloses two ways of employing this core material to increase the impact energy absorption performance of a safety helmet. In a first

embodiment, Sajic discloses this EAT material to provide the impact absorbing material for a safety helmet, as illustrated in FIGS. 1(a) and 2(a) reproduced below. Sajic, [0097]-[0101].

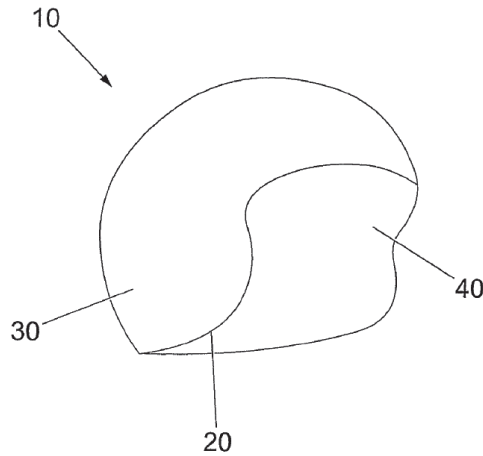


Fig. 1a

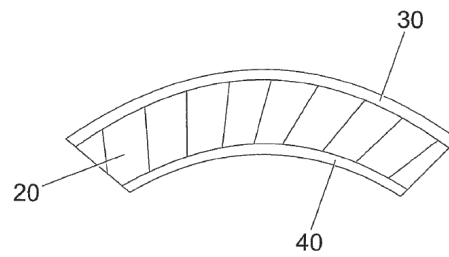


Fig. 1b

73. Sajic discloses that “[s]afety helmets conventionally comprise a substantially spheroidal outer skin of tough plastics material and an inner skin of resilient material such as a hard foam,” such that “[t]he rigid outer skin acts as an impact surface to transmit an impact load more evenly to the inner skin which absorbs the energy imparted by the impact load.” Sajic, [0002]; *see also* Sajic-WO, 2:1-7.

74. As detailed above in Sajic’s FIGS. 1a and 1b, the exemplary helmet uses the above-described core material 20 comprising energy absorbing tubes (EAT) as the energy absorbing material for the helmet. Sajic, [0097], [0101]. The core material 20 “is sandwiched between a second material or outer layer 30 and a

third material or inner layer 40,” and is “continuous throughout the (arcuate) major plane of the helmet 10.” Sajic, [0097].

75. The Fig. 1a, 1b safety helmet design is similarly disclosed in Sajic-WO (*see also* US Patent No. 8,082,599 (“Sajic-599”) with “axially loaded” energy absorbing tubes (Sajic, [0005]), whereas the Sajic safety helmet employs the above-described angled arrangement to improve the impact attenuation performance of the safety helmet throughout.

76. In a second embodiment, Sajic discloses using the above-described EAT-material to provide impact absorbing inserts in a conventional foam liner (*e.g.*, “an expanded polystyrene foam [EPS],” [0114]) of a safety helmet to provide improved impact absorption at desired locations, as illustrated in FIGS. 9 and 10 reproduced below. Sajic, [0113]-[0127].

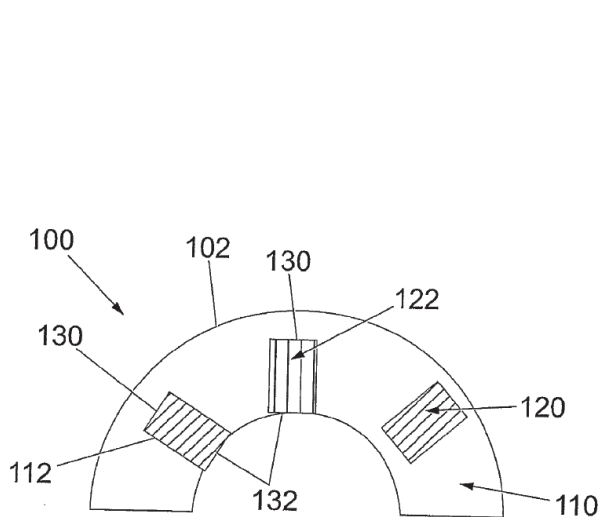


Fig. 9

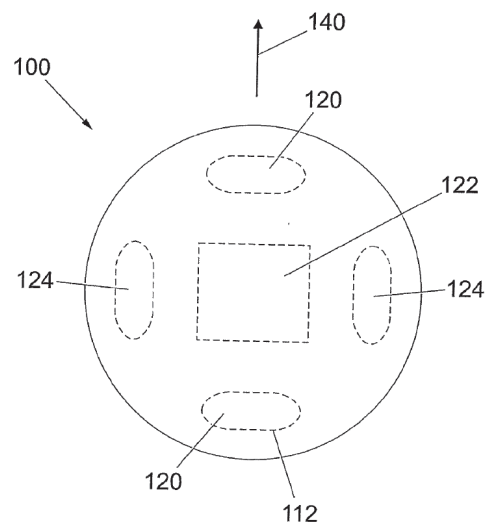


Fig. 10

77. By using inserts comprising energy absorbing tubes in a foam liner, the superior impact performance of Sajic’s core material can be taken advantage of in helmet designs that choose a conventional foam liner for design reasons (*e.g.*, since a device that provides a “high level of protection at all locations is more difficult or costly to produce” ([0004])). Sajic’s insert-based design can provide the “highest level of protection” protection for vulnerable areas such as locations where impacts frequently or wherein the wearer is more prone to injury. Sajic, [0004], [0107], [0113]-[0123].

VII. THE CHALLENGED CLAIMS ARE UNPATENTABLE IN LIGHT OF THE PRIOR ART IDENTIFIED IN THE PETITION

78. I have been asked to provide my opinion on the patentability of claims 1-5, 7, 12-13, and 15-17 of the ’373 patent. For the reasons explained below, it is my opinion that each of claims 1-5, 7, 12-13, and 15-17 are obvious over Muskovitz in view of Sajic.

A. Ground 1: MUSKOVITZ IN VIEW OF SAJIC RENDERS OBVIOUS CLAIMS 1-5, 7, 12-13, AND 15-17

1. The Muskovitz-Sajic Combination

79. Muskovitz discloses that its protective helmets are manufactured in an “in molding” process in which the outer shell is joined to the inner-liner via molding or bonding in the same manufacturing process. Muskovitz, [0081]. Muskovitz gives two examples of foam materials (*e.g.*, “expanded polystyrene

foam (EPS)” or “a foamed polymeric materials” [0119]-[0120]) as suitable material for the impact-absorbing liner of the disclosed “in-molded protective helmet” [0081].

80. As I discussed in § VI.B, Sajic recognized that for design reasons such as manufacturing cost, it may be preferable to provide the “highest level of protection” (Sajic, [0004]) afforded by the disclosed EAT-material at select locations in conventional helmet designs that employ foam material for the impact absorbing liner of a safety helmet, such as the example foam materials Muskovitz discloses for its in-molded protective helmets discussed above. See e.g., Muskovitz, [0119]-[0120].

81. A POSA would have recognized the benefit of using Sajic’s EAT-inserts at desired locations in the Muskovitz protective helmet to leverage the improved impact attenuation performance of Sajic’s EAT-inserts in the in-mold shell/liner composite designs disclosed in Muskovitz as discussed in detail below.

a. It Would Have Been Obvious to Use Sajic’s EAT-Material for the Muskovitz Insert Member

82. As I discussed above in § VI.A, Muskovitz discloses an active ventilation system integrated into the components of the protective helmet. Muskovitz, [0026], [0087]-[0090]. In the FIG. 10 (reproduced below) embodiment, a vent space 28 for an active ventilation system is created by a recess formed in the inner liner 18 and a removeable insert member 26 to eliminate the

need to a provide separate and independently created vent box. Muskovitz, [0087]-[0089].

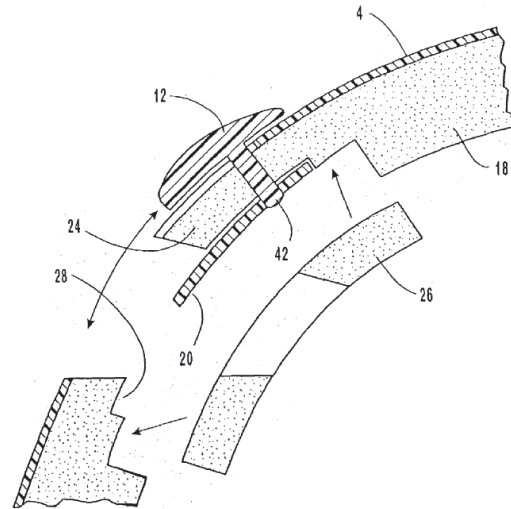


FIG. 10

83. A POSA would have recognized the benefit using Sajic's EAT-material for the Muskovitz insert member 26, referred to hereinafter as the "EAT-Insert-Member," to leverage the impact absorption properties of Sajic's EAT-material in the disclosed in-molded shell/liner composite design of the Muskovitz protective helmet. Muskovitz discloses that the insert member 26 can be formed of any of "various material compositions" (Muskovitz, [0087]) and it would have been obvious to a POSA to implement the EAT-Insert-Member at least because doing so is nothing more than the straightforward use of Sajic's insert material for Muskovitz's insert member to perform the same function and benefiting from the advantageous impact attenuation properties disclosed in Sajic, such as utilizing

both axial and lateral absorption properties of the angle arrangement energy absorbing tubes. *See e.g.*, Sajic, [0106]-[0107].

84. A POSA would have had numerous reasons to implement the EAT-Insert-Member to improve the impact absorption properties of the Muskovitz protective helmet. For example, a POSA would have understood that the EAT-Insert-Member would have improved impact absorption by providing the “superior” impact attenuation of the EAT-material itself—e.g., by the improved performance of using energy absorbing tubes further improved by absorbing impact energy via both the axial and lateral absorption properties of Sajic’s EAT-material. *See e.g.*, Sajic, [0106]-[0107].

85. Thus, a POSA would have been motivated to implement the EAT-Insert-Member to leverage the improved impact attenuation properties of Sajic’s EAT-material—*i.e.*, the improved performance of using energy absorbing tubes and the further improvement of the angle arrangement of tubes. *See e.g.*, Sajic, [0005], [0009], [0106]-[0107], Figs. 3(a)-(b). A POSA would have recognized that implementing the EAT-Insert-Member would have provided a simple and straightforward way to improve the impact attenuation performance without changing the manufacturing process of the shell/liner construction of the Muskovitz protective helmet. *See e.g.*, Muskovitz, [0081], [0119]-[0120].

86. As discussed in § VI.B, Sajic teaches using EAT-inserts as a way to provide the “highest level of protection” (Sajic, [0004]) impact absorption at locations of the helmet that may be more vulnerable (*e.g.*, locations where impacts occur more frequently or locations where the user is more prone to injury or the effects of injury more severe) in safety helmets that employ foam material (*e.g.*, “expanded polystyrene foam” (EPS), Sajic, [0114]) as the impact absorbing liner. *See e.g.*, Sajic, [0004], [0106]-[0107], [0113]-[0123].

87. A POSA would have recognized that implementing an EAT-Insert-Member would provide meaningful impact absorption improvement given the significant footprint of active vent systems disclosed in Muskovitz, as described below. As shown in FIG. 10 (below left), the recess in the liner 18 extends above the actuator 12 and below the bottom of the corresponding vent opening, as illustrated by the solid-red-line annotation.

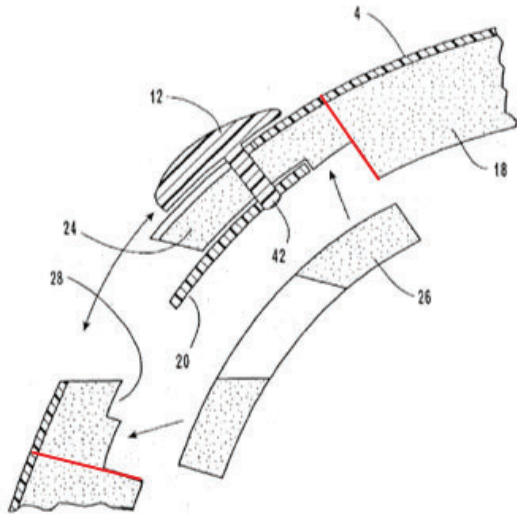


FIG. 10

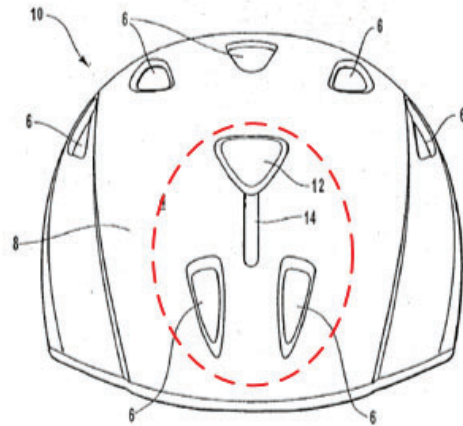
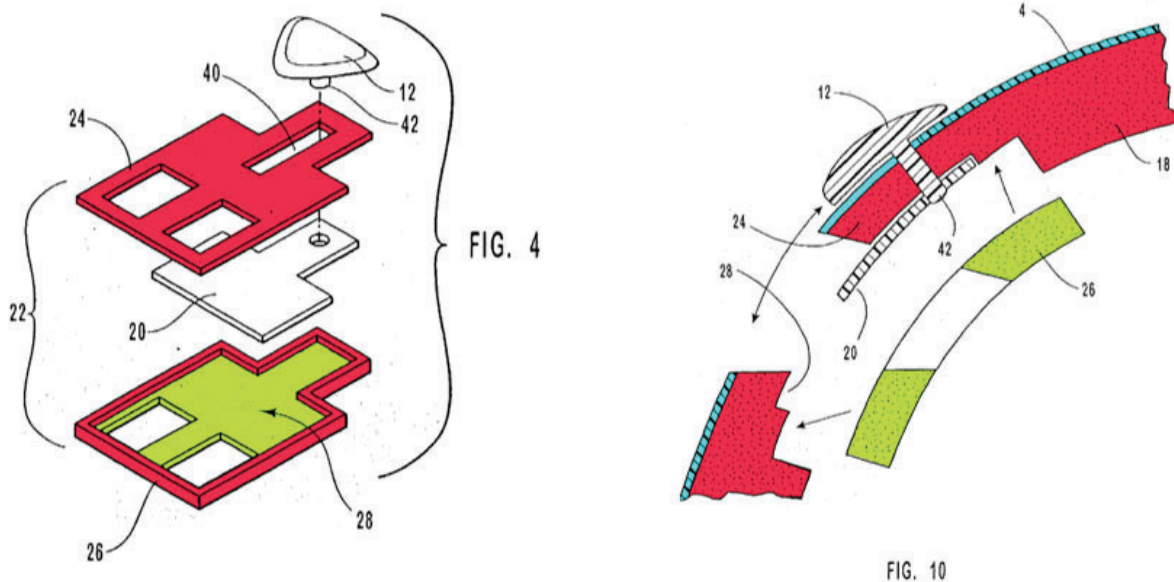


FIG. 2

88. FIG. 10 is a cross-sectional view so only a single vent is visible. In the configurations disclosed in Muskovitz in which a single actuator/vent shield controls air flow through multiple vents (“dual-port active vent configuration” hereinafter) (see e.g., [0023], [0076], [0087]-[0088], FIGS. 1-2, 7, 9-10), the recess extends across two vents to house a vent shield that covers both vents (illustrated by the dashed-red-line annotations in FIG. 2 (above right)) as described below.

89. In the FIG. 10 embodiment, A POSA understood that when a single actuator/vent shield controls air flow through two vents as disclosed in Muskovitz (see e.g., [0023], [0076], FIGS. 1-2), the recess formed in liner 18 spans both vents to be able to accommodate the vent shield that can be displaced to cover both vents and to provide the upper boundary 24 of the vent space for both vents. Muskovitz, [0087]-[0088].

90. Otherwise, the vent shield would not fit within the vent space to provide air flow control through both active vents. This principle is illustrated by comparing the FIG. 4 embodiment in which a separate independent vent box is created with the FIG. 10 embodiment, annotated below with like coloring for like components of the FIG. 4 and FIG. 10 embodiments. Muskovitz, [0067] (“like parts are designated by like numerals throughout.”).



Annotated FIG. 4 and FIG. 10, Muskovitz

91. For the vent box 22 of the FIG. 4 embodiment, vent space 28 formed by upper member 24 and lower member 26 span both of the illustrated apertures that align with corresponding vent openings such that vent shield 20 can be accommodated and displaced to control air flow through both of the corresponding two vents ports. Muskovitz, [0078]-[0079].

92. In the FIG. 10 embodiment, vent box 22 is replaced with the similarly numbered components of the helmet. Muskovitz, [0067]. In particular, the recess in liner 18 (colored red) defines the upper boundary 24 and sidewalls of vent space 28 (as seen in FIG. 10), replacing upper member 24 and the side-walls of lower member 26 of vent box 22 (also colored red). Muskovitz, [0087] (“a vent space 28 [is] defined by a portion of impact absorbing inner liner 18 being removed to form a recess therein, such that inner liner 18 forms the upper boundary of vent space 28”). Insert member 26 (colored green) forms the lower boundary of vent space 28, replacing the bottom portion of lower member (also colored green). Muskovitz, [0088] (“As such, removeable insert 26 forms the lower boundary of vent space 28. As removeable insert 26 is fit within the recess of and coupled to inner liner 18, vent space 28 is created.”).

93. Thus, a POSA would have understood that when a single actuator/vent shield for dual ventilation ports, the recess formed in inner liner 18 would span across both ventilation ports to provide a vent space that likewise spans across both ventilation ports so that the vent shield accommodated therein can be displaced to cover both ventilation ports, as it does in the FIG. 4 embodiment. Muskovitz, [0023], [0076], [0078]-[0079].

94. Even in single-port active vent configurations, the recess extends over a significant area to encompass the actuator and extend below the bottom of the

vent opening. A POSA would have recognized that implementing an EAT-Insert-Member would therefore have had a meaningful improvement to the impact absorption performance of the Muskovitz protective helmet due to the size of the area over which the EAT-Insert-Member would provide improved impact absorption.

95. Additionally, Sajic discloses that the level of protection in areas other than where the EAT-inserts are positioned is at least equal to the protection provided by the foam material in those other areas where there are no inserts, suggesting that the disclosed EAT-inserts may even improve protection even in areas where the inserts are not provided. Sajic, [0126] (disclosing that in “other areas of the helmet 10” where the inserts are not positioned, the “level of protection is at least equal” to the “acceptable level of protection...provided by the foam spacing member” in those areas). A POSA would have understood from Sajic’s disclosure that a reason EAT-inserts may provide protection even in areas where inserts are not positioned is the disclosed property of the angled arrangement of tubes in the EAT-material that results “in a longer total time period for the impact event.” Sajic, [0106]. Thus, the EAT-inserts may provide additional protection for impacts that occur in other locations by lengthening the time-period of impact absorption such that “the total impact energy is absorbed at a lower magnitude over a longer period of time,” as disclosed in Sajic. *Id.* As such,

employing an EAT-Insert-Member may in fact improve impact absorption even outside the footprint of the active vent region.

96. A POSA would have understood that the reason insert member 26 is “preferably the same or similar impact absorbing material as liner 18” (Muskovitz, [0087]) is so that the insert member 26 provides the same or similar impact absorption as the impact absorbing liner 18 in regions where portions of the liner are removed to form the recess into which the active ventilation system are integrated (Muskovitz, [0087]-[0088]).

97. Indeed, Muskovitz does not limit the type of material for inner liner either. In describing its integrated ventilation system, Muskovitz discloses that the “inner liner 18 can consist of any suitable material that is capable of providing sufficient impact attenuation properties to protective helmet 10.” Muskovitz, [0082]. Muskovitz provides no reason that using an insert member 26 formed from a different material than the inner liner would be any less preferable provided that different material provides the similar or the same impact absorption as the inner liner material. Thus, the EAT-Insert-Member would comport with and exceed Muskovitz’s preference for the impact absorbing material for the insert member.

98. To the extent there is some other reason for Muskovitz’s disclosed preference, use of the EAT-Insert-Member is no less obvious. Muskovitz expressly

states that any material composition can be used and a POSA would have recognized multiple benefits of implementing the EAT-Insert-Member discussed above and the additional benefits discussed below.

99. Additionally, a POSA would have been motivated to implement the EAT-Insert-Member to provide impact absorbing material over the vent openings where the Muskovitz insert member 26 provides none, as illustrated in FIG. 10 of Muskovitz reproduced below.

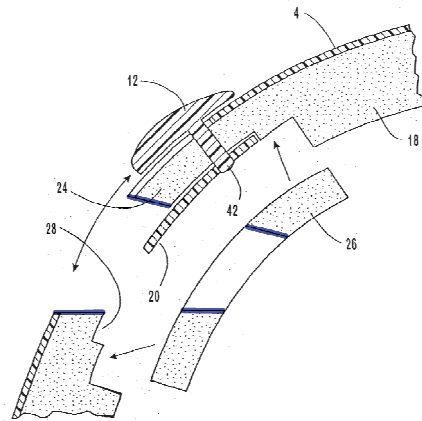


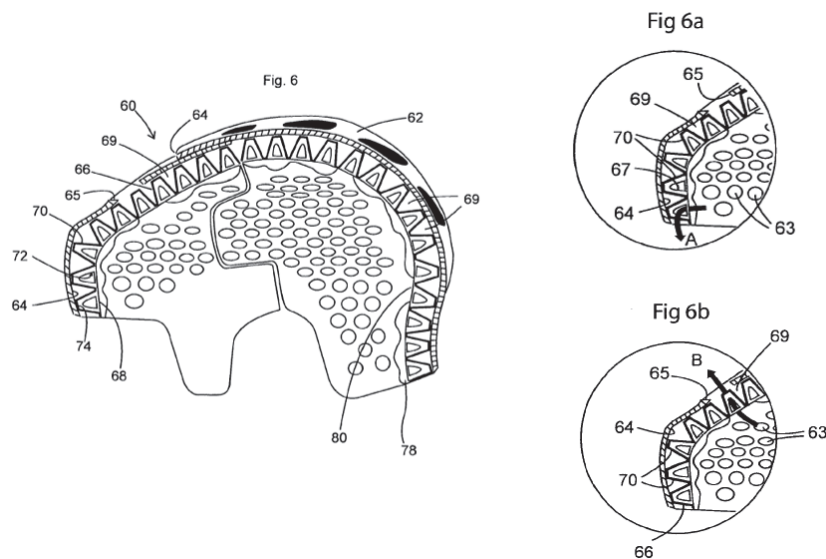
FIG. 10

100. To allow air flow into the interior of the helmet, portions of the Muskovitz insert member 26 that align with the vent openings are removed (outlined in blue above), reducing the amount of impact absorbing material in the Muskovitz insert member available to absorb energy from an impact and leaving a complete void across the vent opening.

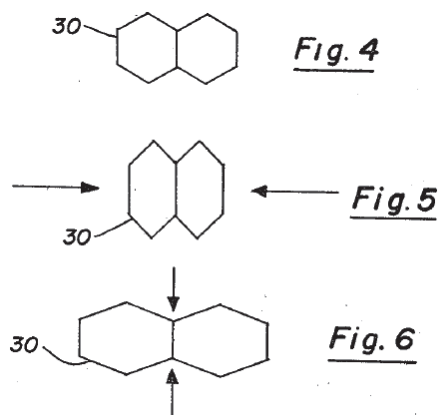
101. It would have been readily apparent to a POSA that implementing the EAT-Insert-Member for improved impact absorption would have obviated the need

for ventilation cut-outs because Sajic's EAT-material itself allows air to flow freely through the energy absorbing tubes, as this was a known (and self-evident) property of such materials. In particular, it was known that the structure of Sajic's EAT-material would allow air to flow freely through the energy absorbing tubes, thus allowing an insert member formed from Sajic's core material to cover corresponding vent openings to provide impact absorption where no other impact absorption material is provided using Muskovitz's insert member.

102. As I discussed in § V.A, it was well-known that open-ended hollow structures used for impact absorption in protective helmets provided the added benefit of ventilating the helmet. For example, Copeland discloses that using open-ended hollow structures with additional side openings provided two mechanisms of air flow—circulation of air through the shock absorbing structure itself (Fig. 6a below) and air flow through openings provided in the outer shell (see Fig. 6b below). Copeland, 4:9-24.



103. As another example, Landi discloses that a “honeycomb material” (1:61-2:9) of open-ended hexagonal cells (see Figs. 4-6 of Landi below), similar to Sajic’s EAT-material of open-ended cylindrical tubes, was “no impediment to air flow” no matter how thick the material due to the “open nature” of the hexagonal core (3:21-22).



104. A POSA would have recognized that Sajic’s EAT-material (see Figs. 2 and 3(a) reproduced below) would likewise allow air to freely flow through the

energy absorbing tubes and that the wide range of disclosed diameters and wall-thicknesses of the tubes that govern the amount of unimpeded air flow would allow the design of an EAT-Insert-Member that achieves a desired amount of air flow for the Muskovitz protective helmet.

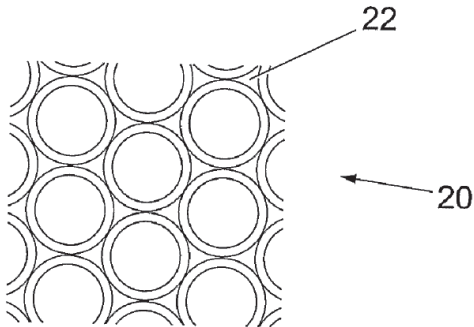


Fig. 2

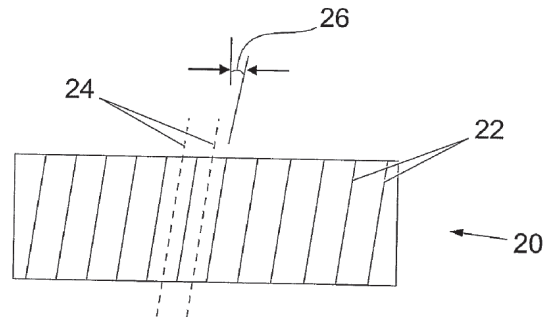


Fig. 3a

105. Sajic discloses tube diameters ranging from 2 to 25 mm and wall-thicknesses between 0.1 and 0.5 mm, providing for a wide range of aspect ratios (i.e., the ratio of tube diameter to wall-thickness, Sajic, [0102]) between 4 and 250 (e.g., between 25 and 80 for a diameter of 8 mm and wall-thickness between 0.1 and 0.3 mm). Sajic, [0063]-[0064], [0102]; Sajic-WO, 14:3-25 (disclosing that aspect ratios between 20 and 60 were one or two orders of magnitude greater than prior art arrangements). A POSA would have understood that this wide range of tube dimensions would have allowed for the choice of EAT-material that allows for virtually any amount of unimpeded air flow through the EAT-Insert-Member. For example, use of the high aspect ratios disclosed would result in negligible

amounts of material that would impede air flow so that any effect on ventilation, if any, could be made *de minimus*.

106. Thus, a POSA would have recognized that employing an EAT-Insert-Member for its advantageous impact attenuation properties would also have the additional benefits of increasing the total amount of impact absorbing material available at active vent ports and providing impact absorbing material across the active vent openings where there otherwise is none. Therefore, a POSA would have had multiple independently sufficient reasons to use Sajic's EAT-material for the Muskovitz insert member, including (1) to take advantage of the improved impact attenuation properties of the material itself, with or without providing cut-outs, to provide the same high-level of impact attenuation at the active vent ports as discussed above; and (2) the additional benefit of eliminating the need to manufacture cut-outs for air flow.

107. The '373 patent does not disclose any unexpected result of using the disclosed honeycomb material or purport to have appreciated any property of honeycomb material that was not known and well-understood. The '373 patent instead discloses that in addition to "providing impact absorption," each of the energy absorbing cells "may include a tube, which may allow air to pass through, providing ventilation to the head of the wearer." '373 patent, 2:45-52.

108. The '373 patent does not disclose any modification to known honeycomb material, nor does the '373 patent describe the material or dimensions of the energy absorbing tubes. Rather, the '373 patent merely makes the well-known observation that “tubes with open longitudinal ends [] allow air to freely flow through the tubes” '373 patent, 2:18-22. Indeed, this is the same unimpeded air flow property as described in Landi at (3:21-22), which I detailed previously. Sajic also discloses “tubes with open longitudinal ends” and a POSA would have understood that Sajic’s EAT-material would likewise allow air to freely through the tubes of the EAT-Insert-Member.

i. Implementing the EAT-Insert-Member

109. An obvious implementation of the EAT-Insert-Member achieving one or more of the above-discussed advantages would have been to employ the open-ended energy absorbing tubes manufactured with six adjacent tubes circumferentially arranged around each tube in a “close packed array.” Sajic, [0098], Fig. 2 (attached below). This arrangement provides the beneficial impact absorption properties as described by Sajic. For instance, Sajic teaches that “[i]nstability, which could lead to a global buckling failure mode, is avoided since the tubes are connected to, and supported by, adjacent tubes,” “even though the tubes are at an angle to the loading.” Sajic, [0103]. In addition, Sajic teaches that

“[b]eing connected to six other tubes which are circumferentially spaced around the tube provides such support in any direction normal to the axis of the tube.” *Id.*

110. In addition, it would have been obvious to a POSA to employ the angled arrangement of energy absorbing tubes disclosed in Sajic (*see e.g.*, Figs. 2 and 3(a) reproduced below) to take advantage of the improved impact absorption properties of this arrangement. As discussed previously in the overview of Sajic above, Sajic notes that this angled arrangement “produces a reaction load which has both a parallel and normal component relative to the loading,” which allows for deflection of the impact load in both the normal and parallel directions, and additionally contributes to the “bending of the tubes without buckling” and is “therefore another mode of absorbing energy in addition to the mode of progressive buckling exhibited by both a conventional arrangement and [Sajic’s] invention.” Sajic, [0099], [0101], [0106]-[0107].

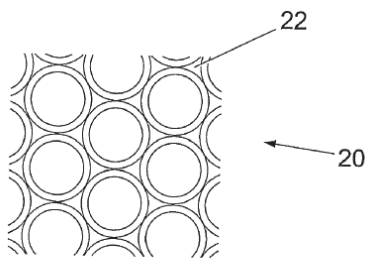


Fig. 2

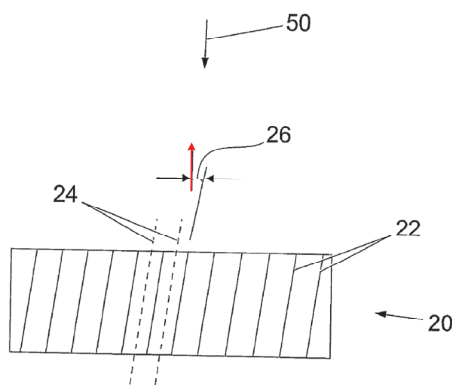


Fig. 3a

111. In particular, and as illustrated above, Sajic discloses that by manufacturing the circular energy absorbing tubes 22 (shown in the top-view of core material 20 in Fig. 2) at a slant such that the longitudinal axes 24 of the tubes form an oblique angle 26 relative to the surface normal of core material 20 (annotated in red above) improved impact performance is achieved due to utilization of both axial and lateral impact absorption characteristics of the tubes. Sajic, [0099], [0106]-[0107]. Sajic further discloses at [0101] that this “same oblique arrangement would be present when the tubes are curved to form the core of a crash helmet or safety pad,” which tend to be “spherical” in structure. .

112. The same improved impact absorption would be achieved for the EAT-Insert-Member by orienting the energy absorbing tubes so that they align with the vent opening shown in the FIG. 10 embodiment similar to the manner in which the ventilation cut-outs of insert member 26 are provided, as illustrated in annotated FIG. 10 of Muskovitz reproduced below.

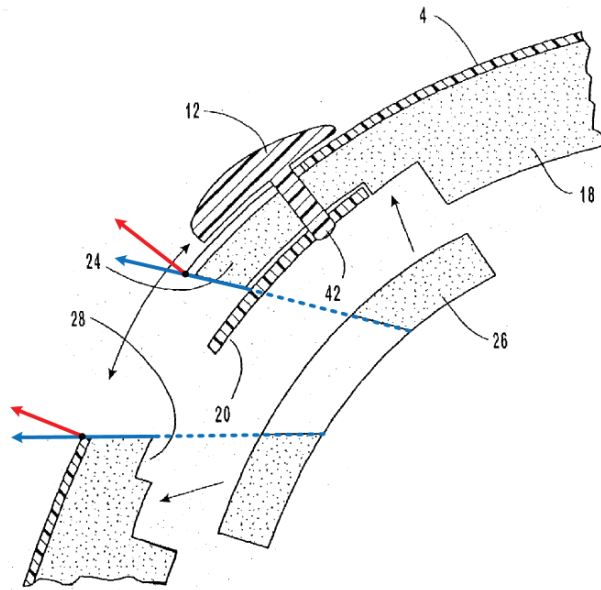


FIG. 10

113. As illustrated above, the vent port visible in FIG. 10 is provided through the shell/liner composite such that the side-walls of the vent port are at an angle (blue arrow) relative to the corresponding surface normal (red arrow) of outer shell 4 and the visible cut-out in insert member 26 is similarly angled to align with the vent opening. Muskovitz, FIG. 10.

114. By orienting the tubes of the EAT-Insert-Member in alignment with either angle (shown by blue arrows above) of corresponding vent openings, the tubes would form oblique angles to the surface normal (red arrow) of the outer shell 4 (*i.e.*, angled relative to the “impact surface,” as illustrated by Sajic in [0099], [0101]), thereby taking advantage of both axial and lateral absorption properties of the energy absorbing tubes and facilitating air flow into the interior of

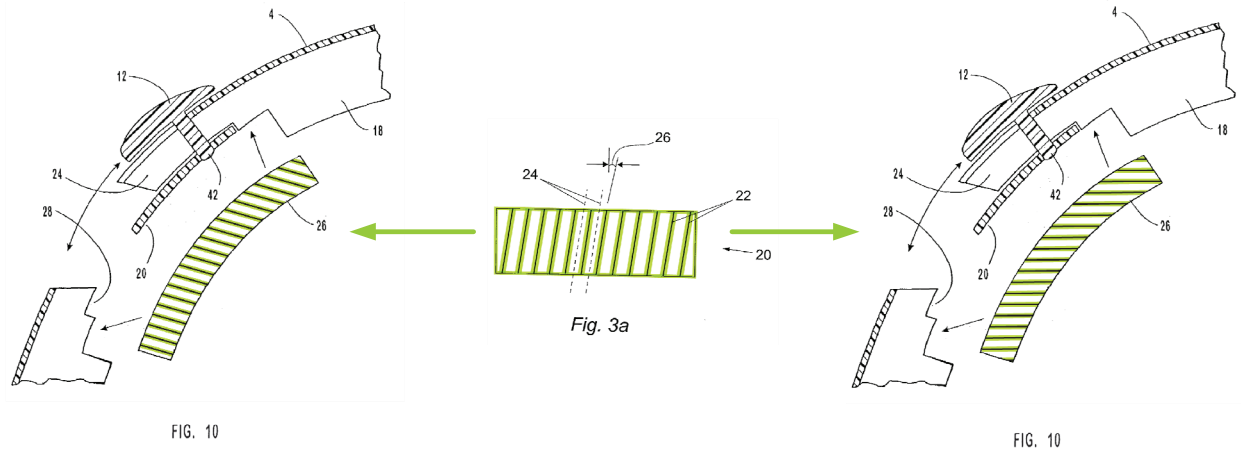
the helmet due to the alignment with corresponding vent openings. Sajic, [0099]-[0101], [0106]-[0107].

115. As discussed in § VII.A.1.a, a POSA would have understood that when using the EAT-Insert-Member, providing cut-outs or apertures through the insert is unnecessary as sufficient air flow would be provided through the EAT-material itself. A POSA would have understood that the dimensions of the energy absorbing tubes may be selected from a wide range (*e.g.*, from the 2 to 25 mm diameter range and 0.1 to 0.5 mm wall-thickness range disclosed in Sajic, as discussed previously) to provide the desired amount (virtually any amount) of air flow into and out of the helmet. Thus, it would have been obvious and desirable to a POSA to eliminate an unnecessary step in the manufacturing process of the EAT-Insert-Member.

116. Additionally, providing cut-outs or apertures in the EAT-Insert-Member would have not only added an unnecessary step in the manufacturing process, but is undesirable due to the reduction in the amount of energy absorbing material provided by the insert and at locations where there is no other impact absorbing material, as I previously discussed. Thus, it would have been obvious and a POSA would have been motivated to implement the EAT-Insert-Member using the EAT-material as manufactured, that is, as an integral material formed of a close packed array of open-ended tubes, preferably of the six-tube adjacency

arrangement that is arcuately-shaped as disclosed in Sajic and sized to fit into the recess of the Muskovitz inner liner. Sajic subsequently applies a sealing material after manufacture of the EAT-material to “prevent[] the foam material from entering the open ends of the tubes” (Sajic, [0122])Sajic, [0062], [0080], [0098]-[0101], [0080], [0103], [0112], [0122]. For the EAT-Insert-Member, obviously no sealing material would subsequently be applied as there is no need to prevent foam from entering the EAT-Insert-Member as it is not insert into the helmet during formation of the helmet as in Sajic, but rather is designed to be a “removeable insert member” as Muskovitz discloses. Muskovitz, [0087]-[0088]. Thus, the EAT-Insert-Member would be used as it is manufactured with open-ends. Sizing and shaping Sajic’s EAT-material like the Muskovitz insert member 26 would have been well within the capabilities of a POSA and Sajic discloses that the EAT-material can be formed to any desired shape and size. *Id.*

117. Examples of this obvious implementation are shown in FIG. 10 of Muskovitz reproduced below, modified using the Fig. 3(a) angled arrangement of Sajic’s EAT-material (below middle) molded into an arcuate insert of the size and shape of the recess (Sajic, [0099], [0101], [0112], [0121]) with the tubes aligned with the top side-wall (below left) and aligned with the bottom side-wall (below right) of the corresponding vent port, which is nothing more than the straightforward application of Sajic’s teachings to Muskovitz.



118. Other configurations of energy absorbing tubes (*e.g.*, different sizes and orientations for the tubes) would have been obvious to a POSA to achieve the desired impact attenuation and ventilation for the protective helmet. Selecting a suitable configuration for the EAT-Insert-Member based on factors, such as the size, number, position and orientation of the vent ports, is merely a matter of obvious design choice.

119. Implementing the Muskovitz-Sajic EAT-Insert would have been well within a POSA's capabilities and would have been simple and straightforward to implement using routine skills of a POSA. In particular, Sajic discloses that integral EAT-material can be manufactured with tubes oriented "at any angle up to 45°" ([0112]) having a wide range of dimensions (diameters ranging between 2-25 mm, side-walls ranging from 0.1 to 0.5 mm and lengths ranging from 10-50 mm) from a wide range of plastic materials and a wide range of sizes (*e.g.*, 75 mm, 90 mm inserts). Sajic, [0063]-[0067], [0121].

120. Sajic further discloses that the EAT-material can be formed to any geometric shape having either a planar or arcuate cross-section (e.g., via “moulding,” Sajic, [0112]) to provide EAT-inserts of a wide range of sizes and shapes. Sajic, [0101], [0112], [0121], Fig. 1b. Thus, it would have been well within the skills of a POSA to successfully provide an EAT-Insert-Member sized to be “fittable within” (Muskovitz, [0087]) the recess formed in liner 18 and coupled to liner to provide the lower boundary of vent space 28. Indeed, Muskovitz discloses that its “insert member 26 may be fittable within or attached to liner 18 using any known means in the art, such as an interference fit, a hook and loop fastening system, threaded members (screws or thumb screws), tongue and groove system, and others.” Muskovitz, [0087]. The wide range of dimensions of the tubes and angles at which the tubes can be manufactured into an integral core material would have allowed a POSA to choose a design that provides the advantageous impact energy attenuation properties disclosed in Sajic ([0099], [0101], [0106]-[0107]) and that facilitates or optimizes air flow into the interior of the helmet.

121. Implementing the EAT-Insert-Member does not require modification to the disclosed “in-mold” manufacturing process of the shell/liner composite of the Muskovitz protective helmet so that implementing the EAT-Insert-Member is a routine matter of sizing Sajic’s EAT-material to fit within the recess formed in the inner liner.

b. The Muskovitz-Sajic-Helmet

122. I use the term Muskovitz-Sajic-Helmet to describe the Muskovitz protective helmet modified to employ an EAT-Insert-Member implemented as discussed above (§ VII.A.1.a) in active vent configurations in which a single actuator/vent shield is employed to control air flow through two ventilation ports of the Muskovitz protective helmet (e.g., the dual-port active vent configurations illustrated in FIGS. 1-2, 7, 9 etc.).

123. Muskovitz does not limit the FIG. 10 embodiment to any particular vent port configuration or helmet design, but rather discloses that “FIG. 10 illustrates a second, alternative embodiment of the protective helmet of the present invention” providing an integrated active ventilation system in which it is not necessary to provide “a separate and independently created vent box as in the first embodiment.” Muskovitz, [0087]-[0089].

124. It would have been obvious to a POSA to employ the FIG. 10 embodiment with any of the variety of disclosed vent port configurations and helmet designs disclosed in Muskovitz. Muskovitz expressly states that “[i]t will be readily understood that the components of the present invention, as generally described and illustrated in the figures herein, could be arranged and designed in a wide variety of different configurations.” Muskovitz, [0066].

125. Muskovitz discloses a variety of helmet designs, including protective helmets comprising one or multiple active vents (*i.e.*, vent ports through which air flow is controllable via an active ventilation system) with additional passive vents (*i.e.*, vent ports through which air flow is not adjustable) and helmets for which all of the one or multiple vent ports on the helmet are active. Muskovitz, [0023] (“As one or a plurality of apertures or ventilation ports may exist within the outer shell, displacement of the vent shield functions to open, close, or partially close off the ventilation ports, and the resulting interior portion of the protective helmet, to the ambient air.”), [0076] (“the ventilation system of the present invention may be designed to modify or adjust air flow through *any or all of ventilation ports 6* incorporated within the protective helmet 10.”), FIGS. 1-2, 6-9, 14-18 and 21.

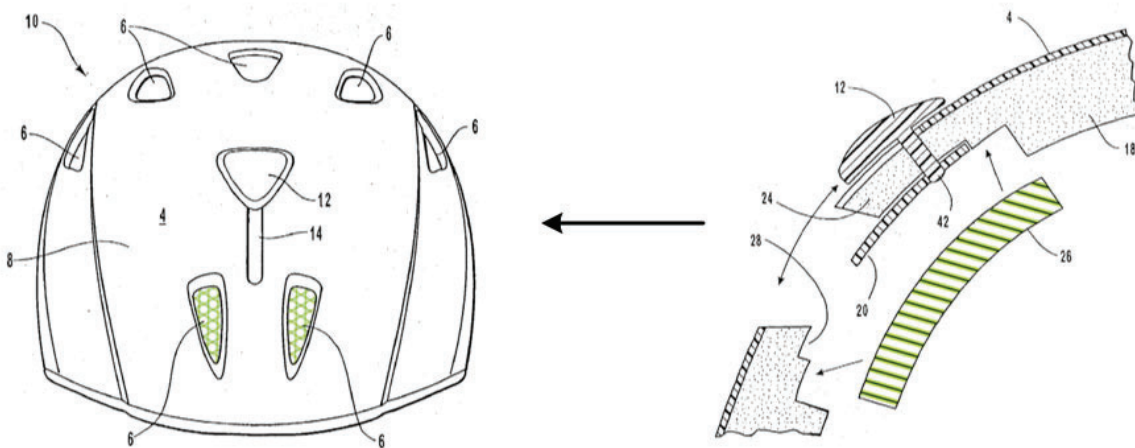
126. For any one or combination of the reasons discussed in § VII.A.1 above, it therefore would have been obvious to implement the EAT-Insert-Member to improve the impact attenuation performance of the Muskovitz protective helmet in helmet designs having any of the vent port configurations disclosed in Muskovitz or any of the “wide variety of different configurations” that it would have been “readily understood” the “components of the present invention” could be “arranged and designed.” Muskovitz, [0066].

127. I describe a first Muskovitz-Sajic-Helmet example with active and passive vent ports (“Muskovitz-Sajic-Helmet-1”) and a second Muskovitz-Sajic-

Helmet example with active vent ports and no passive vent ports (“Muskovitz-Sajic-Helmet-2”) in §§ VII.A.1.b.i and VII.A.1.b.ii, respectively, below.

i. Muskovitz-Sajic-Helmet-1

128. The Muskovitz-Sajic-Helmet-1 refers to the helmet designs disclosed in Muskovitz comprising active and passive vents and a single actuator/vent shield to control air flow through a pair of front vent ports (*see e.g.*, Muskovitz, [0023], [0076], FIGS. 1-2, 7 and 9) that implement the EAT-Insert-Member as described in §§ VII.A.1.a.i and VII.A.1.b above. An example of the Muskovitz-Sajic-Helmet-1 using the vent port configuration of FIGS. 1-2 is illustrated below with the EAT-Insert-Member provided for the active vent ports highlighted in green.



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

129. There are obvious design choice variations of the example Muskovitz-Sajic-Helmet-1 illustrated above, including using any of the dual active port configurations (e.g., the different size and shape of the active vent ports shown in

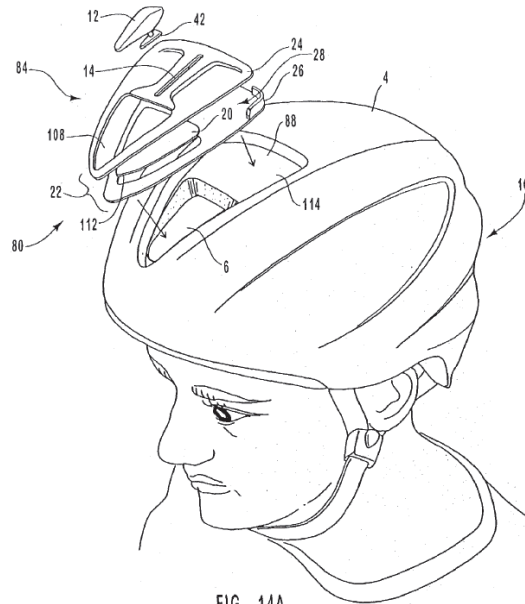
FIGS. 7) and providing an active ventilation system for one or more additional vent ports provided on the helmet. *See e.g.*, Muskovitz, [0066] (“components of its protective helmet “could be arranged and designed in a wide variety of different configurations.”), [0076] (“any or all of ventilation ports incorporated within protective helmet 10” can be made active.).

ii. Muskovitz-Sajic-Helmet-2

130. The Muskovitz-Sajic-Helmet-2 differs from the Muskovitz-Sajic-Helmet-1 only in that it employs helmet designs disclosed in Muskovitz in which only active ventilation ports and no passive ventilation ports are provided. Muskovitz, at [0076], makes clear that “the ventilation system of the present invention may be designed to modify or adjust air flow through any or all of ventilation ports 6 incorporated within protective helmet 10.” *See also* Muskovitz, [0098]-[0102], FIGS. 14-16).

131. Muskovitz discloses example helmet designs in which all of the vent ports provided on the helmet are active such that the wearer can choose to prevent all air flow into the interior of the helmet altogether or allow variable amounts of air flow as desired. For instance, Muskovitz discloses an alternative embodiment of the protective helmet in FIGS. 14A-14B, FIG. 14A reproduced below. In this embodiment, all of the vent ports are active such that “[i]n a closed position, vent shield 20 is displaced such that *ambient air flow is not allowed* to flow through

into the interior of protective helmet 10.” Muskovitz, [0100]; *see also* [0098]. Alternatively, “[v]ent shield 20 may also be partially displaced, thus allowing variable amounts of ambient air into the interior of helmet 10 depending on the desire of the wearer.” *Id.*



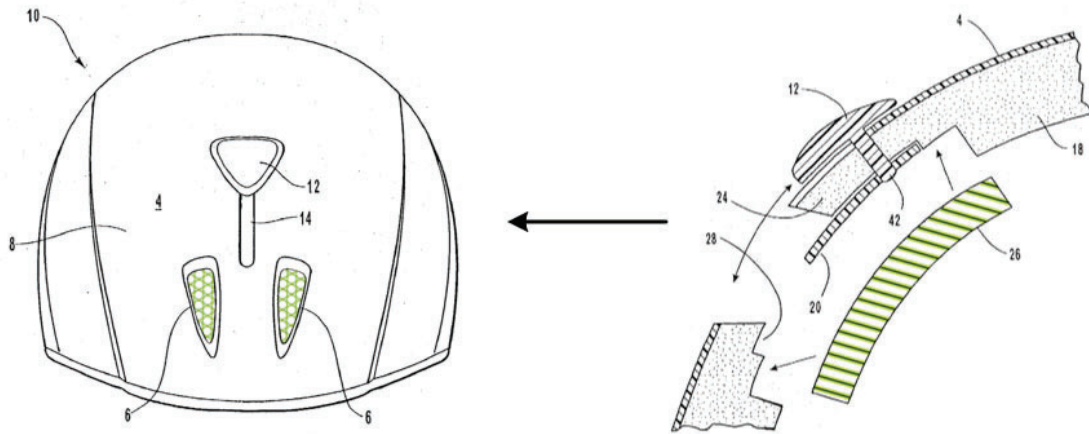
132. Eliminating passive vents from the helmet allows the wearer to close all of the vent ports on the helmet to block air flow into the interior of the helmet, for example, in cold weather conditions to preserve body heat. Muskovitz, [0098], [0100], [0102]. The Muskovitz-Sajic-Helmet would have been an obvious design and particularly suitable for a ski or snowboard protective helmet where temperatures and/or wearer exertion can vary significantly. In such circumstances, it is desirable for the wearer to be able to completely shut off ventilation during cold (potentially extreme cold) conditions and/or when wearer exertion is minimal such that it preferable (or critical) that body heat be retained and air flow into the

helmet prevented, and to be able to sufficiently ventilate the helmet to cool the wearer in conditions where the wearer is generating substantial body heat as a result of exertion and/or warmer temperatures.

133. Therefore, it would have been an obvious matter of design choice to use any of the active vent port configurations shown in Muskovitz in the disclosed helmet shell design with no passive vents to provide the wearer full control over the amount of ventilation. This would allow the wearer to prevent all air flow into the interior of the helmet if desired to preserve body heat in cold weather conditions, but provided ventilation when needed.

134. Thus, the Muskovitz-Sajic-Helmet-2 employing the single actuator/vent shield to control air flow through two vent ports at the front of the helmet (Muskovitz, [0023], [0075]-[0076], FIGS. 1-2, 7 and 9) implemented using the FIG. 10 embodiment to eliminate the need to construct a separate vent box (Muskovitz, [0087]-[0089]) in the helmet design without passive vents (e.g., FIGS. 14-16) to allow the wearer to close all of the vent ports in the helmet if desired (Muskovitz, [0098], [0100]) is merely one of the “wide variety of different configurations” in which Muskovitz discloses it would have been “readily understood” that the “components of the present invention” could be “arranged and designed” (Muskovitz, [0066]), and that would achieve the benefits disclosed in Muskovitz for those components.

135. An example of the Muskovitz-Sajic-Helmet-2 employing the FIG. 14A outer shell design (*i.e.*, with no passive vents) to provide the wearer full control over air flow using the dual active vent port configuration of FIGS. 1-2 is illustrated below, showing the Muskovitz-Sajic EAT-Insert provided for the active vent ports highlighted in green.



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

2. The Muskovitz-Sajic-Helmet Renders Obvious the Challenged Claims

136. The Muskovitz-Sajic-Helmet renders obvious each of claims 1-5, 7, 12-13 and 15-17 as demonstrated in the limitation-by-limitation analysis below. In the below analysis, I use the term Muskovitz-Sajic-Helmet to refer to any of the obvious design variations discussed above, including the Muskovitz-Sajic-Helmet-1 and Helmet-2 discussed in § VII.A.1.b above.

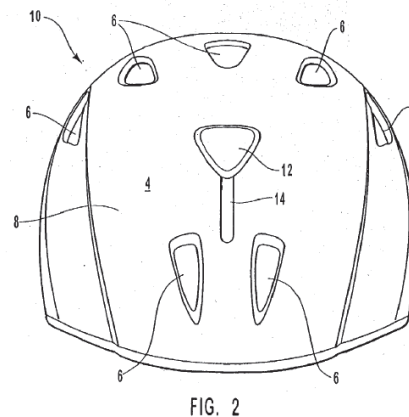
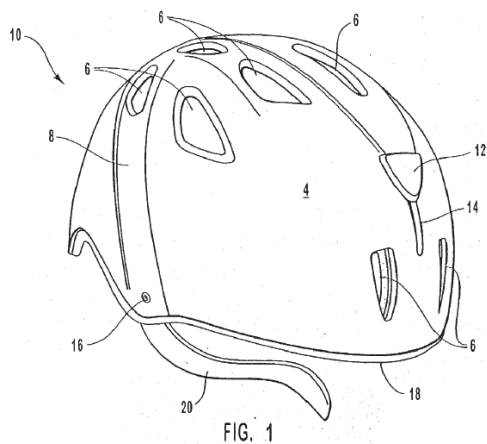
**a. The Muskovitz-Sajic-Helmet Renders Obvious Claim
1**

i. [1PRE] “A helmet, comprising:”

137. Muskovitz discloses that “the present invention features a protective *helmet* and improved ventilation control system” (Muskovitz, [0068]) and each embodiment refers to and the drawing illustrate a “protective helmet 10.” *See e.g.*, Muskovitz, [0075] (“FIGS. 1-9 show several variations of a first, preferred, embodiment of *protective helmet 10*.”), FIGS. 1-3, 6-9, 14-16. The Muskovitz-Sajic-Helmet employs the Muskovitz protective helmet implementing the EAT-Insert-Member and therefore meet [1PRE]. *Id.*; § VII.A.1.b.

ii. [1A] “a shell comprising a plurality of vents including a first vent defining a first opening and a second vent defining a second opening”

138. Muskovitz discloses a “protective helmet 10 having a plurality of ventilation ports 6” that are “designed to facilitate ambient air flow into and out of the interior of the protective helmet 10” as shown in FIGS. 1-2 of Muskovitz (reproduced below).

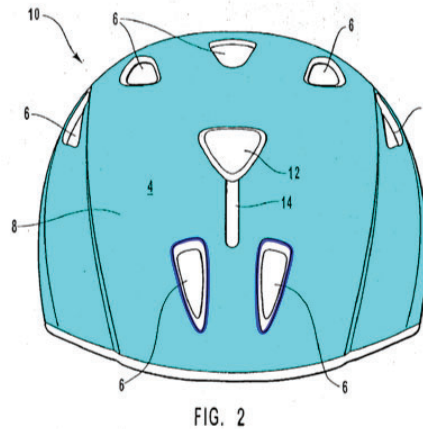


139. As discussed above in § VII.A.1.b, the Muskovitz-Sajic-Helmet uses the active vent port configuration illustrated in FIGS. 1 and 2 in which the outer shell 4 comprises two active ventilation ports 6 controlled by a single actuator/vent shield (Muskovitz, [0075]-[0076], [0084]), with or without passive vents (Muskovitz, [0076], [0098], [0100]).

140. Thus, the Muskovitz-Sajic-Helmet includes an outer shell 4 comprising at least two ventilation ports 6 and therefore meets “*a shell comprising a plurality of vents,*” as recited in [1A].

141. Muskovitz discloses that the ventilation ports 6 include “*apertures* that extend from the outer shell 4 through and into the interior of protective helmet 10” (Muskovitz, [0075])—i.e., *openings* through the outer shell. *Id.* The Muskovitz-Sajic-Helmet includes two active ventilation ports 6 as in the vent port configuration of FIGS. 1-2, FIG. 2 of which is reproduced below and annotated

with first and second ventilation ports 6 (outlined in blue) formed through outer shell 4 (aqua).



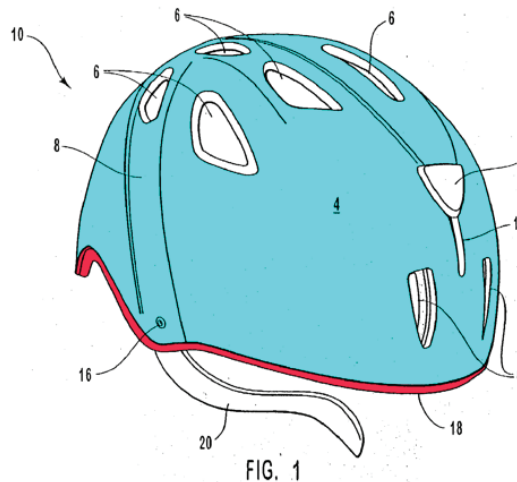
Annotated FIG. 2 of Muskovitz

142. Thus, the two active vent ports 6 the Muskovitz-Sajic-Helmet meets “a first vent defining a first opening and a second vent defining a second opening,” as recited in [1A].

- iii. [1B] “a shock absorbing liner adjacent to and attached to the shell and comprising a cavity at least partially aligned with the plurality of vents”

143. Muskovitz discloses that in “the preferred embodiment, and preferably throughout each of the alternative embodiments discussed and described herein, the protective helmet comprises an inner liner *joined* to an outer shell. The inner liner may be *bonded or molded* to the outer shell to create a shell/liner composite.” Muskovitz, [0068].

144. Muskovitz further discloses that the “inner liner is constructed or manufactured from **impact absorbing material** and provides the helmet its impact absorbing attenuation properties...to protect the wearer of the helmet from potentially dangerous impacts or blows to the head.” *Id.* FIG. 1 of Muskovitz reproduced below illustrates protective helmet 10 comprising inner lining 18 (red) bonded or molded to outer layer 4 (aqua).



Annotated FIG. 1 of Muskovitz

145. Similarly, for the integrated vent system of FIG. 10 (reproduced below) utilized by the Muskovitz-Sajic-Helmet, Muskovitz discloses that “[p]rotective helmet 10 comprises outer shell 4 **joined** (molded or bonded)” to “**impact absorbing** inner liner 18” (Muskovitz, [0087]). A POSA understood that Muskovitz’s “impact absorbing liner” is a “shock absorbing liner” performing the same function as the “shock absorbing liner” described in the ’373 patent. More specifically, Muskovitz at [0068] discloses that its “inner liner is constructed or

manufactured from impact absorbing material and provides the helmet its impact attenuation properties, which are designed to protect the wearer of the helmet from potentially dangerous impacts or blows to the head.” Muskovitz further states that the liner “may be composed of expanded polystyrene foam (EPS) ... to meet the impact attenuation safety requirements,” and that the “popularity of EPS as a protective helmet or helmet liner is due to a combination of multiple factors, including its impact attenuation capability, low cost, ease of manufacturing and light weight.” Muskovitz, [0119]. Muskovitz’s “impact absorbing liner” clearly serves the same purpose as the ’373 patent’s “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).” ’373 patent, 1:57-61.

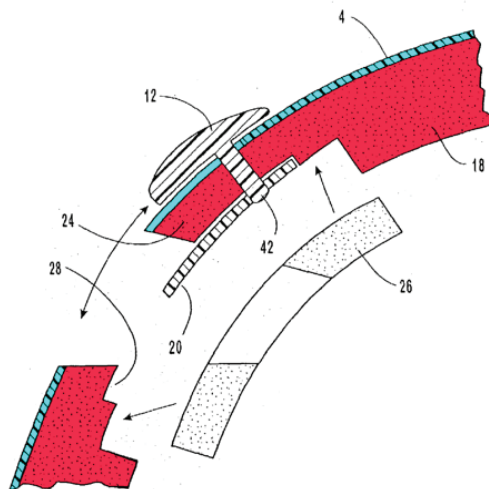


FIG. 10

Annotated FIG. 10 of Muskovitz

146. As illustrated, inner liner 18 (colored red above) is *adjacent* outer shell 4 (colored aqua above) by virtue of being “molded or bonded directly to outer shell 4,” and therefore the Muskovitz-Sajic-Helmet employing the Muskovitz inner liner 18 meets “a shock absorbing liner adjacent to and attached to the shell,” as recited in [1B1]. Muskovitz, [0081].

147. Muskovitz discloses “a portion of impacting absorbing inner liner 18 being removed to form a recess” into which components of the active vent system of the FIG. 10 embodiment are integrated, as illustrated in annotated FIG. 10 reproduced below. Muskovitz, [0087]; *see also* VI.A above.

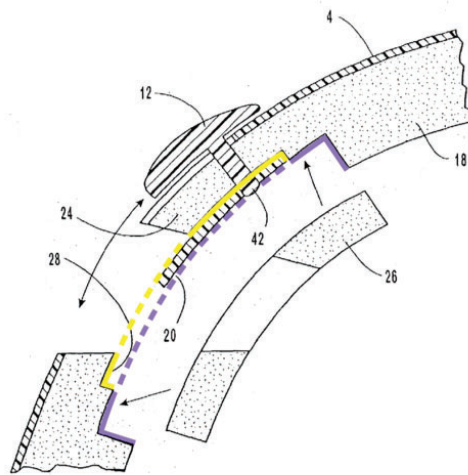


FIG. 10

Annotated FIG. 10 of Muskovitz

148. The recess formed by removing a portion of liner 18 creates a first space (outlined in yellow) that houses vent shield 20 and defines the upper boundary 24 of vent space 28. Muskovitz, [0087]-[0088]. The recess also creates

a second space outlined in purple (i.e., the insert-space referred to above) sized so that insert member 26 is “fittable within” the recess to form the lower boundary of vent space 28. Muskovitz, [0087]-[0088] (“As removable insert 26 is fit within the recess of and coupled to inner liner 18, vent space 28 is created.”).

149. The insert-space formed in the recess of the Muskovitz inner liner 18 employed by the Muskovitz-Sajic-Helmet meets the claimed “*cavity at least partially aligned with the plurality of vents.*”

(1) The Insert-Space is a Cavity

150. The '373 patent uses the term cavity to describe a volume of space formed in the liner to accommodate an insert. '373 patent, 2:33-37 (“The cavities may be shaped to hold inserts 122 and 124...Note that an insert 126 is removed to show a cavity (*e.g.*, an opening, a recess, etc.) 170 of the shock absorbing liner 130 in which the insert 126 may be inserted.”). In particular, the '373 patent describes “a cavity” as “an opening, recess, etc.” that “may be shaped to hold inserts 122 and 124.” 373 patent, 2:33-37. As illustrated in FIGS. 4 and 5 of the '373 patent (annotated below), the disclosed cavities are “opening[s]” or “recess[es]” in liner 130 that form a space (outlined in purple) to “hold inserts.”

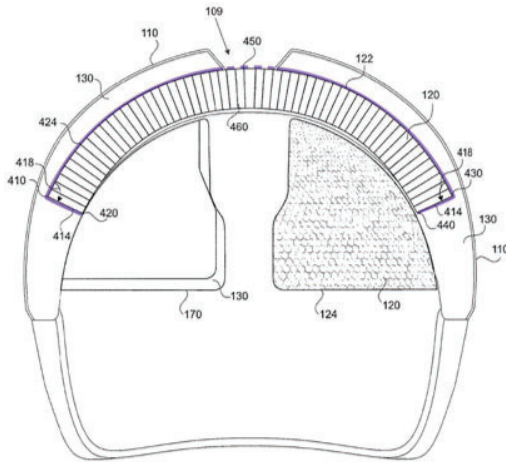


FIG. 4

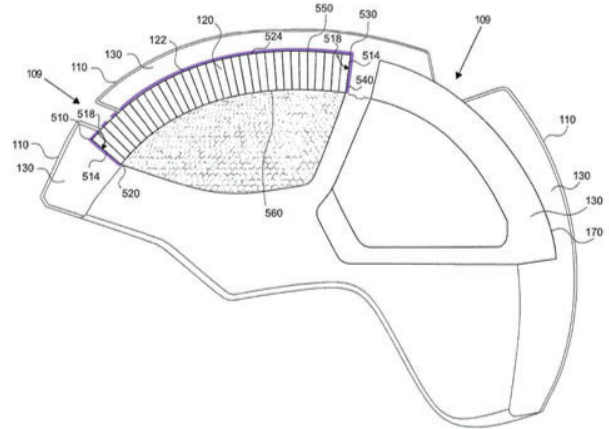


FIG. 5

FIGS. 4 and 5, '373 Patent

151. The insert-space (see purple outline in annotated FIG. 1 above at ¶ 47) created when a recess is formed in liner 18 is likewise a space (i.e., “an opening, recess, etc.,” ‘373 patent, 2:35-36) formed in liner 18 specifically to hold insert member 26. Thus, the insert-space into which insert member 26 fits (e.g., via “an interference fit” (Muskovitz, [0087]) is a “cavity” in the “*shocking absorbing liner*” for the same reasons the ‘373 patent’s cavities are—i.e., it is a space formed in the liner to accommodate an insert, just as described in the ‘373 patent.

152. The insert-space is a distinct compartment formed in inner-liner 18 sized specifically to accommodate insert member 28. The insert-space is also open to another distinct compartment that houses the vent shield—i.e., the vent space 28 for which the insert member 26 forms the lower boundary (Muskovitz, [0087]-[0088])—but the ‘373 patent’s cavities are also open to and contiguous with

corresponding vent openings formed through the shell and the liner, as illustrated in FIGS. 4 and 5 above. It would be inconsistent with the '373 patent's specification to require the claimed "*cavity*" to have no adjoining space and, furthermore, claim 1 recites no such requirement.

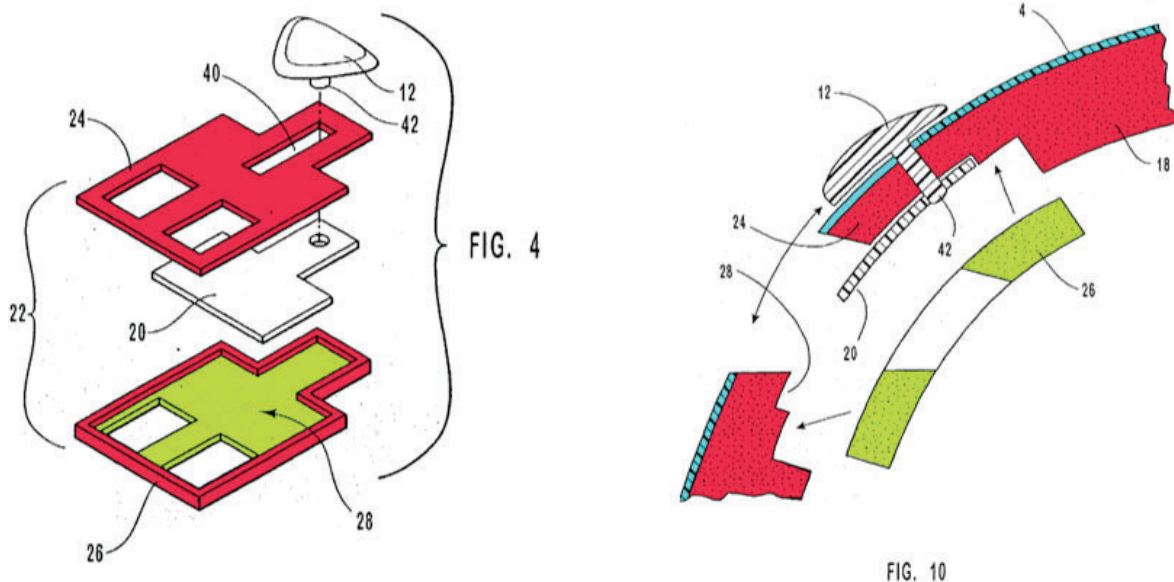
(2) The Insert-Space is Aligned with the Plurality of Active Vents

153. As shown in FIG. 10 (see above), the recess in liner 18 is formed by removing the portion of the liner below the corresponding vent openings so that the recess overlaps with (and expands beyond) the active ventilation ports such that the insert-space into which insert member 26 fits—i.e., the claimed "*cavity*"—is "*aligned*" with the corresponding vents. Muskovitz, [0087], FIG. 10. The '373 patent describes this same relationship where the cavity overlaps with a vent as being "*aligned*" with the vent. '373 patent, 4:19-21 ("[t]hus, a vent 109 of the shell 110 overlaps (e.g., *aligns*) with a portion of cavity 170 of the shock absorbing liner 130"), Fig. 2, Fig. 5.

154. While only one active ventilation port is visible at the illustrated cross-section in FIG. 10, a POSA understood that when a single actuator/vent shield controls air flow through two vents as disclosed in Muskovitz (*see e.g.*, [0023], [0076], FIGS. 1-2), the recess formed in liner 18 spans both vents to be able to accommodate the vent shield that can be displaced to cover both vents and

to provide the upper boundary 24 of the vent space for both vents. Muskovitz, [0087]-[0088].

155. Otherwise, the vent shield would not fit within the vent space to provide air flow control through both active vents. This principle is illustrated by comparing the FIG. 4 embodiment in which a separate independent vent box is created with the FIG. 10 embodiment, annotated below with like coloring for like components of the FIG. 4 and FIG. 10 embodiments. Muskovitz, [0067] (“like parts are designated by like numerals throughout.”).



Annotated FIG. 4 and FIG. 10, Muskovitz

156. For the vent box 22 of the FIG. 4 embodiment, vent space 28 formed by upper member 24 and lower member 26 span both of the illustrated apertures that align with corresponding vent openings such that vent shield 20 can be

accommodated and displaced to control air flow through the both of the corresponding two vents ports. Muskovitz, [0078]-[0079].

157. In the FIG. 10 embodiment, vent box 22 is replaced with the similarly numbered components of the helmet. Muskovitz, [0067]. In particular, the recess in liner 18 (colored red) defines the upper boundary 24 and sidewalls of vent space 28 (as seen in FIG. 10), replacing upper member 24 and the side-walls of lower member 26 of vent box 22 (also colored red). Muskovitz, [0087] (“a vent space 28 [is] defined by a portion of impact absorbing inner liner 18 being removed to form a recess therein, such that inner liner 18 forms the upper boundary of vent space 28”). Insert member 26 (colored green) forms the lower boundary of vent space 28, replacing the bottom portion of lower member (also colored green). Muskovitz, [0088] (“As such, removeable insert 26 forms the lower boundary of vent space 28. As removeable insert 26 is fit within the recess of and coupled to inner liner 18, vent space 28 is created.”).

158. Thus, a POSA would have understood that when a single actuator/vent shield for dual ventilation ports, the recess formed in inner liner 18 would span across both ventilation ports to provide a vent space that likewise spans across both ventilation ports so that the vent shield accommodated therein can be displaced to cover both ventilation ports, as it does in the FIG. 4 embodiment. Muskovitz, [0023], [0076], [0078]-[0079].

159. To the extent there is another way to achieve the vent space disclosed in the FIG. 10 embodiment to house a vent shield that covers two vents, the obvious way to implement the dual-port active vent system would have been obvious to form the recess in liner 18 to span both active vents so that the vent space created therein also spans both active vent ports so that the vent shield accommodated therein can control air flow through both active vent ports—*i.e.*, the same way the vent box 22 in the FIG. 4 embodiment was implemented.

160. As discussed in § VII.A.1.b above, the Muskovitz-Sajic-Helmet employs the single actuator/vent shield configuration disclosed in Muskovitz to control air flow through the two front vents of the protective helmet using the FIG. 10 embodiment, and therefore the insert-space (*i.e.*, the claimed “*cavity*”) of the recess formed in inner liner 18 (or the obvious implementation of the recess described above) of the Muskovitz-Sajic-Helmet overlaps with both of the two active ventilation ports provided through outer shell 4 of the helmet (outlined in blue in the drawing in § VII.A.2.a.ii) and is therefore “*at least partially aligned with the plurality vents,*” as recited in [1B] under the interpretation that limitation [1B] merely requires a cavity that is at least partially aligned with at least two vents of the claimed “*shell comprising a plurality of vents*” recited in [1A].

161. Additionally, Helmet-2 meets “*a cavity at least partially aligned with the plurality of vents*” under any reasonable interpretation because the Muskovitz-

Sajic-Helmet-2 design employs an outer shell with only the two active ventilation ports controlled by the actuator/vent shield (*see e.g.*, § VII.A.1.b.ii above) such that the insert-space (*i.e.*, the claimed “*cavity*”) formed in the inner liner overlaps both of these two active ventilation ports for the reasons discussed immediately above.

162. Because the two active ventilation ports are the only ventilation ports in the Muskovitz-Sajic-Helmet-2, the insert-space of that design is “*at least partially aligned*” with each and every ventilation port provided through the outer shell.

iv. [1C] “a shock absorbing insert positioned in and substantially filling the cavity”

163. The EAT-Insert-Member positioned within the recess of the inner liner of the Muskovitz-Sajic-Helmet meets limitation [1C]. § VII.A.1.b *supra*. Sajic discloses that inserts comprising “an array of energy absorbing tubes” (Sajic, [0117]) “provide a high level of protection from impact loads” (Sajic, [0123]) and that when oriented at oblique angles provide axial and lateral “mode[s] of absorbing energy” that results in “superior performance” (Sajic, [0106]-[0107]). Thus, a POSA understood that the EAT-Insert-Member comprising an array of energy absorbing tubes is “*a shock absorbing insert*” as recited in [1C] for the same reasons discussed above for the “shock absorbing” liner. § VII.A.2.a.iii.

164. Muskovitz discloses that the insert member 26 is “fittable within” (Muskovitz, [0087]) the recess formed in the liner 18 and is sized so that it does not “fill the entire recessed portion of inner liner 18,” (Muskovitz, [0087]) but instead fills the insert-space (i.e., the claimed “*cavity*”) such that when “removable insert 26 is fit within the recess of and coupled to inner liner 18, vent space 28 is created.” Muskovitz, [0087]-[0088].

165. Thus, the EAT-Insert-Member sized as disclosed in Muskovitz in the Muskovitz-Sajic-Helmet is “*positioned in and substantially filling the cavity,*” as recited in [1C]. See §§ VII.A.1.a.i, VII.A.1.b above.

- v. **[1C1] “such that the shock absorbing insert is visible through and spans across at least a portion of each of the plurality of vents”**

166. The EAT-Insert-Member positioned within the insert-space is “*visible through and spans across at least a portion of each of the plurality of vents,*” as recited in [1C1] as can be seen in annotated FIG. 10 modified with the EAT-Insert-Member sized as Muskovitz discloses for insert member 26. Muskovitz, [0087]-[0088].

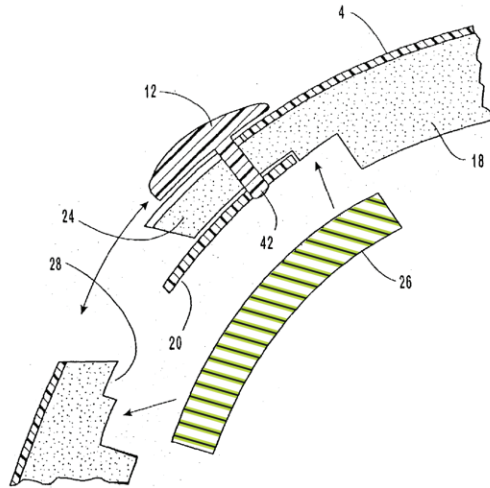


FIG. 10

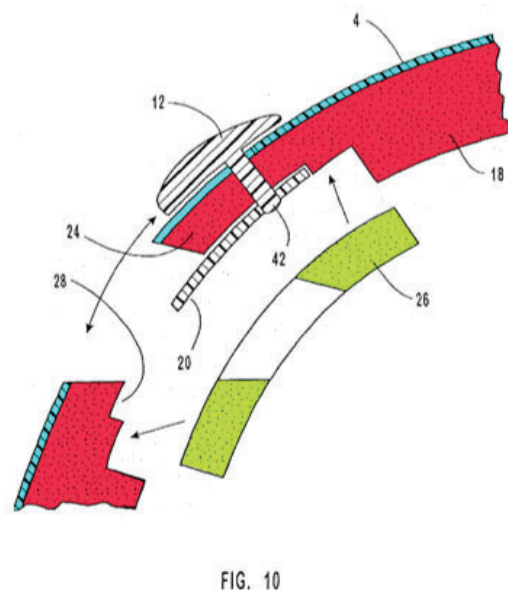
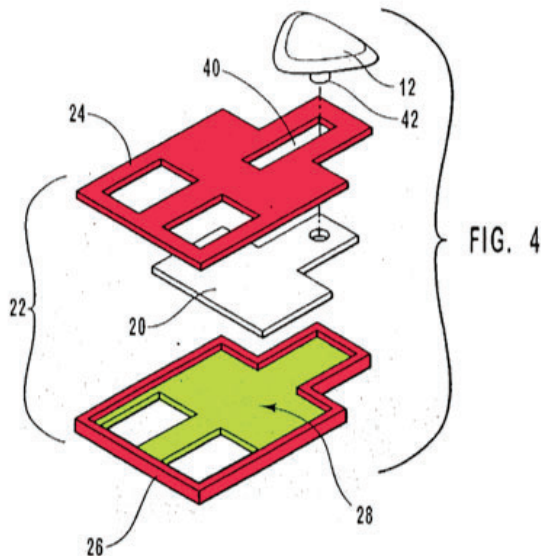
FIG. 10, Muskovitz (Modified with EAT-Insert-Member)

167. Muskovitz’s ventilation ports are “apertures that extend from the outer shell 4 through and into the interior of protective helmet 10” and, as can be seen from the above, at least the portion of the Muskovitz-Sajic EAT-Insert (colored in green) aligned with the vent opening would be visible through the corresponding vent port of the Muskovitz-Sajic-Helmet. Muskovitz, [0075].

168. As discussed in § VII.A.2.a.iii(2) above, only one active vent port is visible in FIG. 10, but a POSA would have understood that to create the vent space bounded on top (and sides) by the inner liner 18 and on the bottom by the insert member 26 (Muskovitz, [0087]-[0088]) for a vent shield that controls the two active vent ports of the Muskovitz-Sajic-Helmet (§ VII.A.1.b), the recess formed in inner liner 18, and thus the insert-space created therein, spans both of the active vent ports.

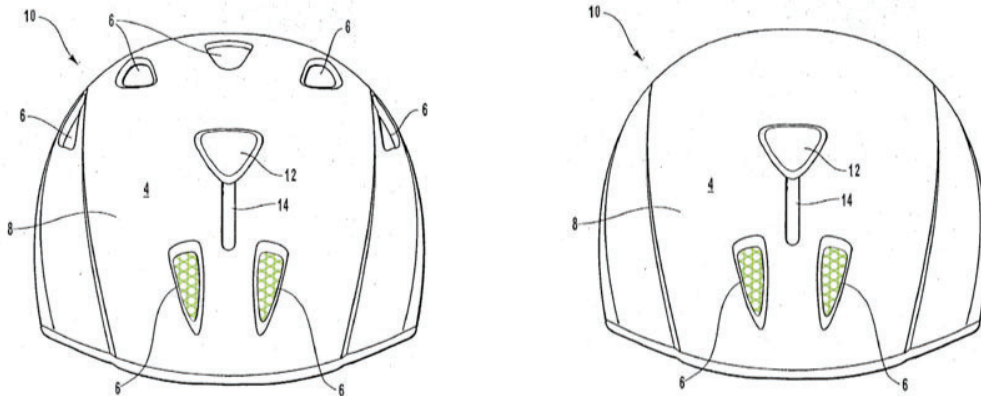
169. Thus, a POSA would have understood that for Muskovitz's insert member 26 to be "fittable within" the insert-space of the recess and form the lower boundary of the vent space (Muskovitz, [0087]-[0088]), the insert member 26 would also span across both of the active vent ports—the insert member would not otherwise fit within the recess.

170. To the extent that Muskovitz does not expressly disclose that the insert member 26 spans across both vent ports in dual active vent port configurations, it would have been obvious to a POSA to implement insert member 26 as such to provide the lower boundary of vent space 28 in the same manner the bottom of lower member 26 of the FIG. 4 vent box is implemented to form the lower boundary of the vent space, as illustrated below in annotated FIGS. 4 and 10 of Muskovitz annotated with coloring as in § VII.A.2.a.iii(2) above. Muskovitz, [0078], [0079]; [0087]-[0089].



Annotated FIG. 4 and FIG. 10, Muskovitz

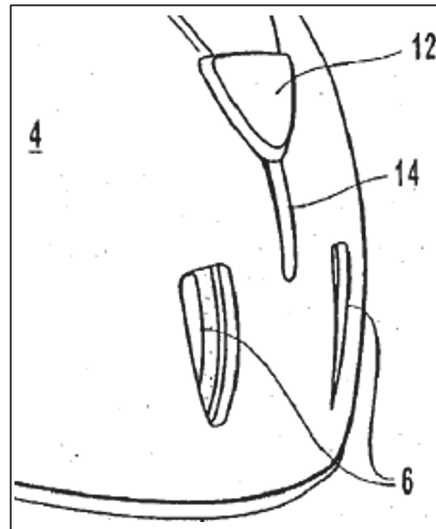
171. Thus, the EAT-Insert-Member sized in this manner spans across, and as a result, is visible through both of the active vent ports of the Muskovitz-Sajic-Helmet, as illustrated below in the example Muskovitz-Sajic-Helmet-1 using FIG. 2 of Muskovitz modified with the EAT-Insert-Member (green), and example Muskovitz-Sajic-Helmet-2 using FIG. 2 of Muskovitz modified with the EAT-Insert-Member and the FIG. 14A shell design (*i.e.*, an outer shell 4 with no passive ventilation ports). § VII.A.1.b.



Modified (Per Above) FIG. 1 of Muskovitz

172. FIG. 1 of Muskovitz shows that there would have been no impediment to seeing the EAT-Insert-Member spanning across the vent ports (“apertures that extend from the outer shell 4 through and into the interior of protective helmet 10,” Muskovitz, [0075]) as even the layers of the active ventilation system along the periphery of the vent opening are visible through the vent port 6, as shown in

active ventilation port region of FIG. 1 enlarged below. The interior layer visible in the vent region below corresponds to insert member 26 when using the FIG. 10 embodiment, and thus insert member 26 is visible through both vents even with the cut-outs (which are eliminated with the EAT-Insert-Member).



Active Ventilation Region of FIG. 1 of Muskovitz

173. A POSA would have understood that the EAT-Insert-Member sized to fit into the recess would have been visible through dual active ventilation ports of any of the various ventilation port configurations disclosed in Muskovitz where visibility is likewise unimpeded. Therefore, the EAT-Insert-Member employed in the Muskovitz-Sajic-Helmet is “*visible through and spans across at least a portion of each of the plurality of vents,*” as recited in limitation [1C1] under the interpretation that limitation [1C1] is met by two ventilation ports for which this relationship is satisfied. Additionally, the Muskovitz-Helmet-2 meets this limitation under any reasonable interpretation because the EAT-Insert-Member is

visible through and spans across both of the *only two* ventilation ports provided through the outer shell of the Muskovitz-Sajic-Helmet-2. §§ VII.A.1.b.ii.

- vi. [1C2] “wherein at least a portion of the shock absorbing liner is positioned between the shell and the shock absorbing insert”

174. In the FIG. 10 (reproduced below) embodiment of Muskovitz, the portion of the liner removed to form the recess into the active vent system is integrated leaves portions of inner liner 18 (Muskovitz, [0087]) adjacent to the outer shell to provide the upper boundary 24 of the vent space and to form the insert-space into which the insert member 26 is fit. Muskovitz, [0087]-[0088];

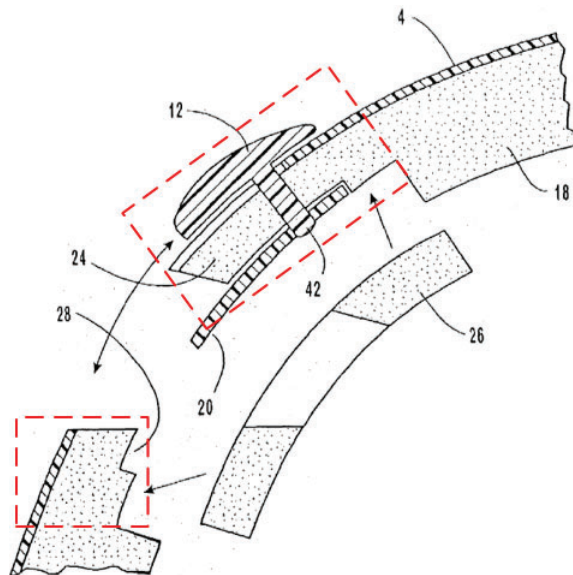


FIG. 10

FIG. 10, Muskovitz (Annotated)

175. Thus, at least the portions of inner-lining 18 of the Muskovitz-Sajic-Helmet within the dashed red boxes annotated on FIG. 10 above (i.e., upper boundary 24 and the portions remaining above the insert-space) are “*positioned between the shell and the shock absorbing insert,*” as recited in limitation [1C2].

vii. [1C3] “**wherein the shock absorbing insert comprises an array of energy absorbing cells, each having respective open first longitudinal ends and open second longitudinal ends**”

176. The EAT-Insert-Member uses the EAT-material of Sajic’s insert, which Sajic discloses are formed of an integral material comprising “*an array of energy absorbing cells*, wherein each cell comprises a tube” (Sajic, [0053]). In addition, Sajic refers to its different views of the EAT-material used in its insert as “tubular array of cells.” Sajic, [0086]-[0087] (describing FIGS. 2 and 3). The ’373 patent at 2:47-51 similarly states that its “insert 126 may include a honeycomb material that includes an array of energy absorbing cells,” wherein “each of the cells may include a tube.” Thus, the EAT-Insert-Member of the Muskovitz-Sajic-Helmet “*comprises an array of energy absorbing cells,*” as recited in [1C3].

177. Furthermore, Sajic describes the materials and the process in which the energy absorbing tubes are formed. Sajic describes its “tubes” to be of a “hollow structure having any regular or irregular geometry” (Sajic, [0015]), which

are formed via the extrusion of various plastic materials such as polycarbonate, polypropylene, and Tubus Honeycombs™ (Sajic, [0067]). Sajic further describes the tubes to have “open ends,” and are integrally formed to become an array of energy absorbing tubes. Sajic, [0066]-[0068], [0080]-[0082], [0104], [0112], [0121]-[0122], Figs. 2, 3(a), 3(b); *see also* VI.B *above*. Thus, Sajic’s discloses integral material comprising energy absorbing tubes that are open-ended.

178. Sajic discloses embedding open-ended inserts in a foam liner and that it is preferable therefore to apply a sealing material to “prevent[] the foam material from entering the *open ends* of the tubes” (Sajic, [0122]) during formation of the disclosed safety helmet. Sajic, [0068], [0082], [0122]. As discussed in §§ VII.A.1.a, the EAT-Insert-Member employs Sajic’s EAT-material as manufactured—i.e., as an integral material comprising an array of energy absorbing tubes having “open ends” (Sajic, [0122]).

179. Thus, the energy absorbing tubes of the EAT-Insert-Member of the Muskovitz-Sajic-Helmet “*each hav[e] respective open first longitudinal ends and open second longitudinal ends,*” as recited in limitation [1C3].

- viii. [1C4] “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”

180. The EAT-Insert-Member meets [1C4] under any of numerous obvious choices of diameter and wall-thickness for the energy absorbing tubes of the EAT-Insert-Member of the Muskovitz-Sajic-Helmet. In particular, Sajic discloses a wide range of dimensions at which the energy absorbing tubes can be manufactured. Sajic, [0063] (“Preferably each tube has a diameter of between 2 and 25 mm. Preferably each tube has a diameter of about 8 mm.”); [0064] (“Preferably the thickness of the side wall of each tube is between 0.1 and 0.3 mm”).

181. As discussed in §§ VII.A.1.a.i and VII.A.1.b, an obvious implementation of the EAT-Insert-Member would have been to orient the energy absorbing tubes in alignment with openings of the active ventilation ports (*i.e.*, the “*first vent defining a first opening*” and the “*second vent defining a second opening*,” § VII.A.2.a.ii) to take advantage of both axial and lateral impact absorption properties of the EAT-material and to facilitate ambient air flow into and out of the interior of the protective helmet 10 via the corresponding active ventilation ports. Muskovitz, [0075], [0098].

182. In this arrangement, the EAT-Insert-Member having energy absorbing tubes “adjacent to six other tubes” (Sajic, [0062], [0103]) in a “close packed array” (Sajic, [0098]) that spans across both of the active ventilation ports of Muskovitz-Sajic-Helmet (see § VII.A.2.a.v above) would have of energy absorbing tubes “*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,” as recited in [1C4] for any number of dimensions for the tubes disclosed in Sajic used in connection with the active ventilation port configurations disclosed in Muskovitz—*i.e.*, when positioned across vents of the various size and shape illustrated in Muskovitz (e.g., the active vent ports illustrated in FIGS. 1-2, 7, etc).

183. For example, an EAT-Insert-Member implemented with a 2-mm diameter tube would unquestionably meet [1C4] because numerous such tubes would be positioned within the respective perimeters of the openings of the corresponding active vents for any of the vent-sizes illustrated in Muskovitz for dual-port active vents. Muskovitz does not disclose dimensions for the illustrated ventilation ports (neither does the ‘373 patent), but it would have been apparent to a POSA that the active vents in FIGS. 1-2 have larger width and length dimensions than the unusably small vents that would be sufficient to satisfy the requirement that two longitudinal ends be within the perimeter of the respective openings of the corresponding vents.

184. For example, based on the relative size of the active vents in FIGS. 1-2 of Muskovitz to the helmet itself (helmet sizes range from small to extra-large to accommodate head circumferences of between 51-65 cm (510-650 mm) so that the outer circumference of the shell of the helmet is meaningfully larger than that), a

POSA would have understood the vent opening to be at least 15 mm in width and 25 mm in length, and in the approximate range of 15-20 mm x 25-35 mm. The photo of the Muskovitz helmet discussed below suggests the actual Muskovitz helmet had front vents of approximately 20-35 mm x 30-40 mm.

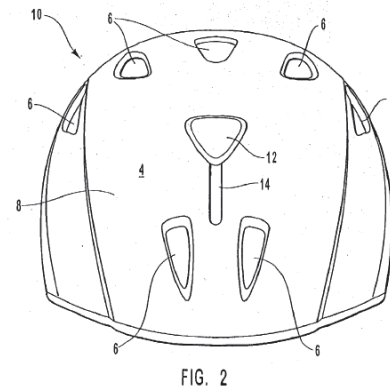
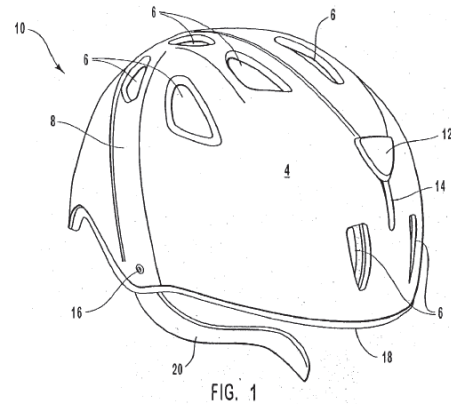
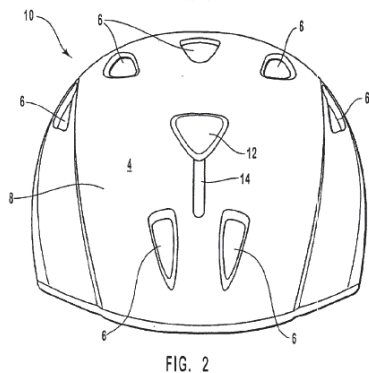
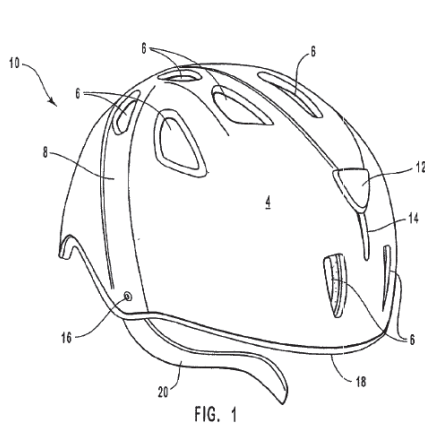
185. Muskovitz filed earlier patent application Muskovitz-Prior (Ex. 1017) that shares much of the disclosure mostly verbatim with Muskovitz, including identical FIGS. 1-2 (illustrated below) and substantially verbatim description of the drawings (compare Muskovitz, [0063]-[0064] with Muskovitz, [0075]-[0076]).

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US 2002/0124298 A1

Patent Application Publication Apr. 8, 2004 Sheet 1 of 19

US 2004/0064873 A1



FIGS. 1-2, Muskovitz-Prior (Left) and FIGS. 1-2, Muskovitz (Right)

186. Muskovitz-Prior also does not give dimensions for the disclosed vents but the provisional application (Muskovitz-Prior-Provisional (Ex. 1018) to which Muskovitz-Prior claims priority had actual photographs of the Muskovitz protective helmet for FIGS. 1 and 2 on which the drawings for the Muskovitz and Muskovitz-Prior FIGS. 1 and 2 were based. FIGS. 1 and 2 of the Muskovitz-Prior-Provisional are reproduced below.

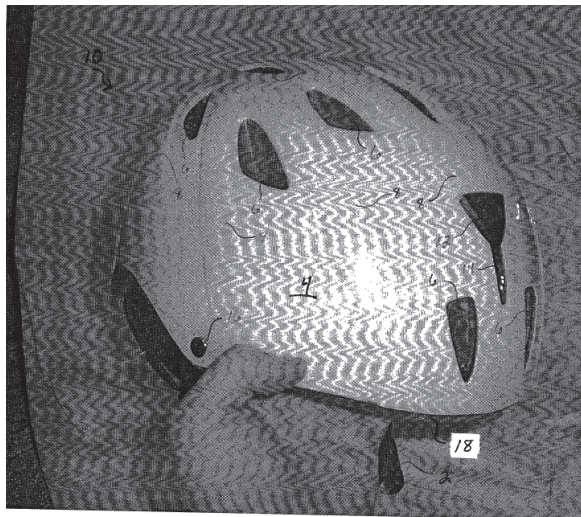


FIG. 1

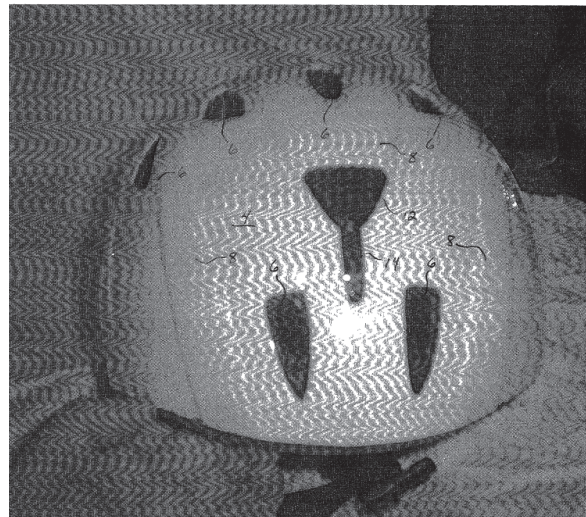


FIG. 2

187. The Muskovitz-Prior-Provisional likewise does not provide dimensions for the vents but the photographs provide context to better appreciate the dimensions of the Muskovitz ventilation ports and supports the reasonableness (and conservativeness) of the 15-20 x 25-35 mm estimate for the dimensions of the Muskovitz FIG. 1-2 active vents that a POSA would have appreciated the Muskovitz FIG. 1-2 active vents at least would have from the relative size of the

vents to the helmet depicted in FIGS. 1 and 2 of Muskovitz. Thus, a POSA would have understood numerous (if not all) obvious choices of tube-diameter and wall-thickness for the EAT-Insert-Member from the ranges disclosed in Sajic would have resulted in an arrangement that meets [1C4].

188. The '373 patent does not disclose dimensions for the tubes of the disclosed honeycomb material or the size of the vent openings, nor does the '373 patent disclose or suggest the arrangement recited in [1C4] is anything more than what results from using a shock absorbing insert made from the honeycomb material disclosed in the '373 patent arrangement in the manner recited in [1A]-[1C3]. The '373 patent does not allege there is anything inventive about this arrangement—it does not describe it at all. All limitation [1C4] requires is that more than one longitudinal end of a cell be positioned with the perimeter of each vent opening.

189. Thus, a POSA would have understood from the '373 patent that limitation [1C4] (as well as [1C5] discussed below) is nothing more than the result of a shock absorbing insert that meets limitations [1C]-[1C3] that is comprised of energy absorbing tubes of the dimensions described in Sajic and active ventilation ports of the configurations disclosed in Muskovitz at the approximate dimensions a POSA would have understood the disclosed vents to have. Thus, the EAT-Member

of the Muskovitz-Sajic-Helmet meets [1C4] using any of numerous obvious choices of tube dimensions from those disclosed in Sajic.

- ix. **[1C5] “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”**

190. A POSA would have understood that the EAT-Insert-Member fit with the recess of the inner liner and spanning both of the active vents of the Muskovitz-Sajic-Helmet would allow air to flow through the tubes of the EAT-material using any of the diameters and wall-thicknesses disclosed in Sajic. § VII.A.2.a.viii *supra*.

191. Muskovitz discloses that the “[v]entilation ports 6 are designed to facilitate ambient air flow into and out of the interior of protective helmet 10” (Muskovitz, [0075]) and that displacing the actuator 12 of the active ventilation system allows the user to “lower or raise vent shield 20” to control “ambient air to flow” through active ventilation ports “into the interior of protective helmet 10” Muskovitz, [0079]-[0080]. I further discussed the ventilation benefits that the tubes of the EAT-material would have provided in § V.A above. Due to the tubular structure of the insert material, ambient air would flow into the protective helmet 10 via the ventilation ports, through the tubes of the EAT-Insert-Member, and toward the interior of the helmet. The wide range of tube dimensions and high

aspect ratio disclosed in Sajic would have allowed for the manufacture of an EAT-Insert-Member having virtually any desired of unimpeded air flow through the material, as I discussed above in § VII.A.1.a.i above.

192. Thus, a POSA would have understood that the EAT-Insert-Member arranged with energy absorbing tubes oriented in alignment with the corresponding active ventilation ports of the Muskovitz-Sajic-Helmet (§§ VII.A.1.a.i, VII.A.1.b) would have provided a configuration where “*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,*” as recited in [1C5].

x. The Recess Also Meets the Claimed Cavity

193. The recess formed in inner-liner 18 of the FIG. 10 embodiment is also a “cavity” (i.e., “an opening, recess, etc.,” ’373 patent, 2:35-36) formed in a “*shock absorbing liner,*” as recited in limitation [1B]. Muskovitz, [0087] (“Specifically, FIG. 10 depicts protective helmet 10 having a vent space 28 defined by a portion of impact absorbing inner liner 18 being removed to form a recess therein”).

194. The recess is “*at least partially aligned with the plurality of vents,*” as recited in [1B] for the same reasons I discussed in § VII.A.2.a.iii(2) at least because the insert-space is created within the recess such that both overlap with an

align with both the active vents of the Muskovitz-Sajic-Helmet. Thus, the recess in inner-liner 18 of the Muskovitz-Sajic Helmet also meets [1B].

195. Limitation [1C] is also met because the EAT-Insert-Member is “*positioned within*” (i.e., it is “fit within inner liner 18,” Muskovitz, [0088]) and also “*substantially fills*” the recess. While insert member 26 does not “fill the *entire*” recess, claim 1 does not require the cavity to entirely fill the cavity. Instead, claim 1 uses qualified language to recite the extent to which the claimed shock absorbing insert is required to fill the cavity. Specifically, the insert need not fill the cavity entirely, only “*substantially.*”

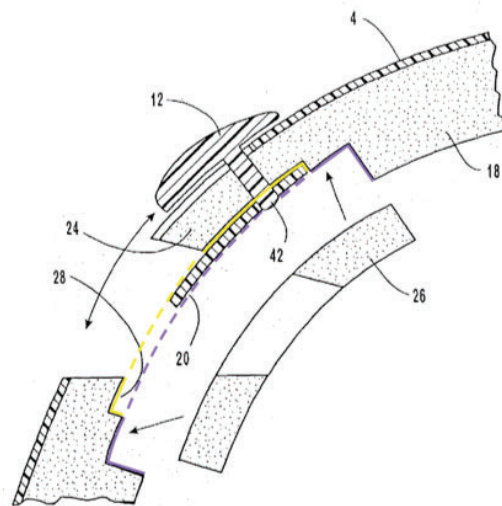


FIG. 10

FIG. 10, Muskovitz (Annotated)

196. The narrow vent space 28 for vent shield 20 (i.e., the space between the yellow and purple outlines in annotated FIG. 10 above) that the insert member

does not fill accounts for a small portion of the recess. Muskovitz, [0087]-[0088], FIG. 10. The substantial portion of the recess is filled by insert member 26. *Id.* A POSA would have understood that the insert member 26, sized to “fit within the recess” to “form an integrated whole,” (Muskovitz, [0088]) leaving only enough space to house vent shield 20 such that it forms the lower boundary of vent space 28, is “*substantially fills*” the recess. Each of the other limitations in claim 1 are met for the same reasons I discussed in §§ VII.A.2.a.i-VII.A.2.a.ix above.

b. The Muskovitz-Sajic-Helmet Renders Obvious Claim 2

197. Claim 2 depends from claim 1 and further recites that the “*shock absorbing liner is seamless.*”

198. Muskovitz discloses manufacturing the protective helmet using an “in-molding” process in which the outer shell and the inner liner are joined together by molding or bonding process in the same manufacturing process. Muskovitz, [0081] (“outer shell 4 is obtained and inner liner 18 is molded or bonded directly to outer shell 4, a process known as in-molding, meaning the outer shell is joined to the inner protective liner using a molding or bonding process”); [0082] (“inner liner 18 is comprised of an impact resistant material, preferably a material that is capable of being molded directly to outer shell 4.”).

199. A POSA would have understood that Muskovitz is disclosing a protective helmet manufactured using widely-adopted and conventional processes

in which the outer shell and inner liner form a generally continuous “shell/liner composite” in the desired shape of the helmet. Muskovitz’s inner liner is illustrated throughout (see *e.g.*, FIGS. 10-12) as a continuous seamless layer of impact absorbing material, except at ventilation ports and at the recess in the FIG. 10 embodiment (to the extent the recess is a “seam”). This is the same arrangement that the ’373 patent illustrates and discloses as “seamless.” ’373 patent, 3:7-25, FIGS. 1-5.

200. Muskovitz does not describe manufacturing the inner liner in segments or otherwise describe any discontinuities in the inner liner, but instead discloses that the inner liner and outer shell are molded together in the same manufacturing process. Thus, a POSA would have understood Muskovitz to disclose an inner liner that is as “seamless” as the liners disclosed in the ’373 patent.

201. To the extent that Muskovitz does not expressly disclose that the inner liner is seamless, it would have been obvious to manufacture inner liner as a continuous layer in the shape of the helmet as helmet liners were conventionally manufactured. Like the ’373 patent (1:57-61), for example, Muskovitz discloses that EPS may be used as the impact absorbing liner for the disclosed protective helmet. The conventional technique for manufacturing an EPS liner was to fill a helmet mold with polystyrene “pellets” that are then heated and blown to fuse and

expand the pellets into a continuous foam in the shape of the helmet. This produces a single unitary (i.e., seamless) liner shaped to the desired form-factor of the helmet.

202. Thus, a POSA would have understood that the Muskovitz inner liner 18 employed by the Muskovitz-Sajic-Helmet, or the obvious implementation of inner liner 18, meets “*wherein the shock absorbing liner is seamless,*” as recited in claim 2.

c. The Muskovitz-Sajic-Helmet Renders Obvious Claim 3

203. Claim 3 depends from claim 1 and further recites that the “*array of energy absorbing cells of the shock absorbing insert comprises an array of tubes.*”

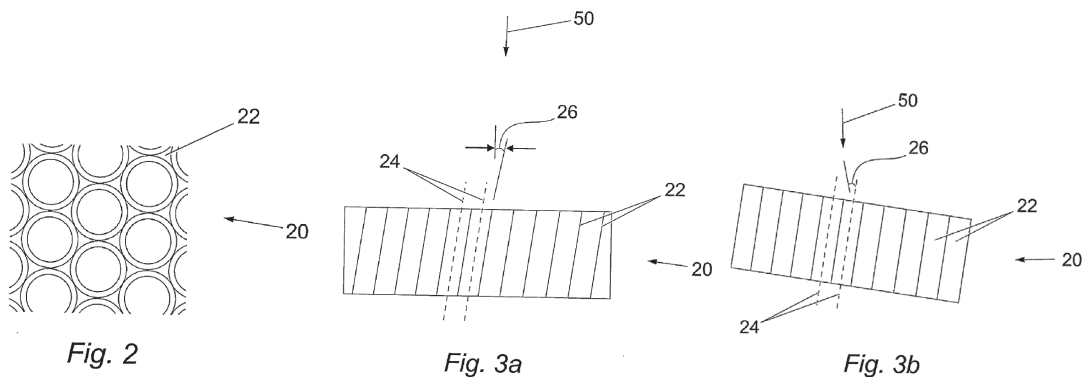
204. As discussed in § VII.A.2.a.vii, the EAT-Insert-Member employed by the Muskovitz-Sajic-Helmet uses the EAT-material of Sajic’s insert. As I discussed previously in § VII.A.2.a.iv, Sajic discloses that its insert is formed from an integral material that “comprises an array of energy absorbing tubes” (Sajic, [0117]), precisely as recited in claim 3. Sajic makes clear the tubular structure of its array of energy absorbing cells in [0053], describing its inserts as comprising “an array of energy absorbing cells, wherein each cell comprises a tube.” Sajic’s disclosure aligns with the ’373 patent’s disclosure, which states that its “insert 126 may include a honeycomb material that includes an array of energy absorbing cells...each of the cells may include a tube.” ’373 patent, 2:48-51.

205. Thus, the Muskovitz-Sajic-Helmet's EAT-Insert-Member meets “wherein the array of energy absorbing cells of the shock absorbing insert comprises an array of tubes,” recited in claim 3 for the same reasons the ’373 patent’s honeycomb material does.

d. The Muskovitz-Sajic-Helmet Renders Obvious Claim 4

206. Claim 4 depends from claim 3 and further recites “wherein the tubes are cylindrical in shape.”

207. As shown by the top-view of Sajic’s Fig. 2 (disclosed as a “cylindrical arrangement,” [0098]) and side-views of Figs. 3(a)-(b) reproduce below, the energy absorbing tubes of Sajic’s EAT-material used by the EAT-Insert-Member of the Muskovitz-Sajic-Helmet are cylinders and therefore are “*cylindrical in shape*,” as recited in claim 3. See also Sajic, [0016] (“the tube has a *cylindrical* or conical structure, most preferably a *circular cylindrical* or circular conical structure.”).



**e. The Muskovitz-Sajic-Helmet Renders Obvious Claim
5**

208. Claim 5 depends from claim 4 and recites “*wherein the tubes are oriented along a thickness of the shock absorbing insert.*”

209. As illustrated in Sajic’s Fig. 3a and Fig. 3b (see above in § VII.A.2.d), the longitudinal axes 24 of the tubes are oriented along the thickness of the integral material, the “thickness” of which is merely the length of the tubes forming the integral material. Sajic, [0099], [0101]. The EAT-Insert-Member uses this same arrangement and therefore has “*the tubes are oriented along a thickness of the shock absorbing insert,*” as recited in claim 3.

210. The ’373 patent discloses this same arrangement, stating, at 4:6-11: “In an embodiment, the tubes may be oriented along a thickness of the insert. In some embodiments, a tube of the insert may be generally oriented along a longitudinal axis that is normal to an adjacent point on the inner surface of the shell 110. For example, the longitudinal axis of a tube of a cell may be arranged at an angle of between 0° and 45° to a line normal to the adjacent point on the inner surface of the outer shell 110.”

f. The Muskovitz-Sajic-Helmet-3 Renders Obvious Claim 7

211. Claim 7 depends from claim 1 and further recites “*wherein the shock absorbing insert extends to a portion of the helmet configured to be positioned at a back of a wearer’s head.*”

212. As discussed in § VII.A.1.b, an obvious variation of the Muskovitz-Sajic Helmet would have been to provide additional active vents on the helmet in addition to the two active ventilation ports provided at the front of the example Muskovitz-Sajic Helmet-1 (§ VII.A.1.b.i) by making additional “vent ports 6 positioned along the rear of helmet 10” (Muskovitz, [0075]) active as contemplated by Muskovitz. Indeed, Muskovitz states, at [0076], that “the ventilation system of the present invention may be designed to modify or adjust air flow through *any or all* of ventilation ports 6 incorporated within protective helmet 10.”

213. One obvious implementation based on Muskovitz teaching would have been to also provide a dual-port active vent system (*i.e.*, a single actuator/vent shield for two vent ports) that controls air flow through two vent ports positioned at the rear of the helmet. By having the vent ports positioned at the rear, the wearer would have the ability to control air flow through the front and back of the helmet. Providing both “intake” and “exhaust” active vent port provides for “an increased efficiency cooling system” as disclosed by Muskovitz ([0075]) with improved wearer control over air flow—complete wearer control for

implementations in which front and back dual-port active vent systems are provided without additional passive vent ports.

214. Additionally, Muskovitz discloses a number of different configurations for providing ventilation ports at the rear of the helmet, such as FIG. 1 “show[ing] a series of vent ports 6 positioned along the rear of the helmet 10” (*see also, e.g.*, FIGS. 1-3, 6-7, 17). Muskovitz recognizes that conventional helmets, such as one disclosed in U.S. Patent No. 6,105,176 (*see* Muskovitz, [0009]), included rear vents positioned alongside the back of the helmet. A POSA would have understood that the positioning and sizing of rear vent ports would have been a matter of design choice, as I discussed previously in § VII.A.1.b and as Muskovitz expressly states. *See* Muskovitz, [0066] (“It will be readily understood that the components of the present invention, as generally described and illustrated in the figures herein, could be arranged and designed in a wide variety of different configurations.”).

215. A POSA implementing dual-port active vent systems at the front and back of the helmet would have been motivated to implement the rear dual-port active vent system in the same way as the front dual-port active vent system of the Muskovitz-Sajic-Helmet (*i.e.*, using the integrated active vent system of the FIG. 10 embodiment employing the EAT-Insert-Member for the reasons discussed in §§ VII.A.1.a and VII.A.1.b above). I will refer to the Muskovitz-Sajic-Helmet

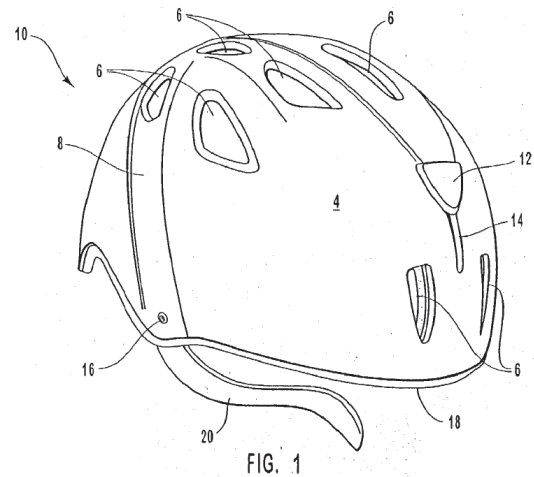
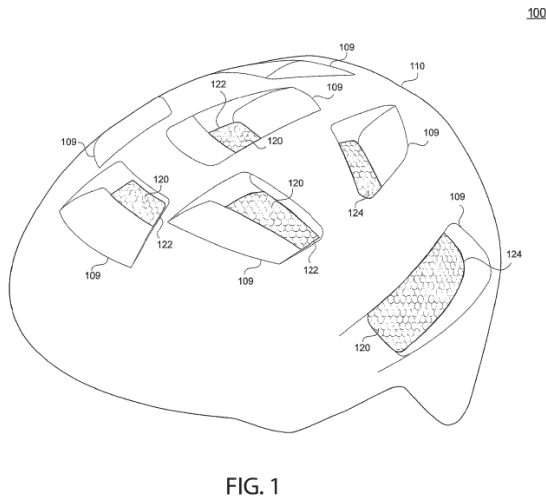
employing both front and back dual-port active vent systems (with or without passive vents) as the Muskovitz-Sajic-Helmet-3.

216. The rear dual-port active vent system of the Muskovitz-Sajic-Helmet-3 meets each of the limitations recited in claim 1 for the same reasons discussed in § VII.A.2.a because it employs the same components of the dual-port active vent system employing an EAT-Insert-Member that was demonstrated to meet each of the limitations of claim 1, but positioned at the rear of the helmet. Specifically, the rear dual-port active vent system would include an EAT-Insert-Member fit into a recess formed in the inner liner attached to the outer shell having two active vents, but in the rear, and therefore the Muskovitz-Sajic-Helmet-3 maps to claim 1 in the same way. In fact, the Muskovitz-Sajic-Helmet-3 meets each of the limitations of claim 1 in two ways as both the front and the rear dual-port active vent system meet the corresponding limitations of claim 1 in the manner discussed in § VII.A.2.a.

217. Furthermore, the EAT-Insert-Member of the rear dual-port active vent system of the Muskovitz-Sajic-Helmet-3 “*extends to a portion of the helmet configured to be positioned at a back of the helmet*” at least because it spans across both active vents positioned at the “rear of [the] helmet” (Muskovitz, [0075]).

218. The ’373 patent does not describe what portions of the helmet are configured to be positioned at the “back” of the wearer’s head or provide any

guidance as to what constitutes the back of the wearer's head. The rear vents 109 of the helmet disclosed in the '373 patent are positioned similarly to the rear vent ports 6 of the Muskovitz protective helmet (Muskovitz, [0075]), as illustrated in the respective FIGS. 1 below.



219. Thus, a POSA would have understood that the rear vent ports 6 of the Muskovitz helmet is provided on a portion configured to be positioned at the back of the wearer's head to the same extent the rear vents 109 disclosed in the '373 patent are. Moreover, the Muskovitz insert member 26 extends beyond the vent openings of the active vent ports in both direction (i.e., above actuator and below corresponding vent openings) to fit within the recess in the FIG. 10 (below) embodiment.

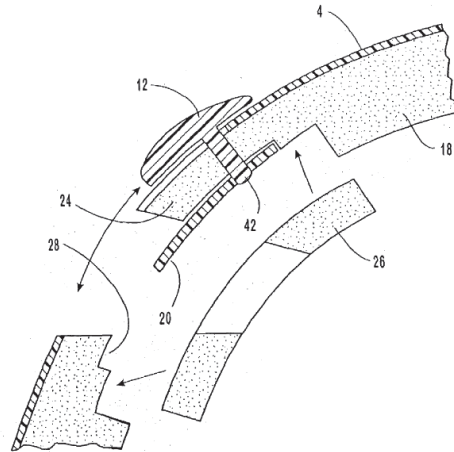


FIG. 10

220. Thus, the EAT-Insert-Member of the rear dual-port active vent system of the Muskovitz-Sajic-Helmet-3 sized the same way as insert member 26 “*extends*” even further than the rear vent ports provided at locations configured to positioned at the back of the wearer’s head and meets claim 7 for this additional reason.

221. Furthermore, it would have been obvious to position the Muskovitz rear vent ports further towards the front or further towards the back of the helmet as a matter of design choice, as Muskovitz discusses many obvious design choices and configurations for its helmets (as I discussed previously in § VII.A.1.b) and expressly states that such different configurations would be readily understood. *See* Muskovitz, [0066]. Claim 7 is therefore obvious to the extent that “*a back of the wearer’s head*” is interpreted as requiring locations *further* towards the back of the head.

g. The Muskovitz-Sajic-Helmet Renders Obvious Claim 12

i. [12PRE] “A helmet, comprising:”

222. See § VII.A.2.a.i ([1PRE]) above.

ii. [12A] “a shell including a first vent defining a first opening and a second vent defining a second opening”

223. Limitation [12A] recites the same shell as [1A], but does not recite “*a plurality of vents*” as recited in limitation [1A]. Therefore, the outer shell comprising the two active vents of the Muskovitz-Sajic-Helmet meets limitation [12A] for the same reasons discussed in § VII.A.2.a.ii above.

iii. [12B] “a shock absorbing liner adjacent to and attached to the shell, the shock absorbing liner having a cavity that extends from and that spans across at least a portion of each of the first and second openings”

224. Limitation [12B] recites the same shock absorbing liner as limitation [1B] with the cavity recited using different language to describe the relationship to the vents. Limitation [12B] is also met by the insert-space of the Muskovitz-Sajic-Helmet. As discussed above in § VII.A.2.a.iii, the insert-space the insert-space is a “cavity” (see § VII.A.2.a.iii(1)) formed in the inner-liner 18 of Muskovitz’s FIG. 10 embodiment that spans across both active vent ports. Thus, the inner-liner of the Muskovitz-Sajic-Helmet meets limitation [12B] for the reasons discussed in § VII.A.2.a.iii(2) above. The recess in inner-liner 18 is also a “cavity” (see §

VII.A.2.a.x) that spans across both active vent ports and meets [12B] as an alternative basis.

iv. [12C] “a shock absorbing insert positioned in and substantially filling the cavity”

225. Limitation [12C] recites the same limitation as limitation [1C] and therefore the EAT-Insert-Member of the Muskovitz-Sajic-Helmet meets limitation [12C] for the same reasons discussed in § VII.A.2.a.iv above. Limitation [12C] is also met as an alternate basis with the recess as the claimed “cavity” for the reasons discussed in § VII.A.2.a.x.

v. [12C1] “such that the shock absorbing insert is visible through and spans across at least a portion of each of the first and second vents”

226. As discussed in § VII.A.2.a.ii, the two active vent ports of the Muskovitz-Sajic-Helmet meet the claimed “*first and second vents*” that the EAT-Insert-Member “*is visible through and spans across*” as discussed in § VII.A.2.a.v. Therefore, the EAT-Insert-Member meets limitation [12C1] for at least the same reasons it meets limitation [1C1].

vi. [12C2] “wherein the shock absorbing insert comprises an array of hollow structures defining a plurality of adjacent through-passages extending through a thickness of the shock absorbing insert”

227. Sajic discloses that a tube is a “hollow structure” ([0015]) that have “open ends” ([0122]). § VII.A.1.a.i. A POSA understood that hollow tubes having

open ends form “*through-passages*” that extends through the length of the tubes. The length of the tubes form the “*thickness*” of the EAT-material. § VII.A.2.e *supra*. Sajic discloses that the EAT-material is arranged in a “close packed array” ([0098]) with each tube preferably adjacent to six other tubes ([0103]). Any two tubes in this arrangement form “*a plurality of adjacent through-passages.*” Thus, the EAT-Insert-Member’s array of energy absorbing tubes meets limitation [12C2]. §§ VII.A.2.a.vii, VII.A.2.b *supra*.

- vii. [12C3] “wherein a first portion of the shock absorbing insert that includes a first group of the plurality of adjacent through-passages overlaps with the first opening to allow air to enter through the first opening and pass through the first group of adjacent through-passages to an interior of the helmet wherein a second portion of the shock absorbing insert that includes a second group of the plurality of adjacent through-passages overlaps with the second opening to allow air to enter through the second opening and pass through the second group of adjacent through-passages to the interior of the helmet”

228. As discussed in §§ VII.A.2.a.v and VII.A.2.g, the EAT-Insert-Member spans across both active vents. A POSA would have understood the EAT-Insert-Member in the region overlapping the first active vent (*i.e.*, “*a first portion*”) would include “*a first group of the plurality of adjacent through-passages* [that] *overlaps with the first opening*” and in the region overlapping the second active vent (*i.e.*, “*a second portion*”) would include “*a second portion of the shock*

absorbing insert that includes a second group of the plurality of adjacent through-passages [that] overlaps with the second opening,” for any group of two or more adjacent tubes manufactured at any number of dimensions disclosed in Sajic at least for the same reasons discussed in § VII.A.2.a.viii above.

229. Similarly, a POSA would have understood that the tubes of the EAT-Insert-Member would “*allow air to enter through*” the respective openings and “*pass through*” respective adjacent through-passages “*to the interior of the helmet*” for the same reasons discussed in § VII.A.2.a.ix above.

**h. The Muskovitz-Sajic-Helmet Renders Obvious Claim
13**

230. Claim 13 recites the following: “The helmet of claim 12, wherein the cavity is configured such that a distance along a first curved side of the shock absorbing insert is greater than a distance along a second curved side of the shock absorbing insert opposite the first curved side [w]hen the shock absorbing insert is positioned in the cavity, the first curved side being closer to the shell than the second curved side.”

231. Claim 13 is met by the EAT-Insert-Member of the Muskovitz-Sajic-Helmet because both the insert-space of the recess and the EAT-Insert-member sized to fit in the insert-space of the recess are arcuate in shape. Therefore, the side of the EAT-Insert-Member closer to the outer shell is greater than the interior side as a matter of geometry, as illustrated in annotated FIG. 10 below.

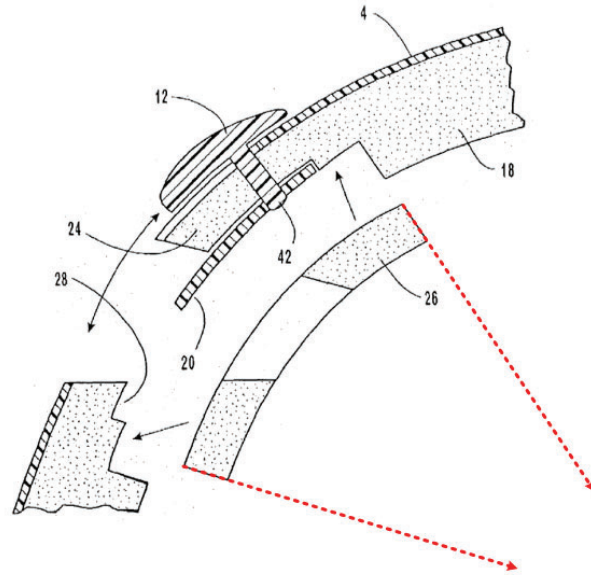


FIG. 10

232. As shown by the red-dashed arrow annotations in FIG. 10 of Muskovitz above, arc-lengths between the two arrows decrease in the direction away from the outer shell such that the arc-length of the side of the EAT-Insert-Member closer to the shell (*i.e.*, the side that “forms the lower boundary of vent space 28,” Muskovitz, [0087]) is greater than the side away from the shell when positioned in the corresponding arcuately-shaped insert-space. Muskovitz, [0087]-[0088].

i. The Muskovitz-Sajic-Helmet Renders Obvious Claim 15

233. Claim 15 recites the following: “The helmet of claim 12, wherein the array of hollow structures comprises an array of tubes oriented along the thickness of the shock absorbing insert.”

234. Claim 15 depends from claim 12 and is met by the Muskovitz-Sajic-Helmet for the same reasons discussed in § VII.A.2.e (claim 5) because the tubes of the EAT-Insert-Member are “*oriented along a thickness of the shock absorbing insert,*” as recited in claim 15.

j. The Muskovitz-Sajic-Helmet Renders Obvious Claim 16

235. Claim 16 recites the following: “The helmet of claim 15, wherein the tubes are cylindrical or circular conical in shape.”

236. Claim 16 depends from claim 15 and is met for the same reasons discussed in § VII.A.2.d (claim 4) because the tubes of the EAT-Insert-Member are “*cylindrical in shape.*” See e.g., Sajic, [0016] (“the tube has a *cylindrical* or conical structure, most preferably a *circular cylindrical* or circular conical structure.”); [0098] (describing Fig. 2 as a “cylindrical arrangement”), etc.

k. The Muskovitz-Sajic-Helmet Renders Obvious Claim 17

237. Claim 17 recites the following: “The helmet of claim 12, wherein the thickness of the shock absorbing insert is equal to or less than a thickness of the shock absorbing liner.”

238. Claim 17 is met because the “*thickness*” of the EAT-Insert-Member (sized like insert member 26) is substantially the same thickness of the insert-space of the recess formed in the inner-liner into which it fits. This insert-space is less

than the thickness of the inner-liner 18, as shown with purple and red arrows, respectively, in annotated FIG. 10 below.

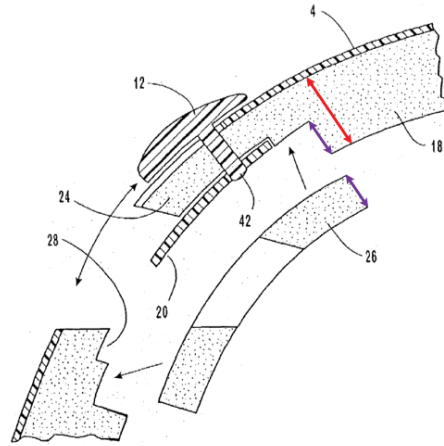


FIG. 10

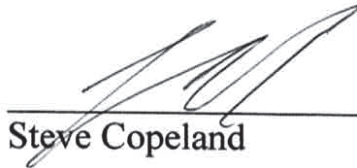
I. Conclusions

239. For the reasons discussed in §§ VII.A.2.a-VII.A.2.k, it is my opinion that the Muskovitz-Sajic-Helmet renders obvious each of claims 1-5, 7, 12-13 and 15-17 and these claims are therefore unpatentable.

240. I declare that all statements made herein of my own knowledge are true, that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

241. I declare under penalty of perjury that the foregoing is true and correct.

Dated: DECEMBER 21/21



Steve Copeland