UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TAYLOR MADE GOLF COMPANY, INC.
Petitioner

v.

PARSONS XTREME GOLF, LLC
Patent Owner

DECLARATION OF GEORGE THOMAS MASE, PH.D. IN SUPPORT OF PETITION FOR INTER PARTES REVIEW OF U.S. PATENT 9,878,220

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Taylor Made (TMG) Exhibit #	***Description***
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1021	UK Patent Application Publication No. GB 2 249 031 A to Lahaix *et al.* ("Lahaix")
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I. Introduction

I, Dr. George Thomas Mase, declare as follows:

1. I have been retained on behalf of Taylor Made Golf Company, Inc. ("Taylor Made") for the above-captioned *inter partes* review proceeding to provide my expert opinions and expert knowledge. I understand that this proceeding involves U.S. Patent No. 9,878,220 ("the '220 patent") titled "Golf Club Heads and Methods to Manufacture Golf Club Heads" by Robert R. Parsons, Michael R. Nicolette, and Bradley D. Schweigert, and that the '220 patent is currently assigned to Parsons Xtreme Golf, LLC ("PXG").

2. In preparing this declaration, I have reviewed and am familiar with all the references cited herein. I have reviewed and am familiar with the '220 patent and its file history. I confirm that to the best of my knowledge the accompanying exhibits are true and accurate copies of what they purport to be, and that an expert in the field would reasonably rely on them to formulate opinions such as those set forth in this declaration.

3. The '220 patent describes golf club heads, and more specifically, iron-type club heads having additional weights and an interior cavity filled with a filler material. I am familiar with the technology described in the '220 patent as of its September 12, 2016 filing date and the state of the art as of its earliest possible priority date, February 19, 2015.

4. I have been asked to provide my independent technical review, analysis, insights, and opinions regarding the ’220 patent and the references that form the basis for the grounds of rejection set forth in the Petition for *Inter Partes* Review of the ’220 patent.

5. I am being compensated at my rate of $350 per hour for my work on this case. My compensation is not dependent upon my opinions or testimony or the outcome of this case.

II. Qualifications

6. As indicated in my *curriculum vitae* (“CV”), included as Exhibit TMG1027, I am currently a professor in the Department of Mechanical Engineering and Faculty Athletic Representative at California Polytechnic State University. My CV includes additional information about my professional history and contains further details on my experience, publications, patents, and other qualifications to render an expert opinion. I will highlight experiences relevant to the technology of the patent at issue below.

7. I earned a Bachelor of Science in Mechanical Engineering from Michigan State University in 1980 and a Master of Science in Mechanical Engineering from the University of California, Berkeley, in 1982. I earned a Ph.D. in Mechanical Engineering from the University of California, Berkeley in 1985.

8. I have worked in the golf industry for several golf club manufacturers. From 1993 to 1994, I was an Advanced Product Engineer at Callaway Golf Company. From 1999 to 2000, I was the Director of Product Simulation and Analysis for Cobra Golf Company. And from 2003 to 2009, I consulted with Hot Stix Golf, and served as the Executive Vice President of R&D and Innovation in 2006. My job responsibilities while being employed in the golf industry included golf club design.

9. I have also been hired by numerous golf club and equipment manufactures to provide consulting services. Specifically, I have provided consulting services directed to general golf technology, finite element analysis of golf products, and golf club head impact simulations. Some of the companies I have consulted for are Nike Golf, Callaway Golf, Cobra PUMA Golf, and Cleveland Golf. The complete list of companies that have hired me may be found in my CV.

10. In addition to my employment and consulting experiences in the golf industry, I am a named inventor on six U.S. patents and two Japanese Patents directed to golf clubs. U.S. Patent Nos. 6,679,784 and 6,530,846 are directed to the design of a set of iron-type golf clubs with a fixed loft angle. U.S. Patent Nos. 6,582,322 and 6,454,664 are directed to the design of the striking face of a driver-type golf club.

11. I have also published numerous articles and given many presentations on golf club and ball technology. In addition to academic publications on golf club and ball technology, I was a columnist for Golf Magazine from 2007 to 2009, where I wrote a column that discussed golf club and ball design and technology. I have delivered presentations discussing golf club design to the PGA and USGA, and have been a Keynote Guest Speaker at the Annual Clubmakers Conference.

12. I have been active in academia since 1987, when I was an assistant professor in the Department of Mechanical Engineering at the University of Wyoming. I have been an assistant professor, associate professor, or professor at the University of Wyoming, Kettering University, Michigan State University, and California Polytechnic State University. I served as the Associate Chair of the Department of Mechanical Engineering at California Polytechnic State University from 2014 to 2017. As a professor, I have advised numerous graduate theses on golf club design and engineering. I have also co-written several editions of a textbook on continuum mechanics, which is a branch of mechanics that focuses on the motion of bodies and the mechanical behavior of materials and is therefore a discipline that is highly relevant to golf club design. As Faculty Athletic Representative, I report to the Provost and am tasked with oversight of the athletic department for academic integrity, institutional control, and student welfare.

III. My Understanding of Legal Principles

13. I understand that my analysis requires an understanding of the scope of the ’220 patent claims and that the disclosures of the ’220 patent and the prior art are judged from the perspective of a person of ordinary skill in the art at the time of the purported invention. For the purposes of this declaration, I have been instructed to consider the time of the purported invention of the ’220 patent to be February 19, 2015, the earliest possible priority date for the ’220 patent. I note, however, that my opinions would not change even if all the relevant disclosures were judged from a later time period.

14. I understand that during an *inter partes* review, claims of an unexpired patent are to be given their broadest reasonable construction in light of the specification as would be understood by a person of ordinary skill in the relevant art. While I find some of the claim terms and the associated discussion in the ’220 patent specification to be unnecessarily confusing and lacking in clarity, for the purposes of this declaration, I have been asked to make a good faith effort to provide constructions for several claim terms.

15. I understand that a claim is invalid if it is anticipated or obvious. I understand that anticipation of a claim requires that every element of a claim is expressly or inherently disclosed in a single prior art reference. I understand that an anticipating reference need not use the exact terms of the claims, but it must

describe the patented subject matter with sufficient clarity and detail to establish that the claimed subject matter existed in the prior art and that such existence would be recognized by persons of ordinary skill in the field of the purported invention. I also understand that an anticipating reference must enable one of ordinary skill in the art to reduce the purported invention to practice without undue experimentation.

16. I understand that a patent claim is invalid if the claimed invention would have been obvious to a person of ordinary skill in the art at the time of the purported invention. This means that even if all of the requirements of the claim cannot be found in a single prior art reference that would anticipate the claim, the claim can still be invalid.

17. I understand that an obviousness analysis involves comparing a claim to the prior art to determine whether the claimed invention would have been obvious to a person of ordinary skill in the art at the time of the purported invention in view of the prior art and in light of the general knowledge in the art as a whole. I also understand that obviousness is ultimately a legal conclusion based on underlying facts of four general types, all of which must be considered: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) any objective indicia of nonobviousness.

18. I also understand that obviousness may be established by combining or modifying the teachings of the prior art. Specific teachings, suggestions, or motivations to combine any first prior art reference with a second prior art reference can be explicit or implicit, but must have existed before the date of purported invention. I understand that prior art references themselves may be one source of a specific teaching or suggestion to combine features of the prior art, but that such suggestions or motivations to combine art may come from the knowledge of a person of ordinary skill in the art. Specifically, a rationale to combine the teachings of references may include logic or common sense available to a person of ordinary skill in the art.

19. I understand that a reference may be relied upon for all that it teaches, including uses beyond its primary purpose. I understand that though a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, the mere disclosure of alternative designs does not teach away.

20. I further understand that whether there is a reasonable expectation of success from combining references in a particular way is also relevant to the analysis. I understand there may be a number of rationales that may support a conclusion of obviousness, including:

- Combining prior art elements according to known methods to yield predictable results;
- Substitution of one known element for another to obtain predictable results;
- Use of a known technique to improve similar devices (methods, or products) in the same way;
- Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
- "Obvious to try"–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 are predictable to one of ordinary skill in the art; and
- 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 teachings to arrive at the claimed invention.

21. I understand that it is not proper to use hindsight to combine references or elements of references to reconstruct the invention using the claims as a guide. My analysis of the prior art is made from the perspective of a person of ordinary skill in the art at the time of the purported invention.

22. I understand that so-called objective indicia may be relevant to the determination of whether a claim is obvious should the Patent Owner allege such evidence. Such objective indicia can include evidence of commercial success caused by an invention, evidence of a long-felt need that was solved by an invention, evidence that others copied an invention, or evidence that an invention achieved a surprising result. I understand that such evidence must have a nexus, or causal relationship to the elements of a claim, in order to be relevant to the obviousness or non-obviousness of the claim.

23. I understand that for a reference to be used to show that a claim is obvious, the reference must be analogous art to the claimed invention. I understand that a reference is analogous to the claimed invention if the reference is from the same field of endeavor as the claimed invention, even if it addresses a different problem, or if the reference is reasonably pertinent to the problem faced by the inventor, even if it is not in the same field of endeavor as the claimed invention. I understand that a reference is reasonably pertinent based on the problem faced by the inventor as reflected in the specification, either explicitly or implicitly.

IV. Level of Ordinary Skill in the Art

24. Based on the disclosure of the ’220 patent, it is my opinion that a person having ordinary skill in the art (“POSA”) at the relevant time would have had (1) at least a bachelor’s degree in mechanical engineering, materials science

engineering, physics, or equivalent coursework, and (2) at least one year of experience researching or developing golf club heads, and/or methods of their manufacture.

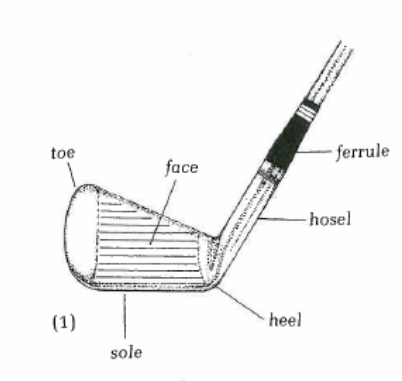
V. State of the Art

25. The state of the art in golf club head design, and more specifically iron club head design before and leading up to the time of the ’220 patent was both expansive and deep. By that, I mean that there were innumerable products, articles, and patents related to club head technology (expansive) and that information about these technologies was well-detailed (deep). Thus, while I often provide citations to one, two, or more references, these are exemplary. Indeed, a POSA would have known that in most instances, myriad other references could also be noted for the same point, concept, or feature related to club head technology.

A. Parts of a Golf Club Head

26. A POSA would have known that there are some basic parts to every golf club head. For example, an iron-type club head includes: a (strike) face, a hosel, a heel, a toe, a top line, and a sole. A POSA would have understood these terms as generally provided below. (“Golfing Terms Dictionary”, TMG1013, 0004-0006; “Wahl”, TMG1004, Fig. 1A; “Maltby, *CDFA*”, TMG1015, 817, 818, 821.):

- "(strike) face": the outlined or defined hitting surface of a wood or iron club (*see, e.g.*, TMG1015, 817);
- "heel": the lower back area of the hosel where the sole meets it (*see, e.g., id.*, 818);
- "hosel": portion of wood or iron head that receives the shaft (*see, e.g., id.*);
- "sole": the bottom of a wood or iron head that would normally touch the ground (*see, e.g., id.*, 821);
- "toe": the point farthest outward of the club head on a wood or iron (*see, e.g., id.*); and
- "top line": the top of an iron head where the face and the back meet (*see, e.g., id.*).
- "back portion": the exterior surface of the club head that is opposite the front surface of the face.



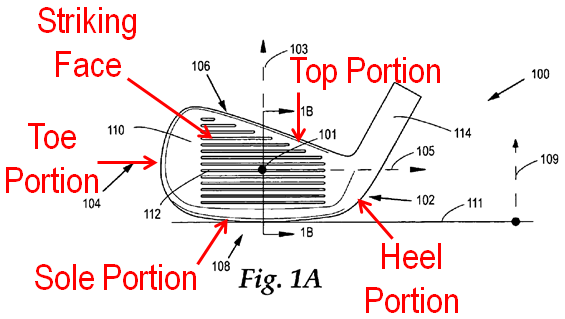


Fig. 1A

(TMG1013, 0005, Fig. 1; TMG1004, Fig. 1A (Annotated).)

27. An analogy well-suited for these terms is with respect to a person's foot, which undoubtedly inspired the names of many of these parts of a golf club head. For example, the toes are the flared extremity farthest from the person's leg and the heel is a narrower extremity closest to the person's leg. There is a substantial area of the foot that is between the toes and the heel. The sole is commonly understood to be the bottom surface of the person's foot. Thus, just as with a foot, these terms provide areas of reference for a club head.

B. Club Head Design Principles: Center of Gravity and Moment of Inertia

28. Two of the most well-known principles in club head design for many decades are 1) center of gravity ("CG") and 2) moment of inertia ("MOI").

29. First, the CG of a golf club head (also referred to as its "center of mass") is an equilibrium point at which the entire weight of golf club head may be considered as concentrated so that, if supported at that point, the club head would remain in static equilibrium in any position. ("Tavares", TMG1016, 9:13-19; TMG1015, 506.) Designing a club head to position the CG in a certain location is one way to affect ball flight and improve accuracy, for example, by helping square the face of the club head at impact with the ball. (TMG1016, 1:20-24; TMG1015, 506.) When the CG is positioned behind the point of contact between the ball and striking face, the ball generally follows a straight route. (TMG1016, 1:28-30; TMG1015, 506.) However, when the point of contact is to the side of the CG, the

ball may travel in an unintended direction, and have a ball flight that is commonly referred to, for example, as a "pull," "push," "draw," "fade," "hook," or "slice," depending on where the point of contact is relative to the CG. (TMG1016, 1:30-34.)

30. Similarly, when the point of contact with the ball is above or below the CG, the ball flight may have a higher or lower trajectory, respectively. (TMG1016, 1:35-37; TMG1015, 506) Because many golfers, and in particular less-skilled golfers, often have difficulty getting the ball airborne, one common club head design technique is to move the CG lower by moving or adding mass near the sole of the club head. (TMG1016, 9:30-32; TMG1015, 506.) This lower CG tends to increase the loft on the player's shots, getting the shot airborne, and generally resulting in better, longer shots. (TMG1016, 9:32-44; "Gilbert", TMG1017, 1:36-39.)

31. Second, the well-known concept of MOI relates to a club head's resistance to rotation caused by off-center hits–a club head with a higher MOI is more resistant to the rotation caused by such off-center hits, thereby allowing off-center hits to travel further and closer to the intended path. (TMG1017, 1:23-25, 8:24-43; TMG1015, 819.) A well-known design technique for increasing MOI is to increase the perimeter weighting of the club head, thereby increasing the "sweet

spot" and generally improving a player's shots. (TMG1017, 1:19-23; "Soracco", TMG1018, 2:43-46.)

C. Types of Irons

32. A POSA would have known that irons are generally classified into three categories: 1) blades and muscle backs, 2) conventional cavity backs, and 3) multi-material cavity backs. (TMG1018, 2:24-26.) While there are some different design concerns between these types of irons, a POSA would have known how to incorporate features from one type of club head into another using routine skill.

33. Blades are the most "traditional" type of irons and have a substantially uniform appearance from the sole to the top line along the back of the club, often with some tapering from sole to top line. (*Id.*, 2:26-29.) Muscle backs are also substantially uniform along the back of the club, but have additional material on the back of the club, often in the form of a rib, that can be used to lower the club head CG. (*Id.*, 2:29-32.) As I discussed above, this is because a club head with a lower CG facilitates getting the golf ball airborne. (*See supra*, Section V.B, ¶30; TMG1018, 2:32-34.) The design of blades and muscle backs results in a smaller "sweet spot" (*i.e.*, the area of the club face that generally results in a desirable golf shot upon striking a golf ball)–in comparison to the cavity back style clubs discussed below–and so are more often used by skilled golfers. (TMG1018, 2:34-38.) These designs also, however, allow skilled golfers to work the ball flight and

"shape" the golf shot as desired, and also provide more "feedback" to the golfer when a shot is hit off-center. (*Id.*, 2:38-40.)

34. The Ping K1 irons, released in the late 1960s, followed thereafter in the 1970's by the iconic Ping Eye irons, are widely credited as the first "perimeter weighting" / "cavity back" style clubs. In comparison to blades and muscle backs, conventional "cavity back" irons move some of the club mass from the center of the club to the perimeter of the club by providing a hollow or cavity in the back of the club, opposite the striking face. (*Id.*, 2:41-43.) This mass redistribution is known as "perimeter weighting" in the art, and it has the effect of increasing the MOI of the club head, making it more resistant to twisting and thus producing a more forgiving club with a larger sweet spot. (*Id.*, 2:43-46; TMG1017, 1:19-23.) The movement of mass from the center of the club also allows the size of the club face to be increased, which further enlarges the sweet spot. (TMG1018, 2:46-49.) Thus, cavity back irons tend to be easier to hit than blades and muscle backs, and are therefore often used by less-skilled golfers. (*Id.*, 2:49-51.)

35. Modern iterations of the conventional cavity back often include multiple types of materials in an effort to make cavity back irons even more forgiving and easier to hit. (*Id.*, 2:52-54.) For example, some designs replace certain areas of the club head, such as the striking face or sole, with a second material that can be either heavier or lighter than a first material used to construct

the rest of the body of the club head. (*Id.*, 2:54-57.) Some designs also include features such as cutout or secondary cavities. (*Id.*, 2:57-58.) As discussed more below, by incorporating materials of different densities or removing additional areas of material from the club head body, mass can be freed up for reallocation to increase the overall size of the club head, expand the sweet spot, enhance the MOI, and/or optimize the club head CG location. (*Id.*, 2:58-63.)

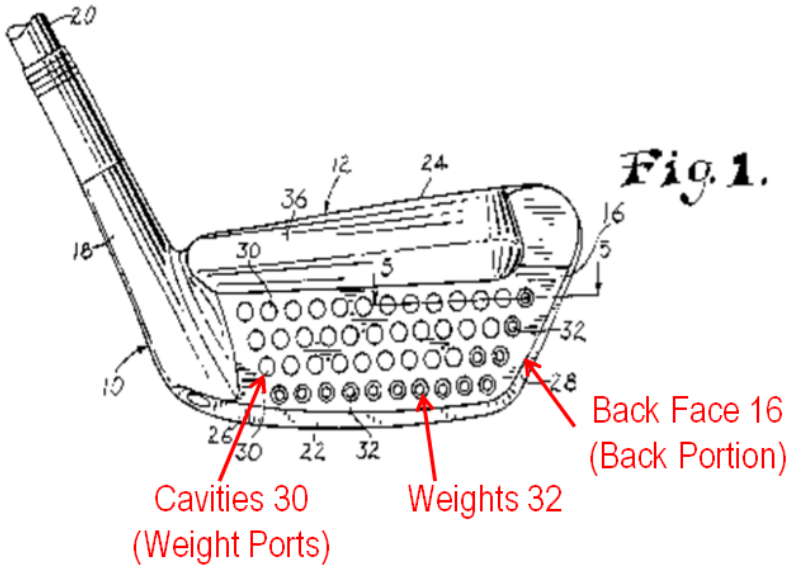
D. Adjustable Weighting / Multiple Materials

36. Many improvements and modifications to cavity back clubs occurred in the decades following their entrance into the market. These include the application of adjustable weighting systems and the use of multiple materials to affect the CG and MOI of the club head. Two examples are provided below, although countless other configurations were designed to achieve the goal of shifting the CG and increasing the MOI.

37. Traditional cavity back irons improved clubs, at least for certain players, by removing weight from the center of the club head and distributing weight lower on the club head–to lower the CG to increase trajectory–and by increasing MOI by perimeter weight–to enlarge the "sweet spot." ("Sanders", TMG1019, 1:16-23.) But the physical characteristics of these traditional cavity back clubs could not be varied once the club was cast or forged. (*Id.*, 1:24-27.) Thus, it was not readily possible to further adjust the club head mass for a

particular individual's swing characteristics–which may vary over time, or according to the conditions of play–for example, to reduce ball trajectory in windy or wet conditions, where that may be advantageous. (*Id.*, 1:27-2:3, 3:2-5.)

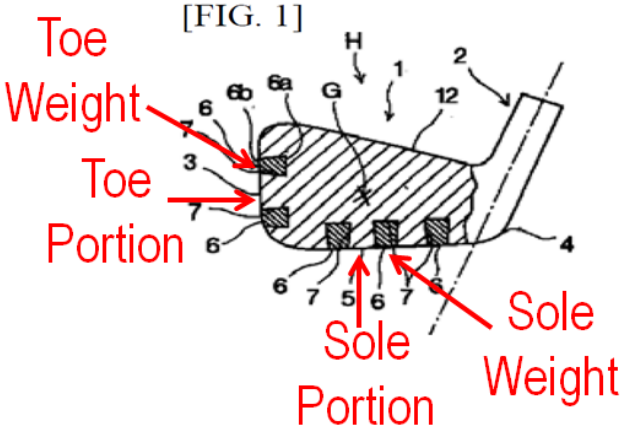
38. Thus, adjustable clubs were developed, for example, with "weight ports or holes placed within the club head and systems for varying the placement of weight within those weight ports." (*Id.*, 2:7-10.) Some clubs used weights of varying densities and/or size that could be inserted, removed, or rearranged. (*Id.*, 2:14-23.) Indeed, as shown below, some designs included many weight ports or cavities in the back of the club head that could be filled with weight pins to customize and optimize the weight distribution for a particularly player. (*Id.*, 4:1-5:19, 8:16-21, 9:5-18, 10:8-12, 10:25-28, 11:28-12:2.)



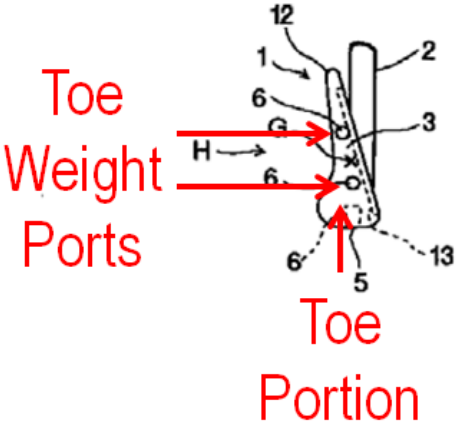
(TMG1019, Fig. 1 (Annotated).)

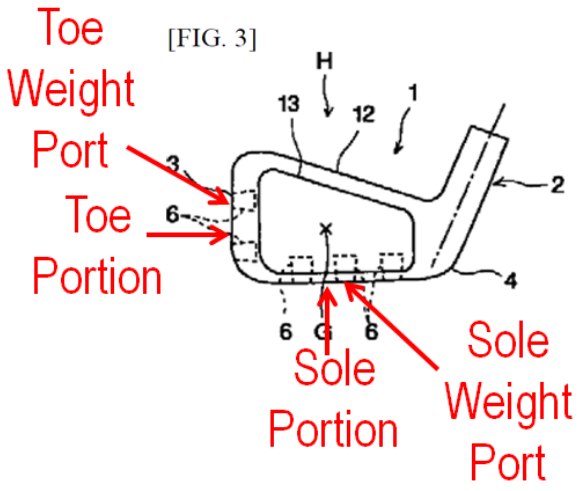
39. A similar approach to increasing the adjustability of CG and MOI was to vary the number and positions of weights having a high specific gravity. ("Kono", TMG1020, ¶¶0002-0003, 0037, 0053.) For example, if the club head body was made primarily from stainless steel, a common club head material, the weights would be made from a material of higher specific gravity, such as tungsten or lead. (*Id.*, ¶¶0016, 0024.) These high specific gravity weights could be, for example, embedded into the toe portion or sole portion of the club, thus lowering the CG and increasing the MOI. (*Id.*, ¶¶0018, 0026, 0046-0047, Figs. 1-3.)

[FIG. 1]



[FIG. 2]

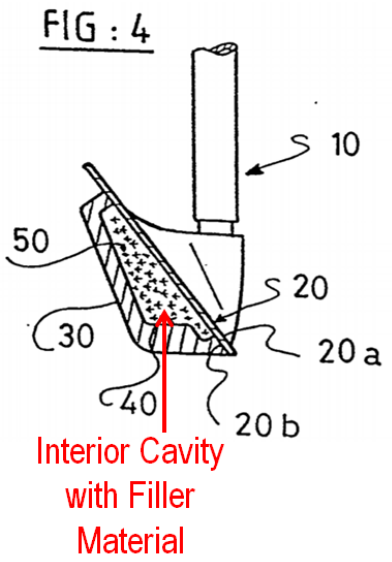




(TMG1020, Figs. 1-3 (Annotated))

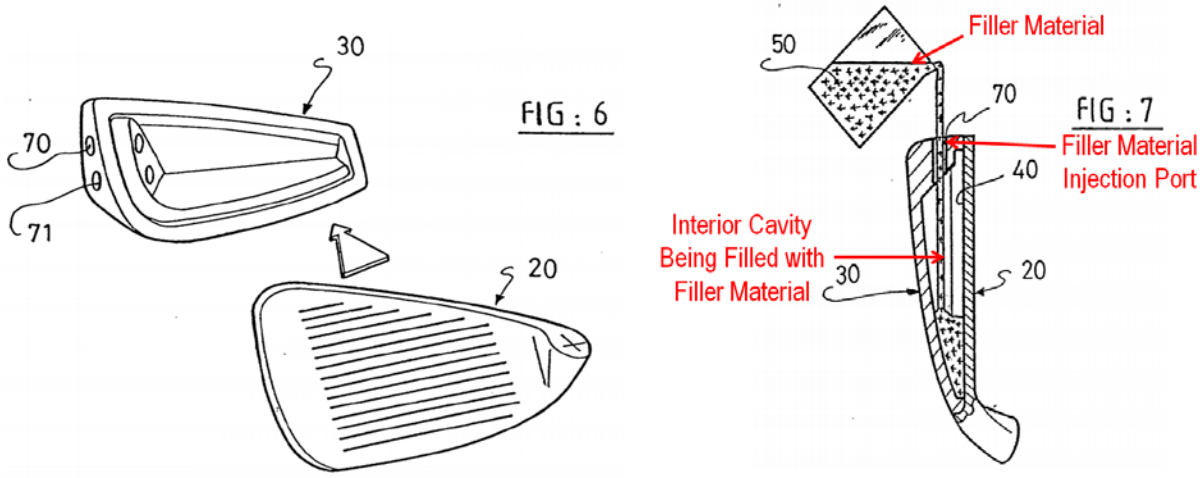
E. Hollow / Filled Club Heads – Thinner Face

40. Another technical modification to increase perimeter weighting was to create a hollow cavity in the interior of the club head (*e.g.*, by forming the body and strike plate separately and welding the strike plate to the body) and thus be able to redistribute the mass around the periphery of the club head. ("Lahaix", TMG1021, p. 1, ¶2, p. 2, ¶2, p. 3, ¶2; TMG1015, 506, 817-819, 821; "Mimeur", TMG1022, 1:39-43.) In order to reduce the "hollow" sound produced by these club heads, the internal cavity could be filled with a material, for example, foam. (TMG1021, p. 1, ¶2, p. 2, ¶2, Figs. 4-5; TMG1022, 1:44-46, 2:5-15.)



(TMG1021, Fig. 4 (Annotated).)

41. This had the additional benefit of supporting the striking face and thus being able to make the striking plate thinner, saving additional mass that could be redistributed around the periphery of the club head. (*Id.*, p. 2, ¶¶1-2, p. 6, ¶2, p. 7, ¶4.) Examples of filler materials included thermoplastics and elastomers such as elastomeric polyurethanes, vulcanized thermoplastic rubbers, silicones, and polyamides. (*Id.*, p. 5, ¶5, p. 5, ¶5.) The filler material(s) could be injected into the cavity through an orifice in the club head, for example, through the toe portion. (*Id.*, p. 5, ¶5, p. 7, ¶3, Figs. 6-7.)



(TMG1021, Figs. 6-7 (Annotated).)

VI. The ’220 Patent

A. Overview of the ’220 Patent

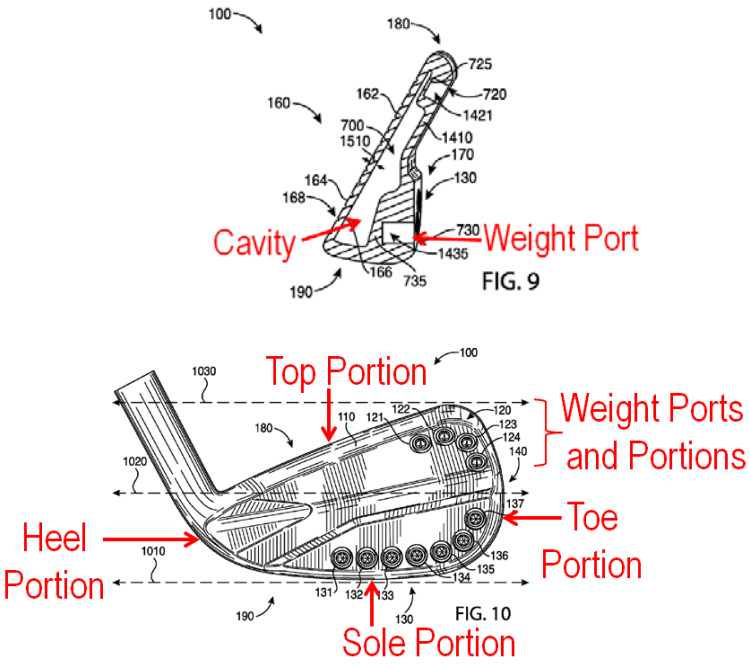
42. The ’220 patent is directed to golf club heads, and in particular iron-type golf club heads. (“’220 Patent”, TMG1001, Abstract, 3:48-53.) The Background section states that “[b]y using multiple materials to manufacture golf club heads, the position of the center of gravity (CG) and/or the moment of inertia (MOI) of the golf club heads may be *optimized* to produce certain trajectory and spin rate of a golf ball.” (*Id.*, 1:43-47 (emphasis added).) Indeed, in my opinion, the ’220 patent simply describes ways to optimize the CG and MOI in a golf club head that were known, implemented, and disclosed long before the ’220 patent. (*Id.*, 6:48-51, 9:57-62.)

43. The ’220 patent does not indicate that any of the features described in the specification are critical to the alleged inventions. In fact, after describing, by

my count, fifty-three features that could be included in the disclosed club heads, the ’220 patent states that the apparatus, methods, and articles of manufacture “are not limited in this regard.” (TMG1001, *passim*.) Indeed, all of these features were known in the prior art and could be included in a club head, or not. The most that the ’220 patent states about how its club heads are differentiated from the prior art is that:

> *Different from other golf club head designs*, the *interior cavity 700* of the body portion 110 *and the location of the first and second sets of weight portions 120 and 130*, respectively, along the perimeter of the golf club head 100 may result in a golf ball traveling away from the face portion 162 at a relatively higher ball launch angle and a relatively lower spin rate. As a result, the golf ball may travel farther (i.e., greater total distance, which includes carry and roll distances).

(TMG1001, 13:27-35 (emphasis added).)



(TMG1001, Figs. 9, 10 (Annotated).)

44. But a POSA would have known that golf clubs having polymer-filled cavities and perimeter weights in exactly the locations described and claimed in the '220 patent were known in the prior art for decades. (*Compare* TMG1001, Abstract, 3:19-25, 6:57-66, 11:4-18, Figs. 9-10 *with* TMG1018, 2:41-46, 3:39-49; TMG1016, Abstract, 4:10-33; "Wahl '496", TMG1005, 4:53-64, 7:18-26, Fig. 5B; TMG1017, 1:19-22; TMG1022, 2:5-15, Fig. 8; "Takahashi", TMG1006, ¶0004, Fig. 3; "Oku", TMG1007, ¶[0028], Fig. 8; TMG1021, p. 2.) Interestingly, I noted that the '220 patent states that these "different" features are not even required to be part of the club head. For example, the '220 patent states that "the golf club head 100 *may not include* (i) the first set of weight portions 120, (ii) the second set of weight portions 130, or (iii) *both the first and second sets of weight*

portions 120 and 130." (TMG1001, 10:43-57 (emphasis added), 23:7-10.) If neither set of weight portions is included, then it certainly cannot be true that "the location of the first and second sets of weight portions 120 and 130" is "[d]ifferent from other golf club head designs…," since there would be no weights at all. (TMG1001, 13:27-35.)

B. Summary of the Prosecution History

45. From my review of the '220 patent's prosecution history, I noticed that the United States Patent and Trademark Office ("USPTO") issued the '220 after only one Office Action. (TMG1002, 133-155.) I found this surprising, because upon reading the claims, I did not think they were inventive, but rather recited well-known features from the prior art.

46. In the non-final Office Action, the Office objected to formalities, rejected all claims under twelve double-patenting grounds, and rejected all of the claims under 35 U.S.C. § 103. (*Id*.) The Office Action repeatedly noted that "[i]t is **WELL-KNOWN** in the golf club head art" to include many claimed features, including "peripheral weighting…to allocate mass to specific areas of the head in order to change the weight balance of the head and relocate the location of the center of gravity…" and "a thin face…[that] allows the face to deform to a greater extent and provide increased momentum to a golf ball during a shot." (*Id.*, 145, 147, 151, 153 (emphasis original). I was unsurprised by these statements by the

Office because, as discussed above, these features were well-known in the art. (*Supra* Sections V.A-V.E.)

47. In response, PXG amended claims 1-12, canceled claims 13-20, and added new claims 21-28. (TMG1002, 196-201.) PXG also filed several terminal disclaimers. (*Id.*, 187-192.) PXG argued that the cited references did not disclose the elements added to the amended claims, specifically "at least one weight portion located closer to the heel portion than the at least one port" and "wherein a portion of the at least one weight portion is closer to the face portion than a portion of the polymer material in the interior cavity." (*Id.*, 203.)

48. An Interview Summary indicated that "[t]he examiner noted that some of the claim language presented with the 08/28/2017 amendment lacks proper antecedent basis." (*Id.*, 232.) After the interview, an Examiner's Amendment added further description to three different paragraphs in the specification directed to the interior cavity and filler ("polymer") material width relationships in the amended claims. (*Id.*, 224-228.) There does not appear to be any textual support in the as-filed specification for some of the amended claim elements, particularly the cavity width relationships. I also note that based on the claims and the prosecution history, it appears that claims 14–20 should all have been amended to depend on claim 13. (*Id.*, 200-201, 229, 232, 249-251.) The Examiner did not provide any

substantive reasons for allowance beyond restating the amended claim language. (*Id.*, 229-231.)

C. Claim Construction

49. It is my understanding that the challenged claims must be given their broadest reasonable interpretation ("BRI") in light of the specification of the '220 patent. Below I discuss terms that are in need of construction.[1]

50. In the related district court litigation, PXG's positions are based on constructions for certain claim terms–some of which are noted herein for reference–that, in my opinion, exceed the BRI. ("Stites TRO Declaration", TMG1012, ¶¶40-61.) Here, I have provided constructions for certain terms that are narrower than PXG's litigation positions because it is appropriate to attempt to meet the BRI standard. Should PXG maintain those unreasonably broad positions here, my opinions would, of course, remain the same that the prior art discloses or suggests each of the limitations in the claims under those constructions. For the

[1] While I find some of the claim terms and the associated discussion in the '220 patent specification to be unnecessarily confusing and lacking in clarity, for the purposes of this declaration, I have been asked to make a good faith effort to provide constructions for several claim terms. I do not necessarily agree that the claims would have been clear or definite to a POSA.

construed terms, I have indicated the first claim or each independent claim in which the term is found.

1. "weight portion" (independent claims 1, 8, 13)

51. Independent claims 1, 8, and 13 and recite the term "weight portion." The '220 patent describes the purpose of the recited weight portions: "[b]y coupling the first and second sets of weight portions 120 and 130, respectively, to the body portion 110…the location of the center of gravity (CG) and the moment of inertia (MOI) of the golf club head 100 may be optimized." (TMG1001, 9:57-62.) A POSA would have known that these were traditional and common reasons for including weights in a club head. (*See, e.g.*, TMG1018, 2:43-46; TMG1016, 8:66-9:16; TMG1017, 1:36-44; TMG1022, 1:40-44; TMG1019, 1:16-23; TMG1015, 506.) In particular, the '220 patent describes that the weight portions "may be partially or entirely made of a *high-density material* such as a tungsten-based material or other suitable types of materials." (TMG1001, 3:39-42 (emphasis added); *see also id.*, 19:25-28.) Again, this was common in golf club design in order to lower the CG and increase the MOI. (*See, e.g.*, TMG1018, 2:43-46; TMG1016, 8:66-9:19; TMG1017, 1:36-44; TMG1022, 1:40-44; TMG1019, 1:16-23; TMG1015, 506.) As was well-known in the art, the '220 patent recognizes that lowering the CG can increase the launch angle for improved shots. (*Compare*

TMG1001, 9:57-62 *with* TMG1016, 9:32-44; TMG1017, 1:36-39; TMG1015, 506.)

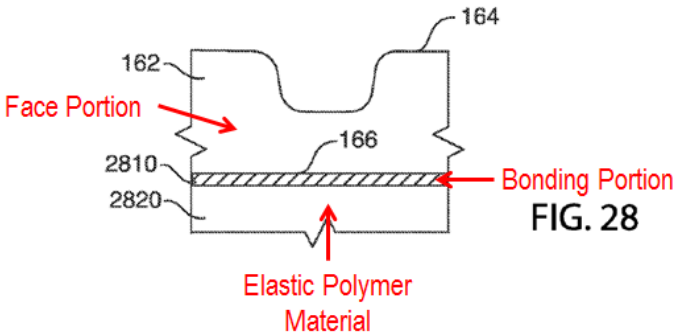
52. Accordingly, a POSA would have interpreted "weight portion" to mean "a discrete piece of material coupled to the club head for the purpose of optimizing the center of gravity and/or moment of inertia." Because every element of a golf club head has a mass, and thus affects the CG and MOI, even if only to the slightest degree, a POSA would have understood that the term "weight portion" has this functional requirement of being for the purpose of optimizing CG and MOI. Thus, not every element of a club head would have been considered a "weight portion." For example, in the Lahaix or Mimeur references discussed above in the State of the Art Section, the "plug" for the filling orifice would not be considered a "weight portion" because its purpose is for closing the filling orifice, not for optimizing the CG and MOI. (*See supra* Section V.E; TMG1021, p. 7, ¶4; TMG1022, 4:46-49.)

2. "bonding portion" (dependent claim 9)

53. A "bonding portion" is not a term of art that would have been known to a POSA. According to the '220 patent, "[t]he bonding portion 2810 may be applied to the back surface 166 to bond the elastic polymer material 2820 to the face portion 162 (*e.g.*, extending between the back surface 166 and the elastic polymer material 2820)." (TMG1001, 16:39-43.)

54. The ’220 patent gives several examples of bonding portions in the form of “bonding agents.” For example, the ’220 patent states that a bonding agent may “be low-viscosity, organic, solvent-based solutions/and or dispersions of polymers or other reactive chemicals.” (TMG1001, 16:32-37.) The ’220 patent lists several commercially available adhesive or epoxies such as “MEGUM™, ROBOND™, and/or THIXON™,” and LOC-TITE© brand epoxies and adhesives. (*Id*.) These brands of adhesives were well-known in golf club design.

55. A POSA would have understood that the bonding portion disclosed in the ’220 patent as a *discrete* agent. That is, the bonding portion *cannot* merely be a part of the face portion or the elastic polymer material. (*See* TMG1001, 16:39-43, “the bonding portion 2810 may be *applied to* the back surface 166 *to bond* the elastic polymer material 2820 to the face portion 162.” (Emphasis added).) Annotated Figure 28 from the ’220 patent supports this view. The figure shows bonding portion 2810 disposed between, and discrete from, face portion 162 and elastic polymer material 2820. (TMG1001, Fig. 28.)



(TMG1001, Fig. 28 (Annotated).)

56. Accordingly, it is my view that a POSA would have interpreted "bonding portion" to mean a "an adhesive agent, distinct from the elastic polymer material and from the body portion, that joins the elastic polymer material to the body portion." This construction is consistent with the language of the claims themselves, which claim the "bonding portion" as a separate claim element from a "face portion" and an "elastic polymer material," which are separately recited in other claims. The construction is also consistent with the '220 patent's specification and how a POSA would understand the term. (TMG1001, 16:25-47.)

3. "toe portion," "top portion," "sole portion," "back portion," and "heel portion" (independent claims 1, 8, 13)

57. The recited "top portion" (180), "toe portion" (140), "sole portion" (190), "back portion" (170), and "heel portion" (150) of the club head are not defined by the '220 patent. In the Figures, these "portions" are referenced by pointing to a general area of the club head, as shown below in Annotated Figures 1 and 2 of the '220 patent. In my opinion, a POSA would have interpreted these respective "portions" as the *surface* at the referenced part of the club head.

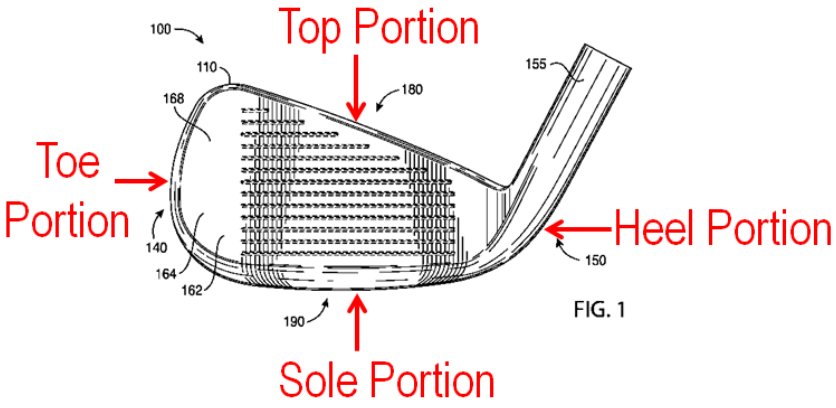


FIG. 1

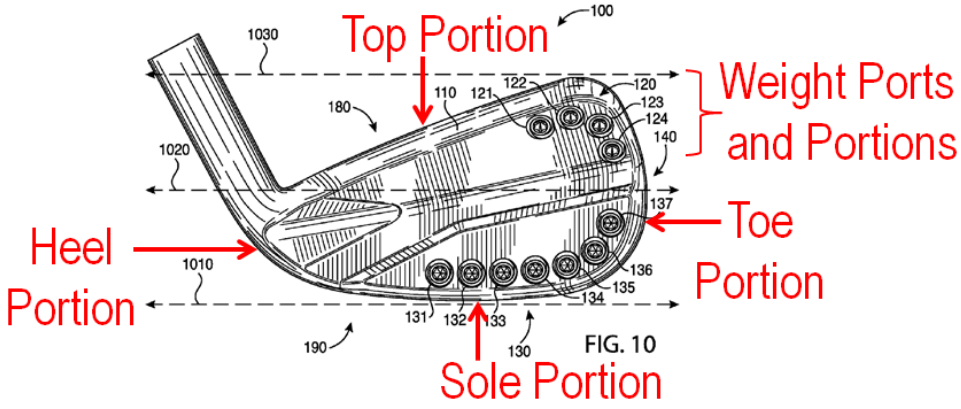


FIG. 10

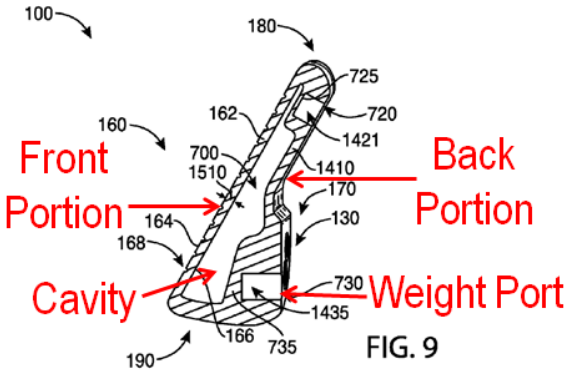


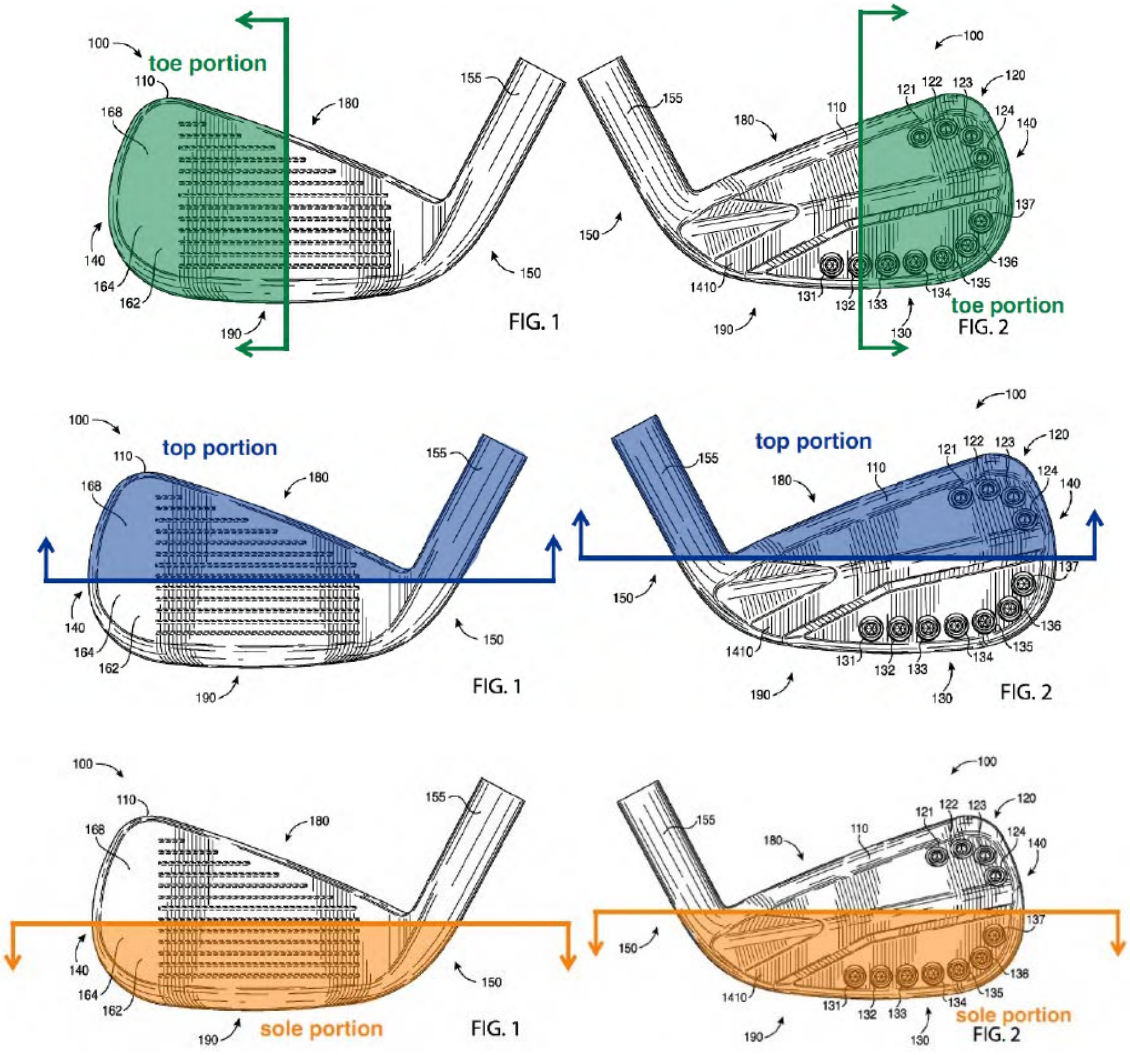
FIG. 9

(TMG1001, Figs. 1, 2, 9 (Annotated).)

58. The terms "toe," "sole," "heel," "back," and "top" (more commonly referred to as the "top line") are common terms for parts of a club head. For

example, as defined above in the State of the Art section, the "toe" of a golf club head is the *point* farthest from the shaft. (*See supra* Section V.A; TMG1015, 821.) Thus, a POSA would have understood the term "toe *portion*" to mean "the surface along the end of the club head." The "toe portion" thus includes the point that is the "toe" of the club. Similarly, the "sole" of a golf club head is the bottom of the club head. (*See supra* Section V.A; TMG1015, 821.) The "sole" (without the added word "portion") is generally considered to be the bottom surface of the club head that touches the ground when the club in in the address position. (*See supra* Section V.A; TMG1015, 821.) This is different from the "toe," which is a single point. However, in reading all of these "portions" terms together, a POSA would have understood that it would be consistent to use the term "sole portion" for uniformity with the other "portion" terms in the claims. Thus, a POSA would have understood the term "sole portion" to mean "the surface along the bottom of the club head." (*See supra* Section V.A; TMG1015, 821.) Likewise and for similar reasons, a POSA would have understood the term "top portion" to mean "the surface along the top of the club head" (also known as the top line), the term "heel portion" to mean "the surface along the nearest end of the club head," and the term "back portion" to mean "the exterior surface of the club head that is opposite the front surface of the face." (*See supra* Section V.A; TMG1015, 818, 821.)

59. In the related District Court litigation, PXG relies on interpretations of these terms that, in my opinion, are far too broad. PXG alleged that each "portion" is simply one half of the horizontally or vertically bisected club head. (TMG1012, ¶¶40-61.) Example annotated drawings from PXG's declarant, John T. Stites, are below:



(TMG1012, ¶¶49, 55, 61.)

60. In my opinion, nothing in the '220 patent specification supports PXG's overly broad interpretation of bisecting the club head. And this is not how a

POSA would have understood these terms. Thus, in my opinion, PXG's interpretation would exceed the broadest reasonable interpretation in light of the specification, which I understand is required for this proceeding.

61. Numerous examples in the '220 patent itself support my opinion that bisecting the club head exceeds the broadest reasonable interpretation. First, Figure 10 illustrates what could be considered a bisecting plane (horizontal midplane 1020) and it does not describe the top portion (180) or the sole portion (190) as being the upper and lower halves of the club head, respectively. If it were intended for the "top portion" and "sole portion" to be halves of the club, which would be contrary to conventional understanding, a POSA would have expected the associated description of Figure 10 to make that designation, but it does not. At the very minimum, for example, a POSA would have expected the reference numbers for the top portion (180) and the sole portion (190) to point to an interior area of the club head, rather than pointing to the customary top and bottom surfaces of the club head.

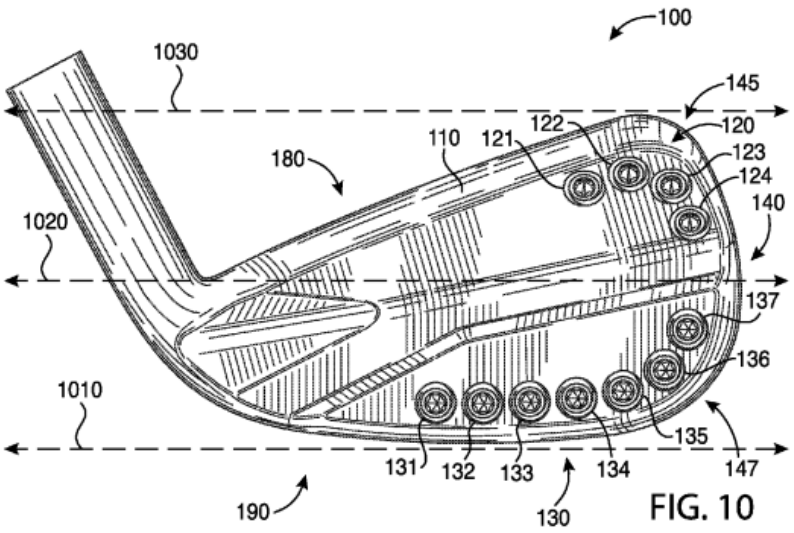


FIG. 10

(TMG1001, Fig. 10.)

62. Instead, the associated description provides that "the ground plane 1010 may be a tangential plane to the sole portion 190" and "top plane 1030 may be a tangential plane to the top portion of the [*sic*] 180…." (TMG1001, 6:34-47.) Because the '220 patent describes the ground plane and top plane as being *tangential* to the sole portion and top portion, it would have actually suggested to a POSA that these "portions" are surfaces of the club head and not an entire half. If they were halves, it would be very difficult to determine where the planes should be tangential to; however, as shown, they are tangential to the highest and lowest points of the top portion and sole portion, respectively, which would have been logical to a POSA.

63. Second, many other descriptions in the '220 patent contradict PXG's interpretation of the club head "portions" as halves. For example:

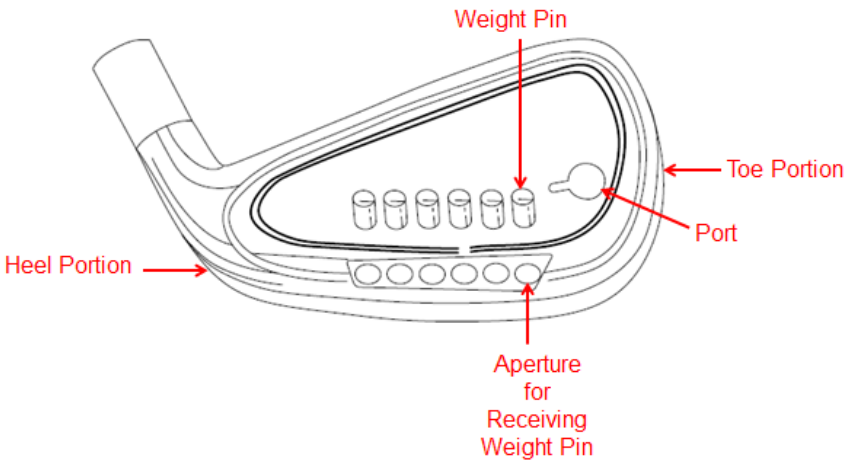
- "The toe portion 140 and the heel portion 150 may be *on opposite ends* of the body portion 110." (*Id.*, 3:60-61 (emphasis added).) A POSA would not have described halves of the club head as being *on opposite ends*. However, opposing surfaces, as the toe and heel portions are in my construction above, would be described in this manner.
- "The front surface 164 may include one or more grooves 168 *extending between* the toe portion 140 and the heel portion 150." (*Id.*, 4:1-3 (emphasis added).) A POSA would not have described grooves as *extending between* the toe and heel portions if they were halves of the club head. This describes that there is an intervening space that separates the toe and heel portions. ("Merriam-Webster", TMG1025, 74 ("in an intervening space or interval"); "The Chambers Dictionary", TMG1014, 147 ("in, to, through, or across the space that separates").) Thus, this description from the '220 patent makes sense if toe and heel portions are end surfaces of the club head–the grooves can be in an intervening space (*i.e.*, "extending between") the toe and heel portions, as is typical on the face of a club head.

- "…the face portion 162 may be relatively thicker *between* the top portion 180 and the sole portion 190 than *at or proximate to* the top portion 180 and the sole portion 190…" (TMG1001, 13:20-25 (emphasis added).) The '220 patent similarly describes that "the face portion 162 may vary in thickness *at and/or between* the top portion 180 and the sole portion 190." (*Id.*, 13:10-13 (emphasis added).) A POSA would have understood that differentiating locations as *between, at, or proximate to* the top portion and sole portion indicates that they are separated by a distance and not halves of the club head. This is also consistent with the definition of "between" discussed above.
- "In particular, … the first and second sets of weight portions 120 and 130, respectively, may lower the location of the CG *towards the sole portion* 190 and further back away from the face portion 162." (*Id.*, 9:62-66 (emphasis added).) Similarly, the '220 patent describes that "[t]he MOI may also be higher as measured about a horizontal axis extending through the CG (e.g., *extending towards the toe and heel portions* 150 and 160, respectively, of the golf club head 100)." (*Id.*, 10:2-5 (emphasis added).) Referring directionally "towards" the sole, toe, and heel portions would have

indicated to a POSA that there is some distance between these portions. Moreover, the CG is nearly always in the lower half of the club, so it would not make sense to move it "towards the sole portion" if the club "portions" were halves of the club head. Similarly, if the "portions" were halves, it would not make sense to have a horizontal axis that extends "towards the toe and heel portions." But both of these passages make sense if the "portions" are interpreted as I have provided above.

- "Referring back to FIGS. 7-9, for example, the body portion 110 may be a hollow body including the interior *cavity 700 extending between the front portion 160 and the back portion 170*. Further, the interior *cavity 700 may extend between the top portion 180 and the sole portion 190*. The interior cavity 700 may be associated with a *cavity height* 750 (H_C), and the body portion 110 may be associated with a *body height* 850 (H_B). While the cavity height 750 and the body height 850 *may vary between the toe and heel portions 140 and 150*, the cavity height 750 may be at least 50% of a body height 850 (H_C>0.5*H_B)." (*Id.*, 10:51-61 (emphasis added).) The explanation above regarding "between" is equally applicable to this passage.

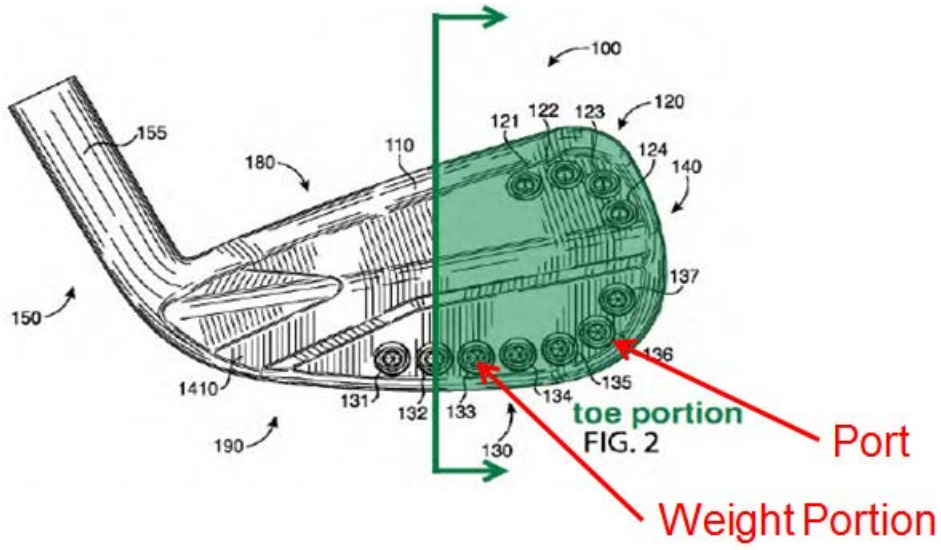
64. Third, and perhaps most importantly, the claim language is consistent with my interpretations and reinforces that PXG's proposal of interpreting the "portions" as halves is incorrect. For example, dependent claim 5 recites a weight portion located closer to the toe portion than the heel portion, and independent claim 1, upon which claim 5 depends, recites the port being located closer to the toe portion than the heel portion. This necessarily requires that both the weight portion and the port be located on the half of the club closer to the toe portion. This makes sense under my interpretation, where the heel and toe portions are surfaces. As shown below, for example, the weight portion can be located closer to the heel than the port, with both the weight portion and the port being located closer to the toe portion than the heel portion.



(TMG1004, Fig. 4 (Modified, Annotated).)

65. If the club "portions" were interpreted as halves of the club head, claim 5 would not make logical sense. Since both the port and the weight portion

must be located closer to the toe portion than the heel portion, they apparently would need to be located in the half of the club that is the "toe portion" because it would be difficult to say an element is closer to the toe portion than the heel portion if it was located inside the heel portion half of the club. However, once both the weight portion and the port are located in the toe portion, it is difficult to say that the port is located closer to the toe portion than the weight portion, as recited in claim 1. In my opinion, this illogical scenario further illustrates that dividing the club "portions" as "halves" exceeds the broadest reasonable interpretation of the claims.



(TMG1001, Fig. 2 (Annotated).)

VII. Overview of the Applied References

66. Each applied reference discloses a golf club head, and more specifically, an iron-type golf club head ("irons"). While the style and method of making the irons may be different (*e.g.*, forged or cast), a POSA would have easily been able to combine their teachings–such as filling cavities and adding perimeter weights–as these features were well-known, combined, and applied in the industry for decades. (*See supra* Section V (*e.g.*, TMG1022, 1:40-62 (discussing filled interior cavities); TMG1019, 1:16-23 (discussing perimeter weighting adjusting CG and MOI).) Thus, their combination requires only routine skill in the art.

A. Wahl

67. Wahl discloses "a hollow iron-type golf club head…including a heel portion [102], a sole portion [108], a toe portion [104], a top-line portion [106], a front portion [130], a rear [or back] portion [128], and a striking face [110]," as shown below in Annotated Figure 1A. (TMG1004, 1:40-42.) The hollow cavity (120) is filled with a filler material (121), for example, an expanding foam material, as illustrated in Annotated Figure 1B. (*Id.*, 1:61-64.) Other examples of filler material include viscoelastic elastomers, polyurethanes, thermoplastic rubbers, and foamed polymers. (*Id.*, 4:51-5:11.) These types of irons with filled cavities were well-known in the prior art. (*See supra* Section V.E (*e.g.*, TMG1022, 1:40-62).)

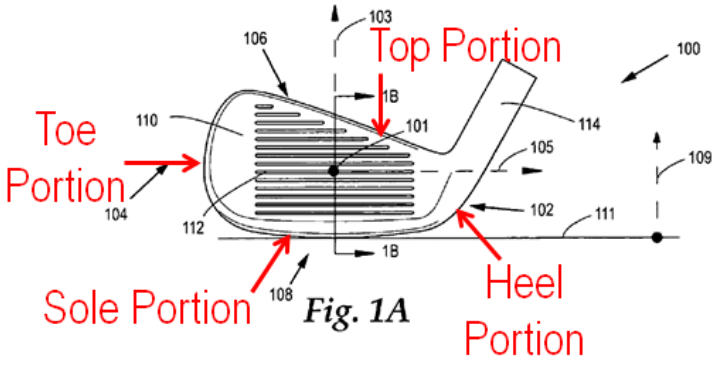


Fig. 1A

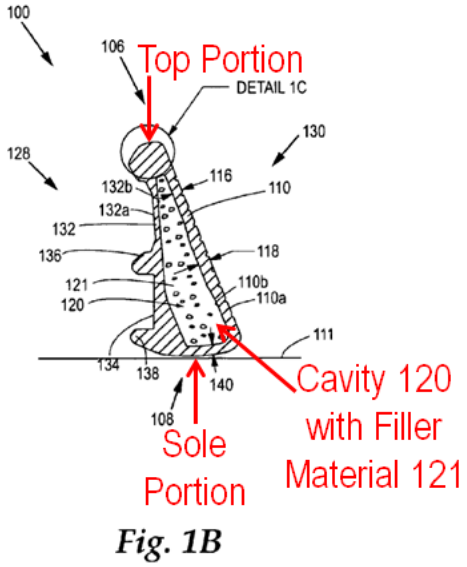


Fig. 1B

(TMG1004, Figs. 1A, 1B (Annotated).)

68. Wahl describes that advantages of filling the cavity include damping the sound upon impact with the ball and reducing vibrations to provide a softer "feel" to the player in comparison to hollow, unfilled club heads. (TMG1004, 13:65-14:4, Fig. 8.) By using a lightweight filler, these benefits can be achieved while maintaining a low CG, which is the purpose of the hollow club head. (*Id.*, 11:20-21, 11:51-53, 14:28-32.)

Regarding these important characteristics, Wahl further discloses:

> body portion 309 can include various features such as *weighting elements*, cartridges, and/or inserts or applied bodies as *used for CG placement, vibration control or damping, or acoustic control or damping. For example, U.S. Pat. No. 6,811,496, incorporated herein by reference in its entirety,*

> discloses the attachment of *mass altering pins* or cartridge *weighting elements*.

(*Id.*, 9:51-57 (emphasis added).)

69. U.S. Patent No. 6,811,496, also to Wahl *et al.* (TMG1005), is discussed below. Because Wahl incorporates Wahl '496 in its entirety–and more specifically for its disclosure regarding weighting elements used for CG placement, vibration damping, and acoustic damping–a POSA would have understood the disclosure of Wahl '496 as being part of the disclosure of Wahl.

B. Wahl '496 (incorporated by reference in Wahl)[2]

70. Wahl describes that an improvement made to irons was the "cavity back" iron, which uses "perimeter weighting, whereby a disproportionate amount of the total weight of a club head is positioned behind and proximate the perimeter of the club head's striking face, thereby creating a cavity immediately behind the striking face." (TMG1005, 1:29-36.) Wahl describes that moving weight peripherally away from the CG of the club head provides forgiveness on off-center hits, resulting in more consistent distance and directional control. (*Id.*, 1:37-40.) Perimeter weighting also generally increases the MOI about the club's CG,

[2] Because Wahl '496 is part of the disclosure of Wahl, I will generally refer to it as "Wahl" within the text; however, I provide citations as "Wahl '496" for clarity.

resulting in less twisting due to off-center hits, and thus more accurate shots. (*Id.*, 1:41-44.)

71. These principles were well-known among golf club designers. (*See supra* Section V.D (*e.g.*, TMG1019, 1:16-23).) Indeed, Wahl states that "[t]he most common way that [lowering the CG] has been accomplished for irons is to move as much weight as possible to the area proximate the sole of the club." (TMG1005, 2:2-5.) Moreover, Wahl notes that another way to increase the MOI about the club's CG is with a "hollow" iron "that incorporate[s] a rear wall that is spaced from the front striking face." (*Id.*, 1:45-48.) The Wahl reference discloses this type of hollow iron, but fills the cavity with filler material to decrease the sound and vibration, which Wahl '496 also discloses can adversely affect the feel of the club. (*Id.*, 2:13-40.)

72. For example, as shown below in Annotated Figure 7, Wahl '496 discloses a club head having a hollow cavity (front recess 70) defined by the main body (11') of the club including striking face (15') and cavity wall (21). (*Id.*, 7:1-5.) A POSA would have recognized that this hollow cavity is very similar to the cavity in Wahl, except without filler material.

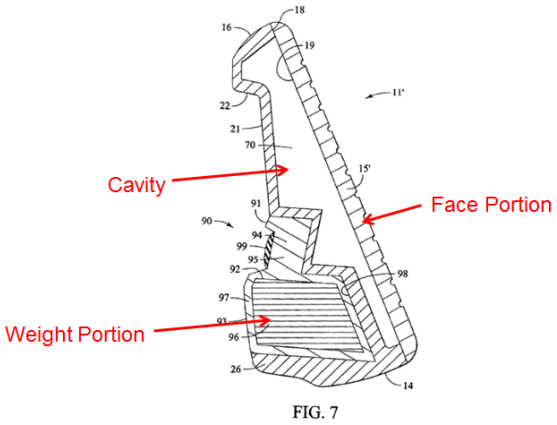


FIG. 7

(TMG1005, Fig. 7 (Annotated).)

73. The club head can include a plurality of pins (42), *i.e.*, the "weighting elements" such as "mass altering pins" referenced in Wahl. (*Id.*, 7:18-23; TMG1004, 9:51-57.) As shown below in Annotated Figure 5B, the pins can be inserted into a plurality of apertures (64) in the back of the club near the sole portion of the club, as described in detail referring to Figures 3A-3B. (TMG1005, 6:16-22, 7:18-23.) The pins are generally constructed from a material with a density greater than the club body, such as tungsten. (*Id.*, 5:47-53.)

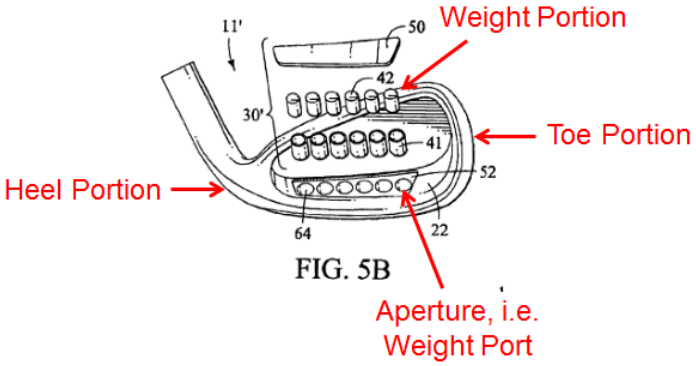


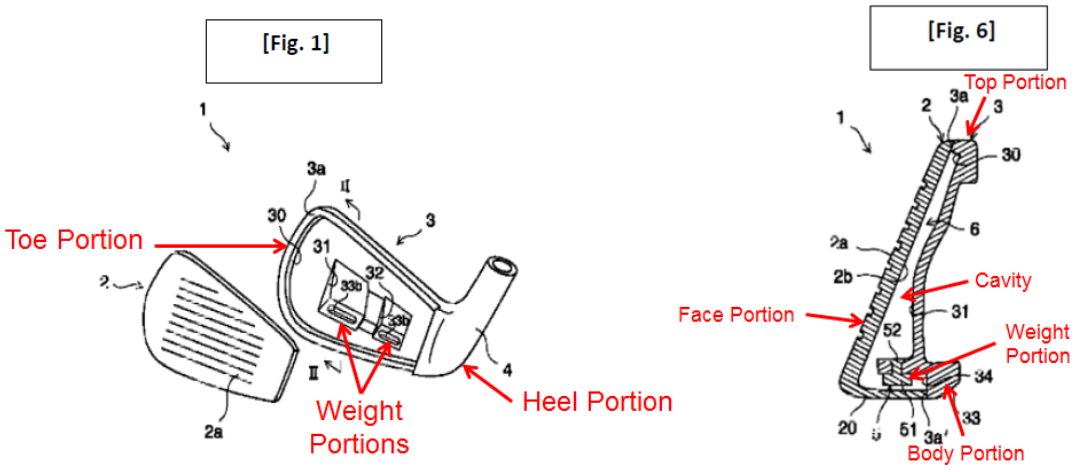
FIG. 5B

(TMG1005, Fig. 5B (Annotated).)

74. Thus, Wahl ’496 teaches an iron-type golf club head with a cavity filled with filler material and a plurality of weights disposed along the perimeter of the club head. These features lower the CG and increase the MOI about the CG to make it easier to get the ball airborne, improve shot accuracy, and improve the sound and feel of the club.

C. Chaen

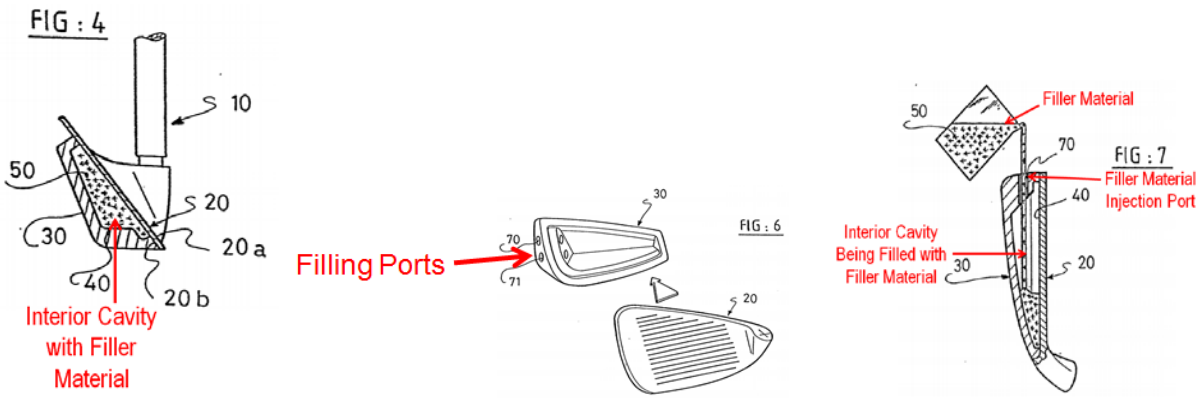
75. Like Wahl and Wahl ’496, Chaen discloses a hollow, iron-type golf club. (TMG1072, “Chaen,” ¶¶1, 10, 11, 25, 37, 49, Fig. 6.) The club includes one or more weight portions coupled to the sole of the club. (*Id.*, ¶¶11, 38-39, 49, Fig. 6.) These weight portions allow the club to have a lower center of gravity without requiring excessively thick club sections. (*See Id.*, ¶¶8-10.) Embodiments of Chaen include two weight portions (5) embedded in ports (33b) that may be through holes that penetrate the sole portion. (*Id.*, ¶38.)



(Chaen, Figs. 1, 6 (Annotated).)

D. Lahaix

76. Lahaix discloses filling a hollow club head with a non-metal filling material, such as a thermoplastic or elastomer, through an orifice located in the toe portion by reaction injection molding. (TMG1021, Abstract, 2, 5, 7, claim 1.) Lahaix also discloses that the filler material "acts as a support in order to prevent the plate from collapsing because of its thinness." (*Id.*, 6, ¶4.) The thinner face of Lahaix allows more weight to be distributed to the periphery of the club head, improving the club head's moment of inertia. (*Id.*, 6.) The thinner face also improves club feel on impact and, in combination with the filler material, produces a more pleasing sound. (*Id.*, 2.)



(TMG1021, Figs. 4, 6, and 7 (Annotated).)

E. Linphone

77. Linphone also discloses a hollow iron-type golf club head. ("Linphone", TMG1035, 0004.) Linphone uses a shock absorbing rubber to dampen vibrations in the club head. (*Id.*) Linphone's shock absorbing rubber filler

bonded to the back surface of the face portion of the club head by an adhesive. (*Id*.) The back surface of the face portion is sand-blasted to form a rough surface before the adhesive solution is applied. (*Id.*, 0005.) The adhesive solution uniformly coats the back surface of the face portion. (*Id.*, 0004.) Bonding the shock absorbing rubber 4 to the back surface of the striking face 12 improves the shock absorbing qualities of the club head. (*Id.*, 0004-0005.) A POSA would have understood that bonding the striking face 12 to the shock absorbing rubber would improve the transfer of vibrational energy from the striking face 12 to the shock absorbing rubber.

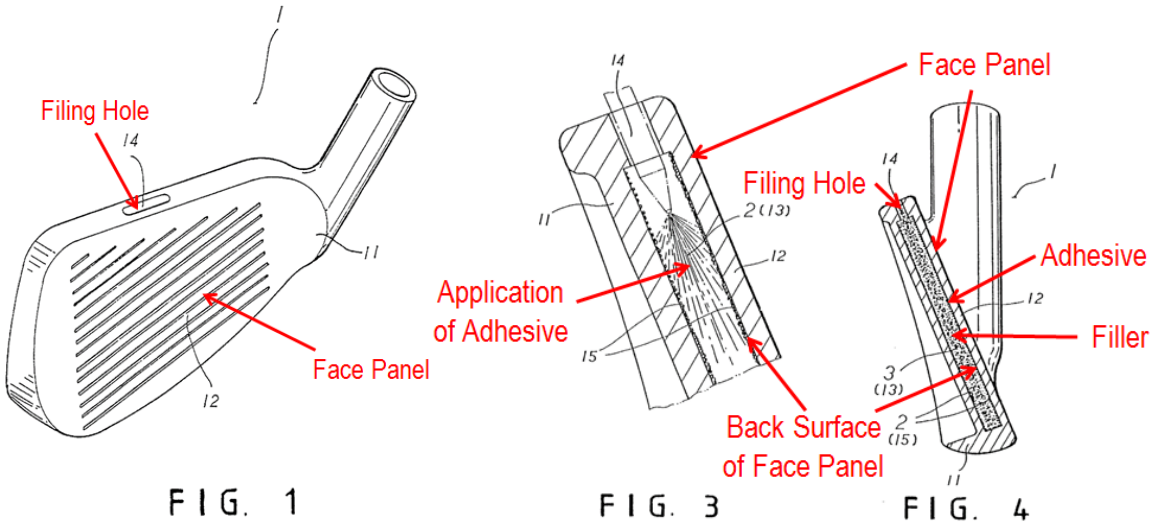


FIG. 1 FIG. 3 FIG. 4

(TMG1035, Figs. 1, 3, and 4 (Annotated).)

VIII. Overview of the Grounds

78. In my opinion, independent claims 1, 8, and 13 are substantially similar. All of the independent claims recite "at least one weight portion," "at least

one port," and "[an] interior cavity. There are many other similarities between the independent claims.

79. Claim 1 recites "wherein a portion of the at least one weight portion is closer to the face portion than a portion of the polymer material in the interior cavity" while claims 8 and 13 recite elements related to the widths of the interior cavity or the polymer material that fills the cavity. I note that many of the differences between the independent claims are present in dependent claims – i.e. claim 5 depends on claim 1 and contains interior cavity width limitations that are substantially identical to those found in claim 8. In addition, many dependent claims are identical or substantially correspond with each other.

80. The table below compares the independent claims (differences in bold).

[1.1] A golf club head	[8.1] An iron-type golf club head	[13.1] A golf club head
[1.2] a face portion;	[8.2] a face portion;	[13.2] a face portion;
[1.3a] a body portion having, a toe portion, **a heel portion**, a top portion, a sole portion, a back portion, and	[8.3a] a body portion having, a toe portion, a top portion, a sole portion, a back portion, and	[13.3a] a body portion having a toe portion, **a heel portion**, a top portion, a sole portion, a back portion, and
[1.3b] an interior cavity extending between the top and sole portions;	[8.3b] an interior cavity extending between the top and sole portions;	[13.3b] an interior cavity extending between the top and sole portions
[1.4] at least one port located **closer to the toe portion than the heel portion** and connected to the interior cavity;	[8.4] at least one port connected to the interior cavity;	[13.4] at least one port located **closer to the toe portion than the heel portion** and connected to the interior cavity; and
[1.5] at least one weight portion located closer to the heel portion than the at least one port;	[8.6] at least one weight portion **coupled to the body portion at a location below a horizontal midplane** of the golf club head,	[13.5] **at least one weight portion located closer the toe portion than the heel portion** and located between the at least one port and the heel portion,
[1.6] wherein the interior cavity is filled with a polymer material from the at least one port,	[8.5] an **elastic polymer material injection molded** in the interior cavity through the at least one port; and	[13.6] wherein the interior cavity is filled with a polymer material from the at least one port, and
[1.7] wherein more than 50% of a mass of the body portion is located		

below a horizontal midplane of the golf club head, and		
	[8.7] wherein a width of the interior cavity at or below the horizontal midplane and above the at least one weight portion is greater than a width of the interior cavity near the top portion and greater than a width of the interior cavity between the at least one weight portion and the face portion.	
		[13.7] wherein a first portion of the polymer material above a horizontal midplane of the body portion has a first width, a second portion of the polymer material below the horizontal midplane has a second width greater than the first width, and a third portion of the polymer material between the first portion and the second portion has a third width greater than the first width and greater than the second width, and wherein the third portion is located between the at least one weight portion and the top portion.

81. A summary of the applied references and the claims for which they are applied is provided below:

Ground	References	Basis	Claims
1	Wahl	§103	1-8, 10-20
2	Wahl, Linphone	§103	9
3	Chaen, Lahaix	§103	1-8, 10-20
4	Chaen, Lahaix, Linphone	§103	9

IX. Ground 1: Wahl Renders Claims 1–8 and 10–20 Obvious

A. Motivation for Combining Embodiments of Wahl

82. A POSA would have been strongly motivated to combine the embodiments of Wahl as presented here. As discussed above in Section VII.A, Wahl incorporates Wahl ’496 in its entirety—and specifically for its disclosure of weighting elements used for CG placement, vibration damping, and acoustic damping. (TMG1004, 9:51-57.)

83. Wahl discloses that “weighting elements, cartridges, and/or inserts or applied bodies” can be utilized for “CG placement, vibration control or damping, or acoustic control or damping.” (*Id.*, 9:51-54.) Wahl describes the well-known principle that moving weight peripherally away from the CG of the club head provides forgiveness on off-center hits, resulting in more consistent distance and directional control, and also increases the MOI about the club’s CG, resulting in less twisting due to off-center hits, and thus more accurate shots. (TMG1005, 1:37-

44; *see also supra* Section V.B (*e.g.*, TMG1018, 2:43-46).) Wahl alters CG placement, in part, by inserting weight pins of greater density than the club head body into apertures in the back of the club head near the sole portion. (TMG1005, 5:47-53, 6:16-22, 7:18-23.) At the time of the alleged invention, a POSA would have understood this well-known way to lower the CG and increase the MOI of a golf club head. (*See supra* Sections V.B (*e.g.*, TMG1016, 9:32-44), V.D (*e.g.*, TMG1019, 1:16-23).)

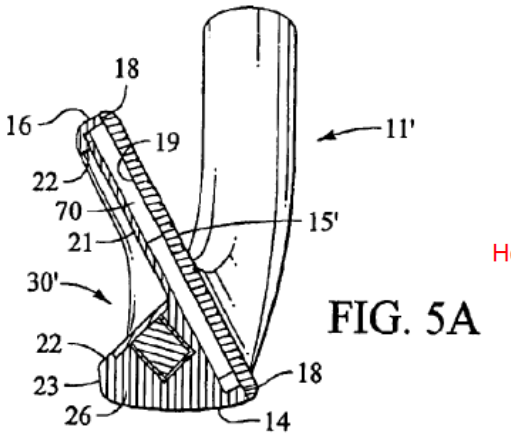


FIG. 5A

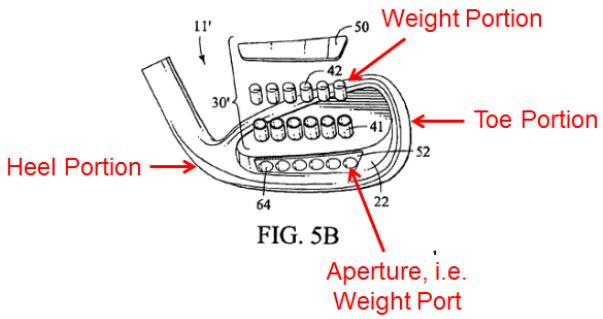


FIG. 5B

(TMG1005, Figs. 5A-B (Annotated).)

84. And as shown below in a variation of the embodiment in Figure 5B, the width of the cavity may be modified to accommodate the weight assembly. (TMG1005, 4:11-12, 7:38-8:3, Fig. 7.)

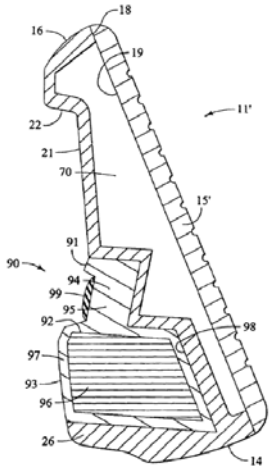


FIG. 7

(TMG1005, Fig. 7.)

85. It would have been obvious to a POSA to incorporate the weighting elements of Wahl ’496 into the rear surface of Wahl, as Wahl expressly suggests when it incorporates Wahl ’496 by reference. (TMG1004, 9:51-57.) Moreover, a POSA would have been continually trying to further optimize the CG and MOI, and thus it would have been obvious to add the weight elements of Wahl ’496 into the club head of Wahl. (*Id.*, 9:51-57; *see* TMG1005, 1:37-44, 6:16-22, 7:18-23.) A composite image of the club head of Figure 4 of Wahl combined with the port location (210) shown in Figure 2A of Wahl and the weight insert of Figure 5B of Wahl ’496 is shown below to illustrate the obviousness of the resulting combination.

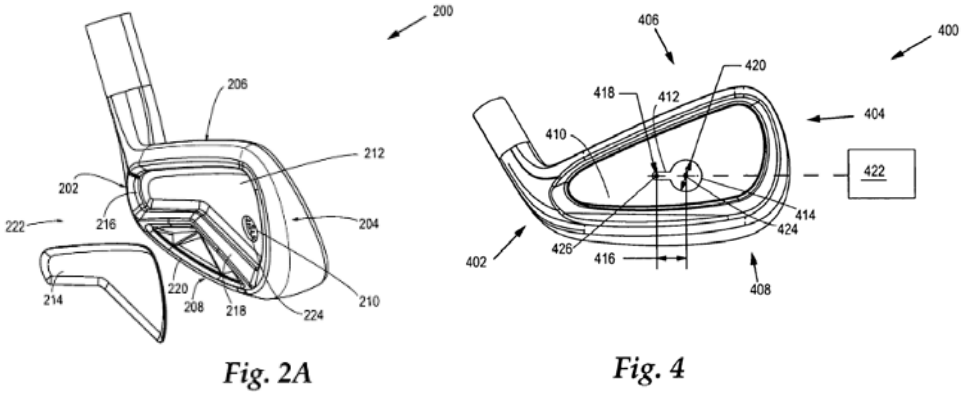


Fig. 2A *Fig. 4*

(TMG1004, Figs. 2A, 4.)

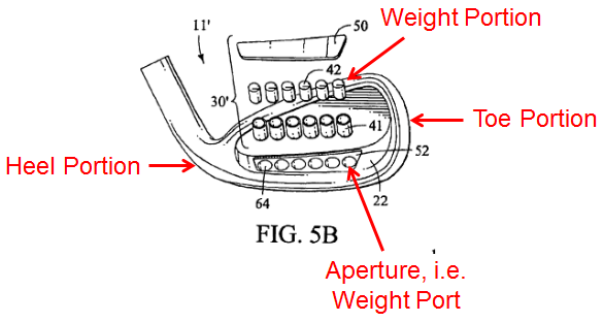
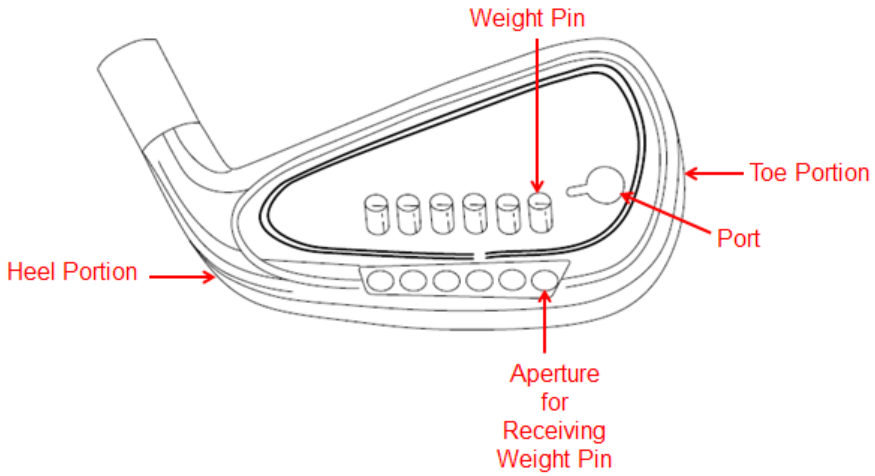


FIG. 5B

(TMG1005, Fig. 5B (Annotated).)



(TMG1004, Fig. 4 and TMG1005, Fig. 5B (Modified, Annotated).)

86. Modifying the club head of Wahl to incorporate the weight elements of Wahl '496 would have been nothing more than the use of a known technique to improve similar devices in the same way. And adding the weight elements of Wahl would have simply been a combination of prior art elements according to known methods to yield predictable results—improved control over the CG and MOI of the club head.

B. Wahl Renders Claim 1 Obvious

1. "[a] golf club head" [1.1]

87. Wahl, titled "Golf Club Head," in particular, discloses "[a]n iron-type golf club head…." (TMG1004, Abstract, 1:33-34, 3:26-28.) Thus, Wahl renders element [1.1] obvious.

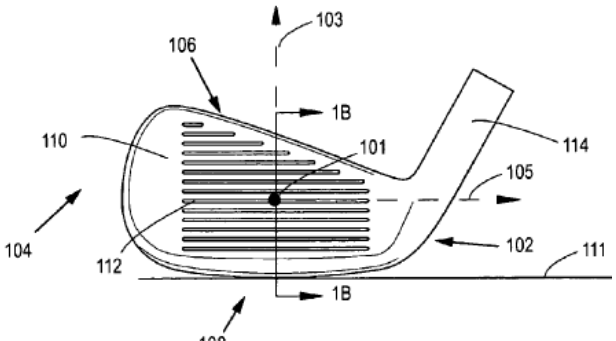


Fig. 1A

(TMG1004, Fig. 1A.)

2. "a face portion"[1.2]

88. Wahl's club head, like all golf club heads, includes a "striking face 110." (*Id.*, 3:28, Figs. 1A.) Accordingly, Wahl renders element [1.2] obvious.

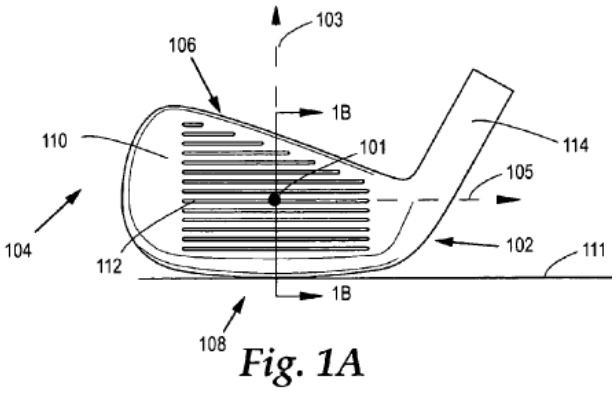


Fig. 1A

(TMG1004, Fig. 1A)

3. "[1.3a] a body portion having, a toe portion, a heel portion, a top portion, a sole portion, a back portion, and [1.3b] an interior cavity extending between the top and sole portions"

a) Element [1.3a]

89. Like every golf club, Wahl discloses that the golf club head has a body portion that includes "a *heel portion*, *a sole portion*, *a toe portion*, *a top-line portion*, a front portion, a rear portion, and a striking face" and "[t]he hollow iron golf club head 100 further includes a back portion 128." (*Id.*, 1:39-42 (emphasis added), 2:30-33, 3:26-29, 3:61-62 Figs. 1A, 1D.) The term "top-line portion" is the more common term for what the '220 patent calls the top portion, although in my opinion a POSA would have understood the top portion to be an equivalent term. Accordingly, Wahl renders element [1.3a] obvious.

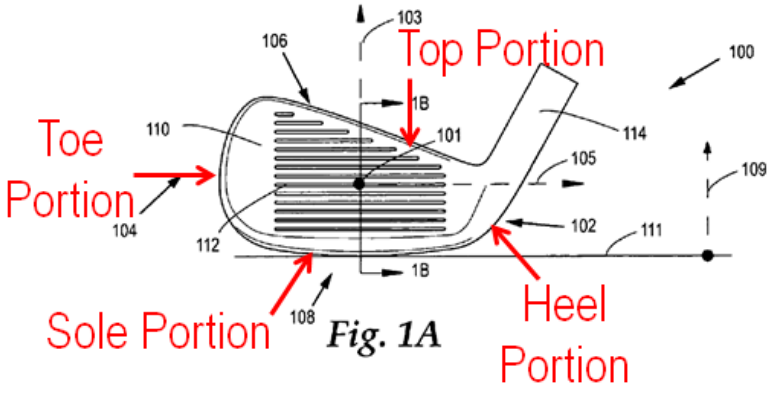


Fig. 1A

(TMG1004, Fig. 1A (Annotated).)

b) Element [1.3b]

90. Wahl discloses that "back wall 132 encloses the entire back portion 128 of the club head to define a *cavity 120* that is primarily filled with a filler material 121." (*Id.*, 4:14-17 (emphasis added); Fig. 1B.) As shown below in Annotated Figure 1B, the interior cavity (120) extends between the top line portion (106) and the sole portion (108). Thus, Wahl renders obvious element [1.3b].

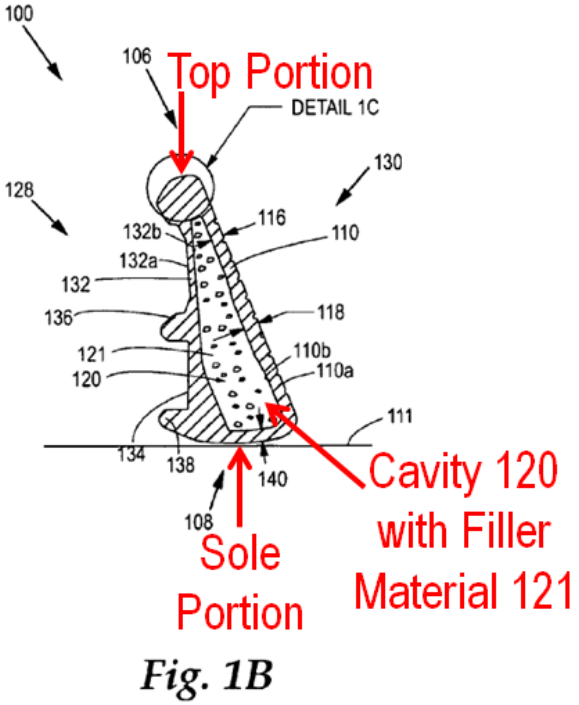


Fig. 1B

(TMG1004, Fig. 1B (Annotated).)

4. "at least one port located closer to the toe portion than the heel portion and connected to the interior cavity" [1.4]

91. Wahl discloses that "[a]n aperture 210 is located in the back wall 212 and can be used for filling the hollow iron 200 with a sound dampening filler material 224." (*Id.*, 8:14-16.) Thus, the aperture (i.e., port) is connected to the interior cavity. As shown below in Figure 2A, aperture 210 is located closer to the toe portion than the heel portion.

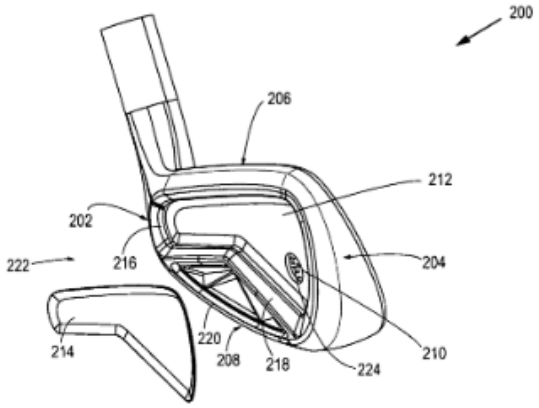


Fig. 2A

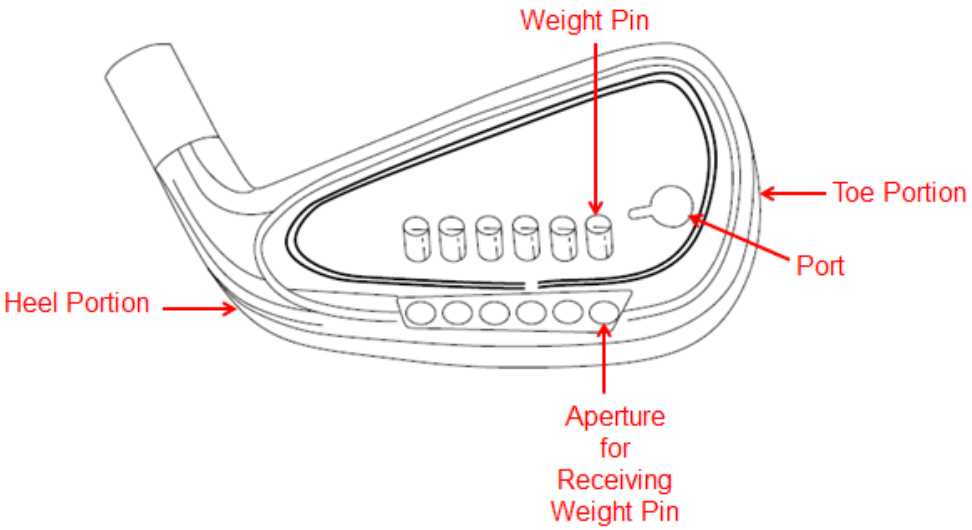
(TMG1004, Fig. 2A.)

92. In a similar embodiment, Wahl discloses that "the aperture 338 *can be located anywhere on the club head body surface* other than the front striking face. For example, the aperture 338 can be located on the sole, toe, heel, or top line surfaces." (*Id.*, 10:53-57 (emphasis added).) Thus, at the very least, it would have been obvious for a POSA to locate the port closer to the toe portion than the heel portion given the finite number of possible port locations due to the limited space available on the back surface of the club. Accordingly, Wahl renders element [1.4] obvious.

5. "at least one weight portion located closer to the heel portion than the at least one port" [1.5]

93. The combination of the Wahl '496 weight insert, and corresponding weight pins, with the club head of Wahl, discloses or renders obvious element [1.5]. The composite image below illustrates an obvious way to combine the weight insert of Wahl '496 on the back surface of Wahl's club head. A POSA

would have found it obvious to place the fill port in or near a location illustrated in Wahl, such as, for example, the location shown in Figure 2A of Wahl. Likewise, it would have been obvious for a POSA to place the weight insert in approximately the location shown below at least because it is similar to the location of the weight insert in the club head shown in Figure 5A of Wahl '496 and because of the well-known desirability of lowering the CG of a club head. (*Id.*, 9:51-57; Sections V.B, V.D.) As shown below, there is at least one aperture, and corresponding weight pin, located closer to the heel portion than the port. Accordingly, Wahl renders element [1.5] obvious.



(TMG1004, Fig. 4 and TMG1005, Fig. 5B (Modified, Annotated).)

6. "wherein the interior cavity is filled with a polymer material from the at least one port" [1.6]

94. Wahl discloses that "[a]n aperture 210 is located in the back wall 212 and can be used for filling the hollow iron 200 with a sound dampening filler

material," and thus Wahl's port is used to fill the interior cavity. (TMG1004, 8:14-16.) Wahl also discloses that "the filler material occupies about 50% to about 99% of the total club head cavity volume." (*Id.*, 15:7-8.) A POSA would have understood "about 99%" to mean filling the entire club head. Filler materials can include viscoelastic elastomers, vinyl copolymers, polyesters, polyurethanes, thermoset and thermoplastic rubbers, and foamed polymers. (*Id.*, 4:18-25, 4:51-5:11.) A POSA would also have known that, at least, for example, "viscoelastic elastomers" and "styrene/isoprene block copolymers" are "polymer materials." Accordingly, Wahl renders element [1.6] obvious.

7. "wherein more than 50% of a mass of the body portion is located below a horizontal midplane of the golf club head" [1.7]

95. First, a POSA would have understood that Wahl and Wahl '496 both illustrate club head designs where more than 50% of the mass of the body portion is below the horizontal midplane. (*See, e.g.*, TMG1031, 61-63 (discussing advantages of hollow clubs similar to those of Wahl, including a lower CG and improved mass distribution).) The horizontal midplane is located halfway between lowest point of the sole and the highest point of the toe when the club is positioned in the normal address position prior to striking the ball. For example, as shown below, Figure 3B of Wahl illustrates an enlarged sole bar (highlighted). (TMG1004, 10:15-57.) Likewise, Figures 5A and 7 of Wahl '496 illustrate enlarged sole bars (26) even when adding weights to the club head. (TMG1005,

7:1-26, 7:37-64.) And in a cross-section that is not through the weight pin, for example, the entire sole bar is the material of the body portion, providing significantly more material, and thus mass, below the midplane. The substantial amount of additional material present in the enlarged sole bars highlighted below at least renders obvious the claimed body portion mass distribution. Furthermore, a POSA would have understood that even when including weights in the club head, it is advantageous to maintain more than 50% of the mass of the body portion below the horizontal midplane because this requires fewer weights to be added while still maintaining a low CG. Thus, Wahl renders element [1.7] obvious.

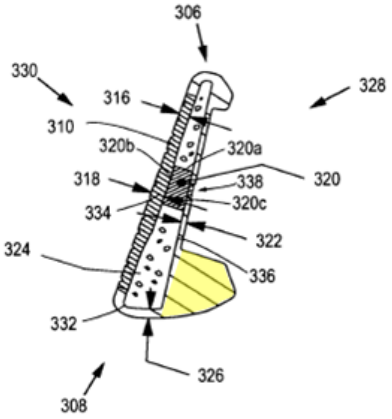


Fig. 3B

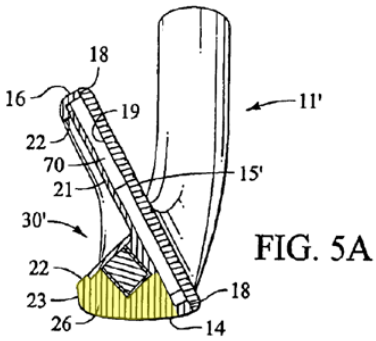


FIG. 5A

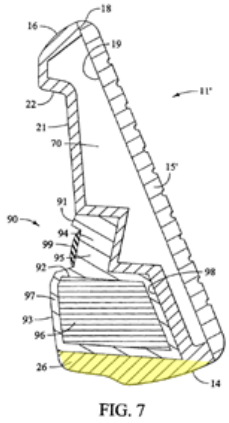


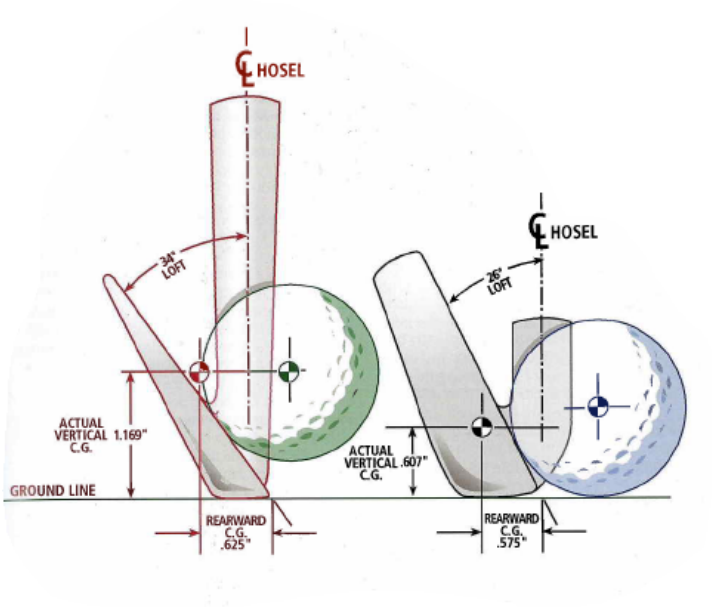
FIG. 7

(TMG1004, Fig. 3B; TMG1005, Figs. 5A, 7.)

96. Second, it would have been obvious to a POSA–and in fact, typical–to locate more than 50% of the club head mass below a horizontal midplane. Having more than 50% of the mass of the body portion below the horizontal midplane will

result in a CG that is below the horizontal midplane because CG and mass distribution are directly related. The desirability of a low CG, and thus low mass distribution, was well-known in the art. As discussed above, lowering the CG generally makes it easier to hit the ball with a higher trajectory. (*See supra* Section V.B (*e.g.*, TMG1016, 9:32-44), VI.C.1 (*e.g.*, TMG1022, 1:40-44).) Thus, a POSA would have found element [1.7] obvious in view of well-known design principles.

97. Specifically, Maltby shows an iron-type club that has a CG below a horizontal midplane as an example of a design principle in modern iron-type clubs. (TMG1031, 56-57.) As shown below, the modern iron outlined in black (right side) has a CG that is much lower than the horizontal midplane. (*Id.*) In fact, Maltby indicates that the iron outlines on pages 56 and 57 are "full scale drawing[s]." (*Id.*) The measured height (by ruler) of the modern iron outlined in black is approximately 2.25 inches, which means that the listed CG height of 0.607 inches results in a CG that is less than one third of the height of the club—well below the horizontal midplane.



(TMG1031, 57.)

98. Maltby also discusses the well-known benefit of having the club head CG at or below the CG of the golf ball, which is located 0.840 inches above the surface the ball is resting on. (*Id.*, 48; *see* TMG1044, "USGA Rules", App. III, Rule 3.)

Defining Actual Vertical Center Of Gravity (AVCOG) In Irons

AVCOG	Description
.450" to .624"	Highest Technology to Date, Highest Playability
.625" to .699"	Excellent, Solid Hits, Forgiving, Consistent
.700" to .799"	Very Good Playability for Many Golfers
.800" to .874"	.840" is Ball CG, Must Use Down and Through Swing, Expert Golfer's Only
.875" and Up	Avoid

(TMG1031, 48.)

99. Since iron-type clubs are typically used to hit the golf ball when it is resting on the ground, this means that the club head CG should generally be less than about 0.840 inches from the ground. (TMG1031, 48.) Typical iron club heights were also well-known in the art—Maltby, for example, discloses a set of irons with body portion heights ranging from 1.94 to 2.13 inches. (TMG1015, 534; *see also Id.*, 139-143 (disclosing an iron set with club heights ranging from 2.06 inches to 2.31 inches).) These club heights thus have horizontal midplane heights of approximately 0.97 to 1.07 inches from the ground plane–above the CG of the golf ball. Thus, the height of a standard golf ball dictates that club head CG should generally be located below the horizontal midplane of the club head. Accordingly, a POSA would have been motivated to design a body portion with a CG below the horizontal midplane in order to maximize club performance. And such a CG placement requires at least 50% of the body portion mass to be located below the horizontal midplane.

100. By way of further example, U.S. Patent Application Publication 2013/0316842 ("Demkowski") discloses an iron-type club that is configured to minimize the movement of the CG of the club head when a weight is added to the club. (TMG1071, "Demkowski", Abstract, ¶¶70-73.) To illustrate this point, Demkowski includes CG points for club heads with and without the weight portion, as shown in Figure 2B, with points "CG1" and "CG2" shown on the back

of the club head. (*Id.* ¶¶71, 73, Fig. 2B.) CG1 is defined as "the nominal CG before adding the weight," which is the CG of the body portion of the club head of Demkowski (without the weight). (*Id.*, ¶71.) As shown below, CG1 is located below a horizontal midplane of the club head, and thus more than 50% of the body portion mass is below the horizontal midplane.

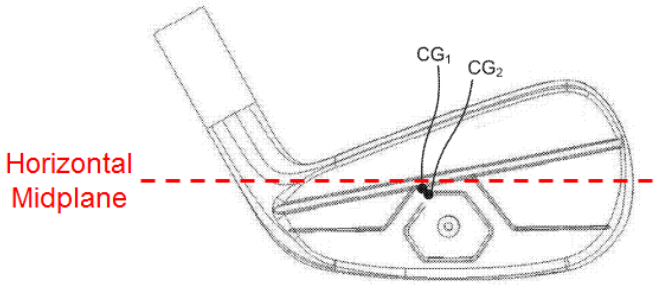


FIG. 2B

(TMG1071, Fig. 2B (Annotated).)

101. Demkowski also includes z-axis measurements of 19.2 mm and 19.6 mm for the nominal CG of embodiments of the club head, where the z-axis is defined as the axis perpendicular to ground plane. (*Id.*, ¶104.) As discussed above, typical horizontal midplane heights range from approximately 0.97 to 1.07 inches from the ground plane, which equals about 24.6 mm to 27.05 mm. These horizontal midplane heights are well above the nominal CGs listed in Demkowski– or put another way, the CG of the club head body (without the weight) is below the midplane. Accordingly, in view of the well-known teachings of locating the CG

below the horizontal midplane, it would have been obvious to distribute more than 50% of the mass of the club head below the horizontal midplane.

102. Additionally, in my opinion, the claimed limitation would have required nothing more than routine experimentation with a well-known variable, the club head mass distribution, that is taught in the prior art. And there are a finite number of options for the club head mass distribution with respect to the horizontal midplane: more than 50% of the club head mass may be above the midplane, below the midplane, or equally distributed above and below the midplane. Thus, it would at least have been obvious for a POSA to optimize the mass distribution through routine experimentation and, in light of the well-known advantages of a low CG, have a body portion configuration with more than 50% of the body portion mass below the horizontal midplane. For these additional reasons, Wahl renders element [1.7] obvious.

103. Furthermore, I also note that PXG does not describe any criticality to the claimed range of weight distribution. In fact, outside of the claim, I did not find any description in the ’220 patent of a body portion having 50% of its mass below the horizontal midplane. In my opinion, there is nothing critical or novel about the well-known mass distribution recited in this claim element, and thus it would have been obvious to a POSA as nothing more than optimizing a variable according to a

well-known concept that was disclosed in the prior art. Accordingly, Wahl renders element [1.7] obvious.

8. "wherein a portion of the at least one weight portion is closer to the face portion than a portion of the polymer material in the interior cavity" [1.8]

104. The combination of Wahl's embodiments discloses the claimed relationship between the weight portion and polymer material. As discussed above, a POSA would have been motivated to add the weight insert of Wahl '496 into Wahl's club head to optimize the CG. (*Supra* Sections IX.A and IX.B.5.) And so a POSA would have turned to Wahl '496 for ways to integrate the weights into Wahl's club head. Figure 7 of Wahl '496 illustrates a modified embodiment of Figure 5A, previously discussed, and demonstrates one way to incorporate the weight insert of Wahl '496 into a hollow, iron-type club, like Wahl. (TMG1005, 7:38-64.) It would have been obvious to a POSA to modify Wahl's cavity as configured in Figure 7 of Wahl '496 in order to accommodate the weight portion at least because it would have been the use of a known technique to improve similar devices in the same way. The resulting club head would have the cavity shape shown in Figure 7 of Wahl '496, filled with a polymer material as disclosed in Wahl.

105. The '220 patent does not expressly describe how to measure the distances of the claimed elements to determine which is "closer" to the face

portion, nor does the ’220 patent provide specific distances from these features to the face portion. Instead, PXG presumably relies on the Figures as disclosing the relative distances. (TMG1002, 223-224, 232.) As shown below in Figure 38, for example, lines 3840 and 3842 show the distances being measured from the back surface of the face portion in a direction perpendicular to the back surface. (*See, e.g.*, TMG1001, Figs. 37-41.) Furthermore, when discussing absolute distances, a POSA would typically assume the distance in question is the *minimum* distance, measured using lines perpendicular to a planar surface. This is because there is only one minimum distance between any two objects, but there are, of course, many other distances depending on the measurement path. Thus, without any other guidance, a POSA would have taken the distance from a feature to the face portion along a line perpendicular to the back surface of the face portion, which also matches the apparent measurement method used in the ’220 patent.

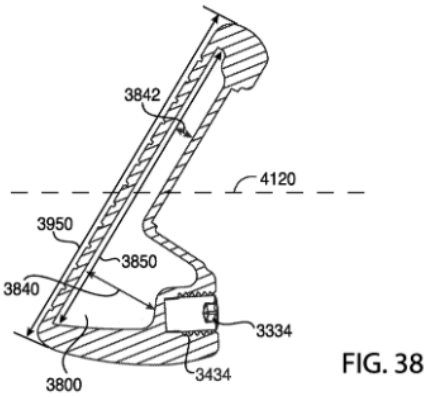


FIG. 38

(TMG1001, Fig. 38.)

106. Even if the drawings in Wahl are not drawn to scale, in my opinion, these drawings at least render obvious the features recited in element [1.8], as they clearly disclose to a POSA having different widths of the cavity at various locations from the sole portion to the top portion of the club head.

107. As shown below in annotated Figure 7 of Wahl ’496, a portion of the weight portion is closer to the face portion than a portion of the polymer material in the combined Wahl-Wahl ’496 club head having the cavity configuration in Figure 7 of Wahl ’496, filled with the polymer material as disclosed in Wahl. And although, like the ’220 patent, Wahl ’496 does not disclose these actual distances, a POSA would have found the relative relationship disclosed by the Figures. As shown below, the distance “A” between a portion of the polymer material and the face portion is greater than the distance “B” between a portion of the weight portion and the face portion, and thus a portion of the weight portion is closer to the face portion than a portion of the polymer material. Accordingly, Wahl renders element [1.8] obvious.

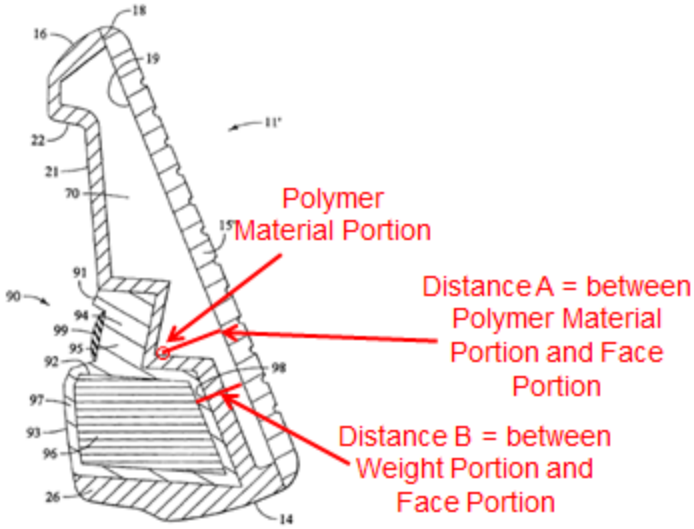


FIG. 7

(TMG1005, Fig. 7 (Annotated).)

C. Wahl Renders Claim 8 Obvious

108. Many of the elements of independent claim 8 are the same or similar to those in independent claim 1, and so much of my analysis for claim 1 also applies to claim 8.

1. "[a]n iron-type golf club head" [8.1]

109. Wahl, titled "Golf Club Head," in particular, discloses "[a]n iron-type golf club head…." (TMG1004, Abstract, 1:33-34, 3:26-28.) Thus, Wahl renders obvious element [8.1].

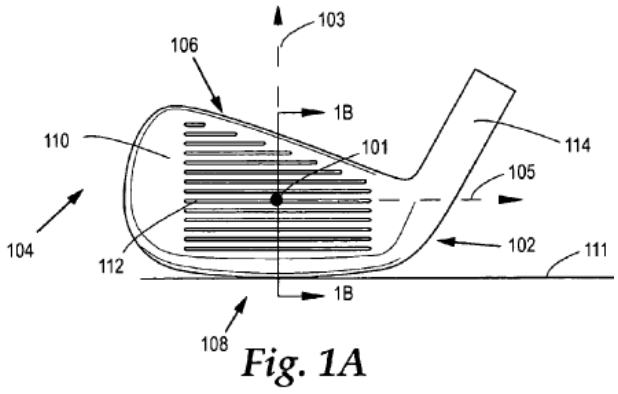


Fig. 1A

(TMG1004, Fig. 1A.)

2. "a face portion"[8.2]

110. Wahl's club head, like all golf club heads, includes a "striking face 110." (*Id.*, 3:28, Figs. 1A.) Accordingly, Wahl renders element [8.2] obvious.

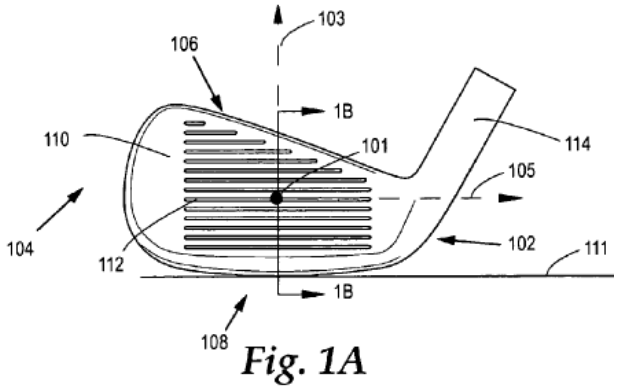


Fig. 1A

(Wahl, Fig. 1A)

3. "[8.3a] a body portion having, a toe portion, a top portion, a sole portion, a back portion, and [8.3b] an interior cavity extending between the top and sole portions"

a) Element [8.3a]

111. Like every golf club, Wahl discloses that the golf club head has a body portion that includes "a *heel portion*, *a sole portion*, *a toe portion*, *a top-line*

portion, a front portion, a rear portion, and a striking face" and "[t]he hollow iron golf club head 100 further includes a back portion 128." (*Id.*, 1:39-42 (emphasis added), 2:30-33, 3:26-29, 3:61-62 Figs. 1A, 1D.) The term "top-line portion" is the more common term for what the '220 patent calls the top portion, although in my opinion a POSA would have understood the top portion to be an equivalent term. Accordingly, Wahl renders element [8.3a] obvious.

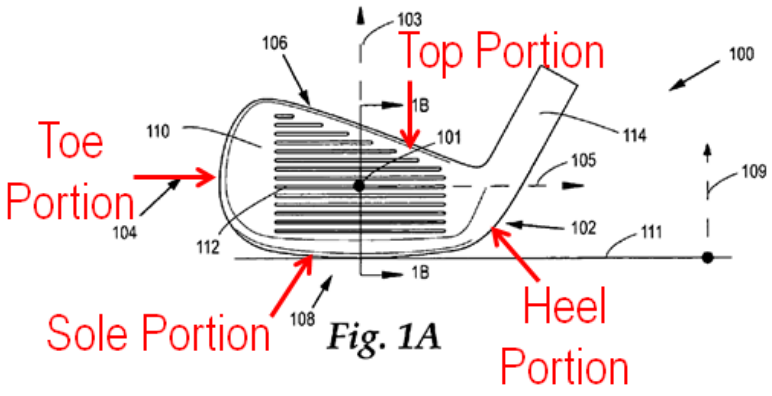


Fig. 1A

(TMG1004, Fig. 1A (Annotated).)

b) Element [8.3b]

112. Wahl discloses that "back wall 132 encloses the entire back portion 128 of the club head to define a *cavity 120* that is primarily filled with a filler material 121." (*Id.*, 4:14-17 (emphasis added); Fig. 1B.) As shown below in Annotated Figure 1B, the interior cavity (120) extends between the top line portion (106) and the sole portion (108). Thus, Wahl renders obvious element [8.3b].

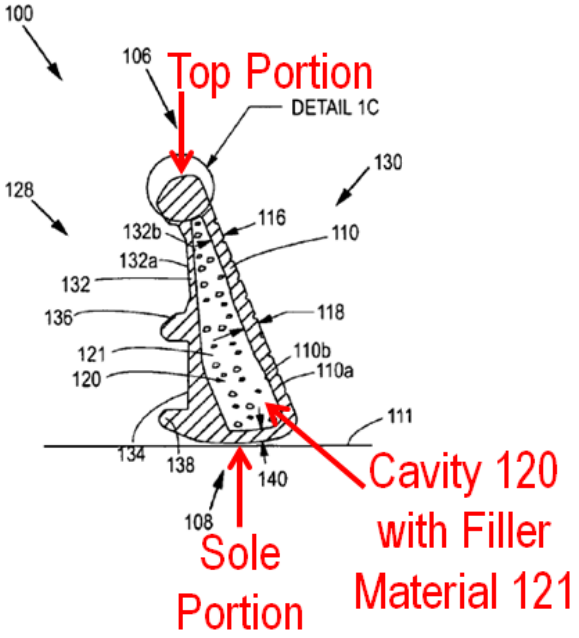


Fig. 1B

(TMG1004, Fig. 1B (Annotated).

4. "at least one port connected to the interior cavity" [8.4]

113. Wahl discloses that "[a]n aperture 210 is located in the back wall 212 and can be used for filling the hollow iron 200 with a sound dampening filler material 224." (*Id.*, 8:14-16.) Thus, the aperture (i.e., port) is connected to the interior cavity. Accordingly, Wahl renders element [8.4] obvious.

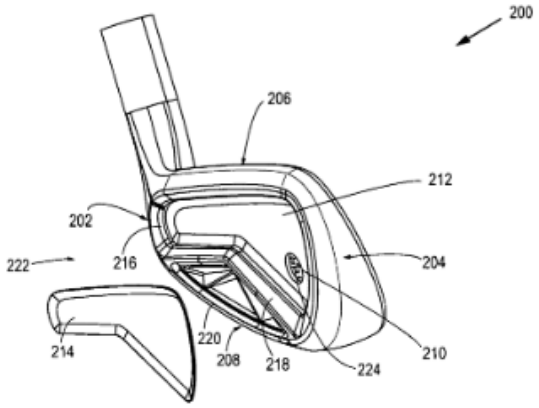


Fig. 2A

(TMG1004, Fig. 2A.)

5. "an elastic polymer material injection molded in the interior cavity through the at least one port" [8.5]

114. Wahl discloses "a cavity 120 that is primarily filled with a filler material 121." (*Id.*, 4:14-17.) Wahl also discloses "aperture 210 is located in the back wall 212 and can be used for filling the hollow iron 200 with a sound dampening filler material 224 . . . ." (*Id.*, 8:14-17.) Thus, Wahl discloses a port that is used to fill the interior cavity.

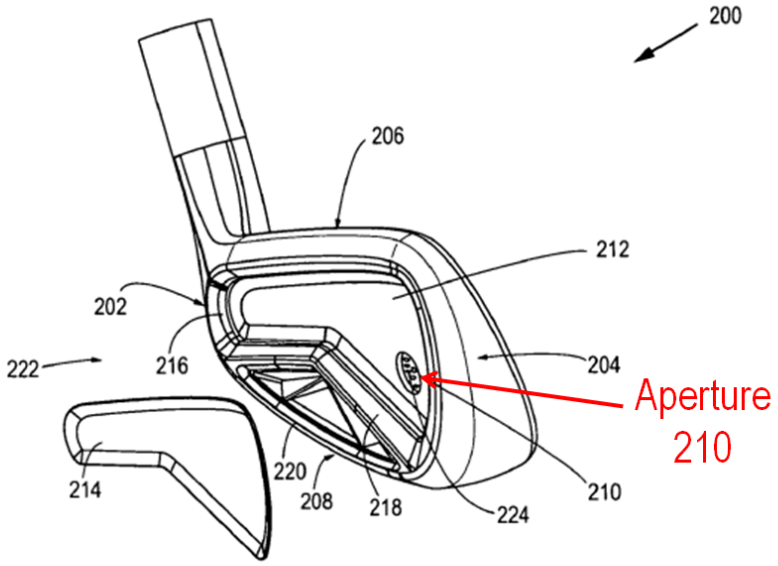


Fig. 2A

(TMG1004, Fig. 2A (Annotated).)

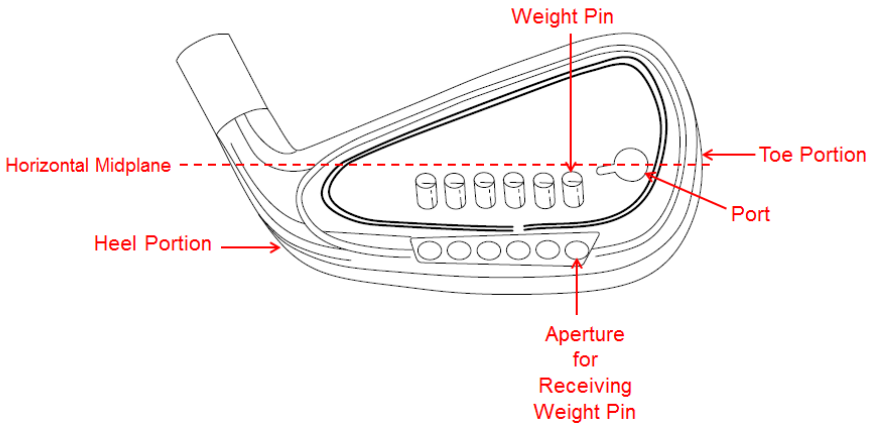
115. Wahl contemplates various filler materials and lists over 20 types including "viscoelastic elastomers" and "styrene/isoprene block copolymers." (*Id.*, 4:53-58.) A POSA would have known that, at least, for example, "viscoelastic elastomers" and "styrene/isoprene block copolymers" are "elastic polymer materials."

116. Wahl also discloses that the filler material can be "non-expanding foam such as injection foam, urethane, two part foam, or chemical initiated expansion foam." (*Id.*, 13:59-64.) Although Wahl does not expressly describe how the filler material is disposed into the cavity, Wahl's reference to "injection foam" and "expansion foam" would have suggested to a POSA that the filler material, in

at least some embodiments, is injection molded—a well-known method of filling a hollow club. (*See, e.g.*, TMG1021, Abstract, 5, ¶5, 7, ¶4, Figs. 4, 6-7.) Thus, at the very least, it would have been obvious to a POSA to use injection molding to fill Wahl's cavity. Accordingly, Wahl renders element [8.5] obvious.

6. "at least one weight portion coupled to the body portion at a location below a horizontal midplane of the golf club head" [8.6]

117. The combination of the Wahl '496 weight insert, and corresponding weight pins, with the club head of Wahl, discloses element [8.6]. The composite image below illustrates an obvious way to combine the weight insert of Wahl '496 on the back surface of Wahl's club head. It would have been obvious to a POSA to have the fill port in or near a location illustrated in Wahl, such as, for example, the location shown in Figure 2A of Wahl. Likewise, it would have been obvious for a POSA to place the weight insert in approximately the location shown below at least because it is similar to the location of the weight insert in the club head shown in Figure 5A of Wahl '496 and because of the well-known desirability of lowering the CG of a club head. (TMG1004, 9:51-57; Sections V.B, V.D.) As shown below, the weight ports, and corresponding weight portions, are located below the horizontal midplane. Accordingly, Wahl renders element [8.6] obvious.



(TMG1004, Fig. 4 and TMG1005, Fig. 5B (Modified, Annotated).)

7. "wherein a width of the interior cavity at or below the horizontal midplane and above the at least one weight portion is greater than a width of the interior cavity near the top portion and greater than a width of the interior cavity between the at least one weight portion and the face portion" [8.7]

118. The combination of Wahl's embodiments discloses the claimed cavity widths. As discussed above, a POSA would have been motivated to add the weight insert of Wahl '496 into Wahl's club head to optimize the CG. (*Supra* Sections IX.A and IX.C.6.) And so a POSA would have turned to Wahl '496 for ways to integrate the weights into Wahl's club head. Figure 7 of Wahl '496 illustrates a modified embodiment of Figure 5A, previously discussed, and demonstrates one way to incorporate the weight insert of Wahl '496 into a hollow, iron-type club, like Wahl. (TMG1005, 7:38-64.) It would have been obvious to a POSA to modify Wahl's cavity as configured in Figure 7 of Wahl '496 in order to accommodate the weight portion at least because it would been the use of a known technique to

improve similar devices in the same way. The resulting club head would have the cavity shape shown in Figure 7 of Wahl ’496, filled with a polymer material as disclosed in Wahl. As shown below, a horizontal midplane is drawn parallel to a ground plane tangent to the sole portion and halfway between the ground plane and a plane tangent to the uppermost point of the top portion.

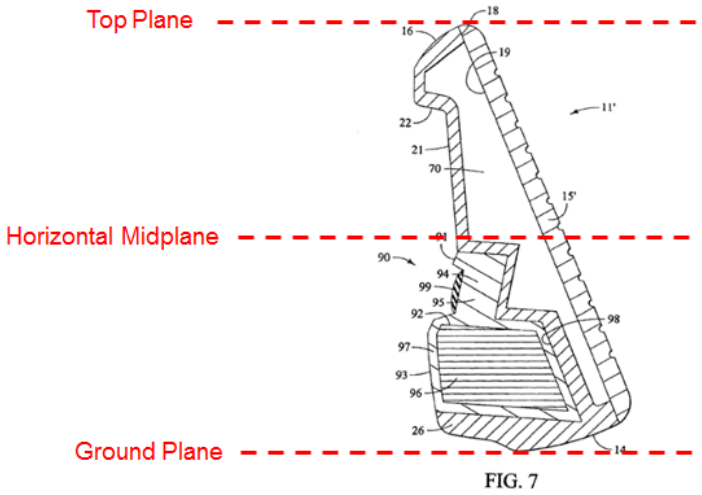


FIG. 7

(TMG1005, Fig. 7 (Annotated).)

119. Again, the ’220 patent does not expressly describe how to measure the distances of the claimed elements to determine which is “closer” to the face portion, nor does the ’220 patent provide specific distances from these features to the face portion. Instead, PXG presumably relies on the Figures as disclosing the relative distances. (TMG1002, 223-224, 232.) As shown below in Figure 38, for example, lines 3840 and 3842 show the distances being measured from the back surface of the face portion in a direction perpendicular to the back surface. (*See*,

e.g., TMG1001, Figs. 37-41.) Furthermore, when discussing absolute distances, a POSA would typically assume the distance in question is the *minimum* distance, measured using lines perpendicular to a planar surface. This is because there is only one minimum distance between any two objects, but there are, of course, many other distances depending on the measurement path. Thus, without any other guidance, a POSA would have taken the distance from a feature to the face portion along a line perpendicular to the back surface of the face portion, which also matches the apparent measurement method used in the ’220 patent.

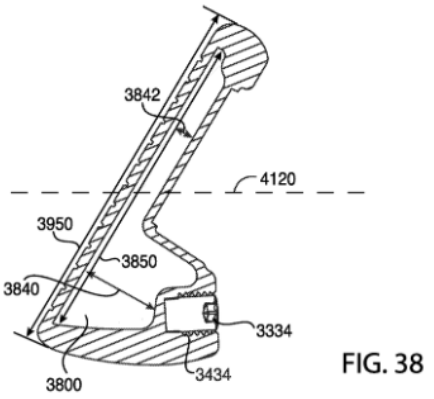


FIG. 38

(TMG1001, Fig. 38.)

120. Even if the drawings in Wahl are not drawn to scale, in my opinion, these drawings at least render obvious the features recited in element [8.7], as they clearly disclose to a POSA having different widths of the cavity at various locations from the sole portion to the top portion of the club head. As shown below, cavity width distance “A” near the top portion and cavity width distance “C” between the weight portion and the face portion are both less than cavity width

distance "B" located between the horizontal midplane and the weight portion. Accordingly, Wahl renders obvious element [8.7].

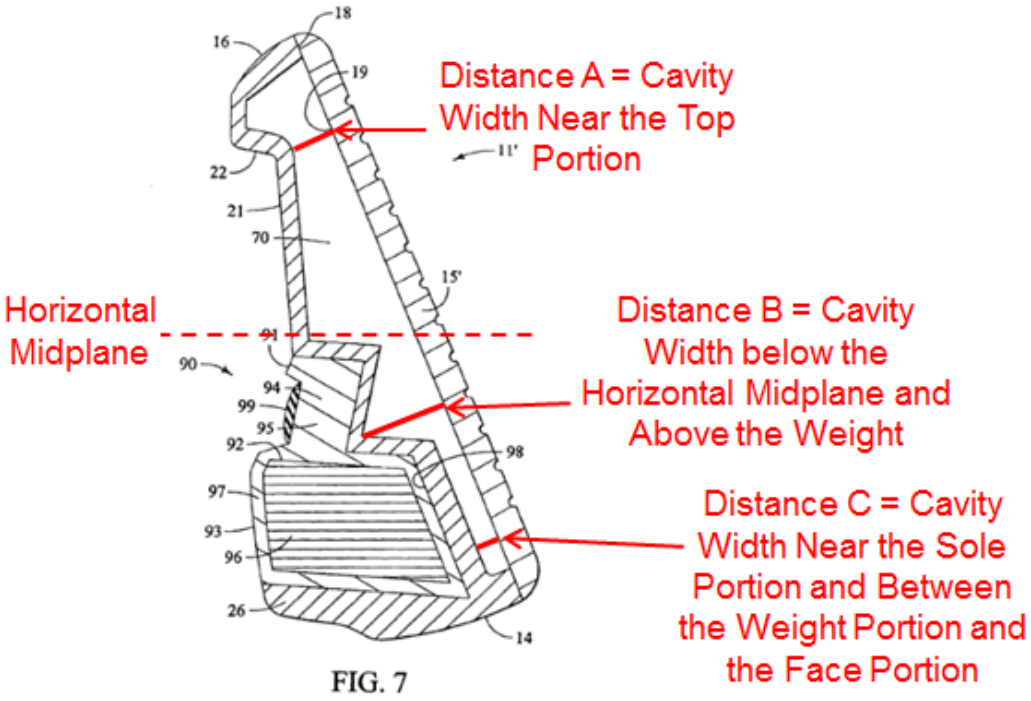


FIG. 7

(TMG1005, Fig. 7 (Annotated).)

D. Wahl Renders Claim 13 Obvious

121. Many of the elements of independent claim 13 are the same or similar to those in independent claims 1 and 8, and so much of my analysis for claims 1 and 8 also applies to claim 13.

1. “[a] golf club head” [13.1]

122. Wahl, titled “Golf Club Head,” in particular, discloses “[a]n iron-type golf club head….” (TMG1004, Abstract, 1:40-41, 3:26-28.) Thus, Wahl renders obvious element [13.1].

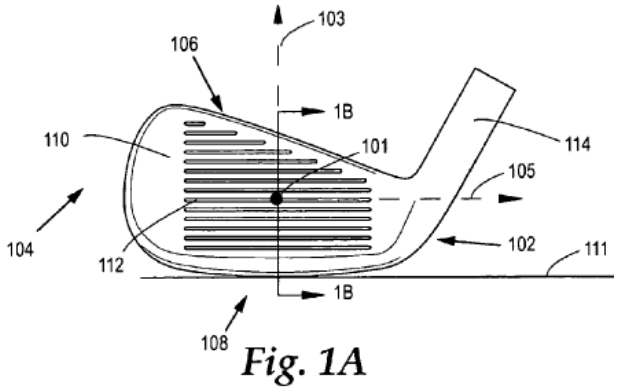


Fig. 1A

(TMG1004, Fig. 1A.)

2. “a face portion”[13.2]

123. Wahl’s club head, like all golf club heads, includes a “striking face 110.” (*Id.*, 3:28, Fig. 1A.) Accordingly, Wahl renders element [13.2] obvious.

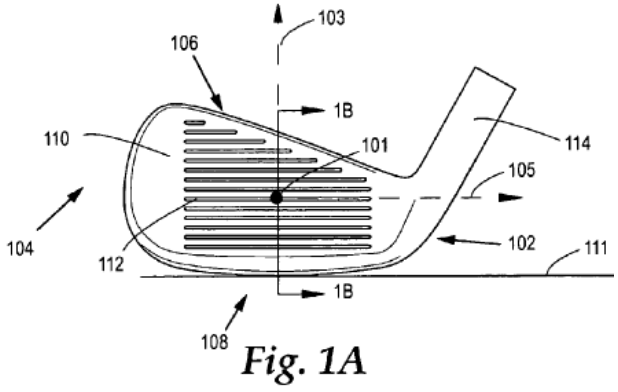


Fig. 1A

(TMG1004, Fig. 1A)

3. "[13.3a] a body portion having a toe portion, a heel portion, a top portion, a sole portion, a back portion, and [13.3b] an interior cavity extending between the top and sole portions"

a) Element [13.3a]

124. Like every golf club, Wahl discloses that the golf club head has a body portion that includes "a *heel portion*, *a sole portion*, *a toe portion*, *a top-line portion*, a front portion, a rear portion, and a striking face" and "[t]he hollow iron golf club head 100 further includes a back portion 128." (*Id*., 1:41-42 (emphasis added), 2:30-33, 3:26-29, 3:61-62 Figs. 1A, 1D.) The term "top-line portion" is the more common term for what the '220 patent calls the top portion, although in my opinion a POSA would have understood the top portion to be an equivalent term. Accordingly, Wahl renders element [13.3a] obvious.

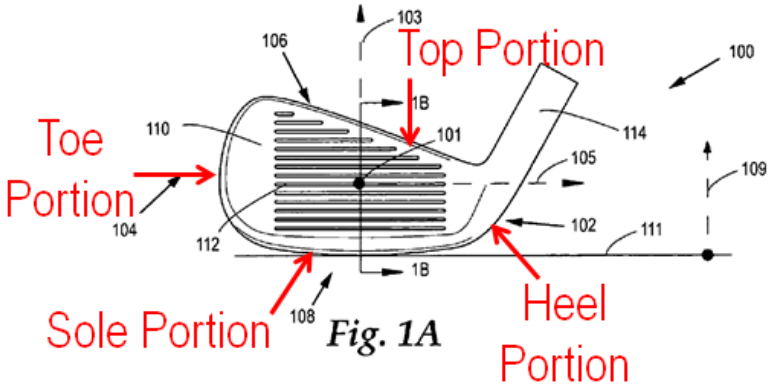


Fig. 1A

(TMG1004, Fig. 1A (Annotated).)

b) Element [13.3b]

125. Wahl discloses that "back wall 132 encloses the entire back portion 128 of the club head to define a *cavity 120* that is primarily filled with a filler material 121." (*Id*., 4:14-17 (emphasis added), Fig. 1B.) As shown below in Annotated Figure 1B, the interior cavity (120) extends between the top line portion (106) and the sole portion (108). Thus, Wahl renders obvious element [13.3b].

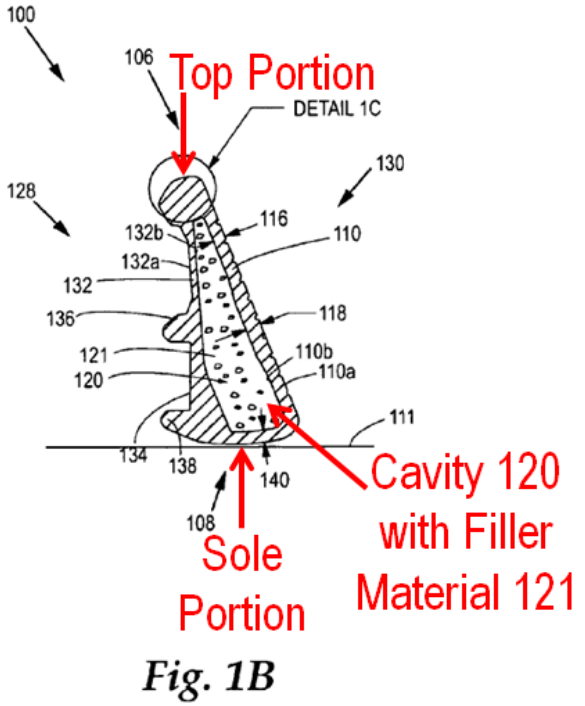


Fig. 1B

(TMG1004, Fig. 1B (Annotated).

4. "at least one port located closer to the toe portion than the heel portion and connected to the interior cavity" [13.4]

126. Wahl discloses that "[a]n aperture 210 is located in the back wall 212 and can be used for filling the hollow iron 200 with a sound dampening filler material 224." (*Id.*, 8:14-16.) Thus, the aperture (i.e., port) is connected to the

interior cavity. As shown below in Figure 2A, aperture 210 is located closer to the toe portion than the heel portion.

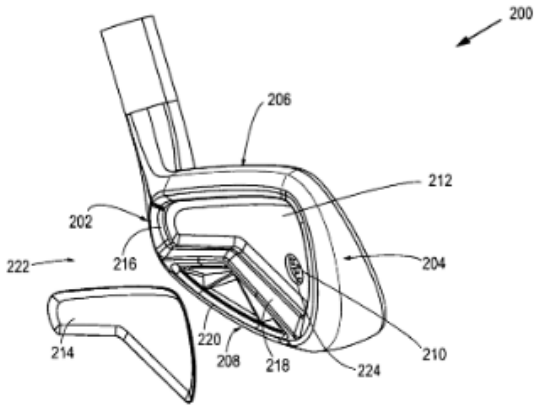


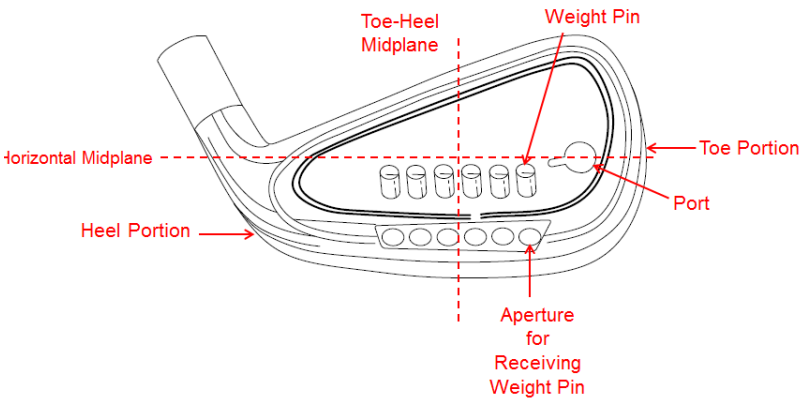
Fig. 2A

(TMG1004, Fig. 2A.)

127. In a similar embodiment, Wahl discloses that "the aperture 338 *can be located anywhere on the club head body surface* other than the front striking face. For example, the aperture 338 can be located on the sole, toe, heel, or top line surfaces." (*Id*., 10:53-57 (emphasis added).) Thus, at the very least, it would have been obvious for a POSA to locate the port closer to the toe portion than the heel portion given the finite number of possible port locations due to the limited space available on the back surface of the club. Accordingly, Wahl renders element [13.4] obvious.

5. "at least one weight portion located closer [to] the toe portion than the heel portion and located between the at least one port and the heel portion" [13.5]

128. The combination of the Wahl '496 weight insert, and corresponding weight pins, with the club head of Wahl, discloses element [13.5]. The composite image below illustrates an obvious way to combine the weight insert of Wahl '496 on the back surface of Wahl's club head. It would have been obvious to a POSA to have the fill port in or near a location illustrated in Wahl, such as, for example, the location shown in Figure 2A of Wahl. Likewise, it would have been obvious for a POSA to have the weight insert in approximately the location shown below at least because it is similar to the location of the weight insert in the club head shown in Figure 5A of Wahl '496 and because of the well-known desirability of lowering the CG of a club head. (*Id*., 9:51-57; Sections V.B, V.D.) As shown below, the resulting combination discloses this claim element. Accordingly, Wahl renders element [13.5] obvious.



(TMG1004, Fig. 4; TMG1005, Fig. 5B (Modified, Annotated).)

6. "wherein the interior cavity is filled with a polymer material from the at least one port" [13.6]

129. Wahl discloses that "[a]n aperture 210 is located in the back wall 212 and can be used for filling the hollow iron 200 with a sound dampening filler material," and thus Wahl's port is used to fill the interior cavity. (*Id*., 8:14-16.) Wahl also discloses that "the filler material occupies about 50% to about 99% of the total club head cavity volume." (*Id*., 15:7-8.) A POSA would have understood "about 99%" to mean filling the entire club head. Filler materials can include viscoelastic elastomers, vinyl copolymers, polyesters, polyurethanes, thermoset and thermoplastic rubbers, and foamed polymers. (*Id*., 4:18-25, 4:51-5:3.) A POSA would have known that, at least, for example, "viscoelastic elastomers" and "styrene/isoprene block copolymers" are "polymer materials." Accordingly, Wahl renders element [13.6] obvious.

7. "wherein a first portion of the polymer material above a horizontal midplane of the body portion has a first width, a second portion of the polymer material below the horizontal midplane has a second width greater than the first width, and a third portion of the polymer material between the first portion and the second portion has a third width greater than the first width and greater than the second width, and wherein the third portion is located between the at least one weight portion and the top portion" [13.7]

130. The combination of Wahl's embodiments discloses the claimed cavity widths. As discussed above, a POSA would have been motivated to add the weight insert of Wahl '496 into Wahl's club head to optimize the CG. (*Supra* Sections

IX.A, IX.C.6.) And so a POSA would have turned to Wahl ’496 for ways to integrate the weights into Wahl’s club head. Figure 7 of Wahl ’496 illustrates a modified embodiment of Figure 5A, previously discussed, and demonstrates one way to incorporate the weight insert of Wahl ’496 into a hollow, iron-type club, like Wahl. (TMG1005, 7:38-64.) It would have been obvious to a POSA to modify Wahl’s cavity as to match the cavity in Figure 7 of Wahl ’496 in order to accommodate the weight portion at least because it would been the use of a known technique to improve similar devices in the same way. As discussed above, Wahl discloses completely filling the interior cavity with filler material, and thus the cavity width and polymer width are equal. (TMG1004, 15:7-8.) The resulting club head would have the cavity shape shown in Figure 7 of Wahl ’496, filled with a polymer material as disclosed in Wahl.

131. Once again, the ’220 patent does not expressly describe how to measure the distances of the claimed elements to determine which is “closer” to the face portion, nor does the ’220 patent provide specific distances from these features to the face portion. Instead, PXG presumably relies on the Figures as disclosing the relative distances. (TMG1002, 223-224, 232.) As shown below in Figure 38, for example, lines 3840 and 3842 show the distances being measured from the back surface of the face portion in a direction perpendicular to the back surface. (*See, e.g.*, TMG1001, Figs. 37-41.) Furthermore, when discussing absolute

distances, a POSA would typically assume the distance in question is the *minimum* distance, measured using lines perpendicular to a planar surface. This is because there is only one minimum distance between any two objects, but there are, of course, many other distances depending on the measurement path. Thus, without any other guidance, a POSA would have taken the distance from a feature to the face portion along a line perpendicular to the back surface of the face portion, which also matches the apparent measurement method used in the ’220 patent.

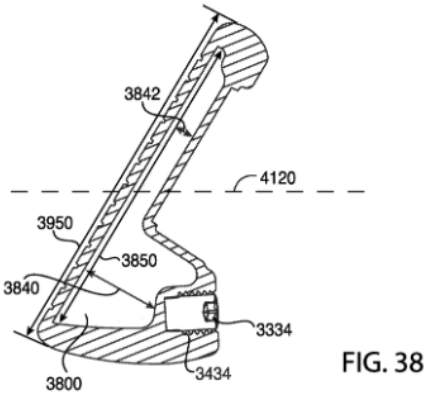


FIG. 38

(TMG1001, Fig. 38.)

132. Even if the drawings in Wahl are not drawn to scale, in my opinion, as shown below, these drawings at least render obvious the features recited in element [13.7] as they clearly disclose to a POSA having different widths of the cavity at various locations from the sole portion to the top portion of the club head. As shown below, cavity width distance “A” above the horizontal midplane is less than cavity width distance “C” below the horizontal midplane and both are less than cavity width distance “B,” which is located between distance “A” and distance “C”

and between the weight portion and the top portion. Accordingly, Wahl renders obvious the element [13.7].

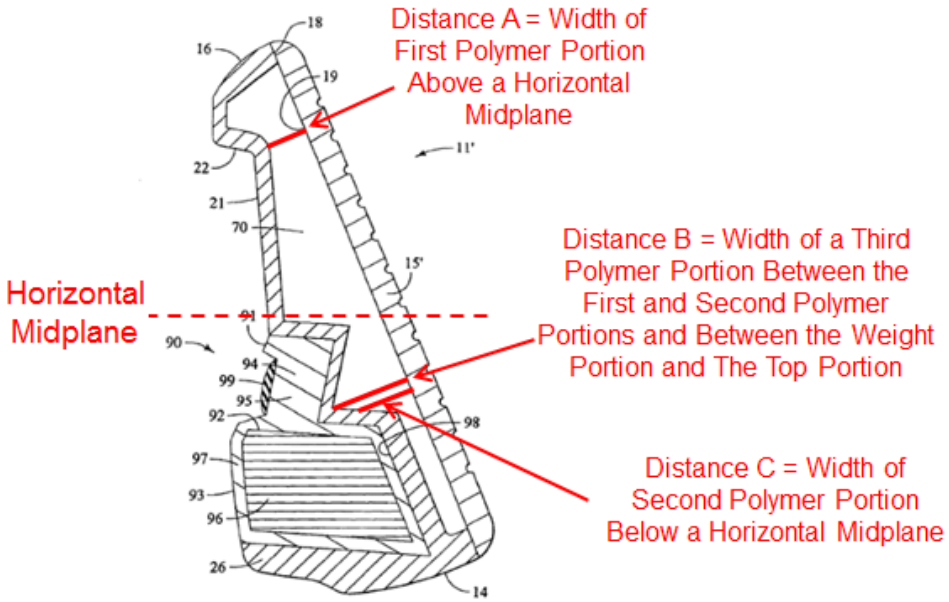


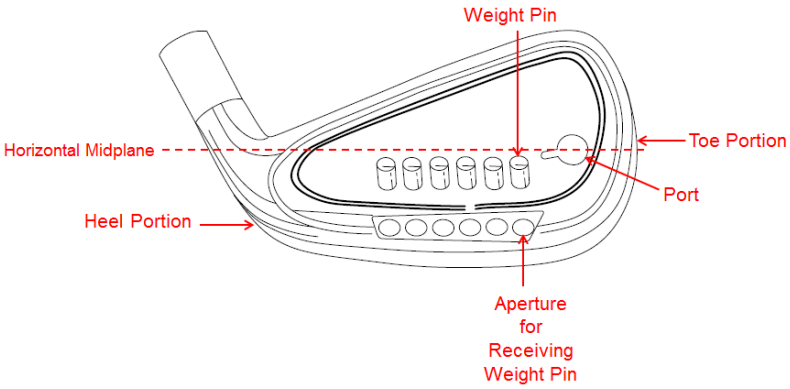
FIG. 7

(TMG1005, Fig. 7 (Annotated).)

E. Wahl Renders Claim 2 Obvious

133. Claim 2 recites "wherein the at least one port is located at or near a periphery of the body portion." The '220 patent does not define the term "periphery," but based on the location of the ports in the Figures of the '220 patent and how a POSA would have understood the term "periphery," the location of the port shown below in modified Figure 4 of Wahl discloses a port located at, or at least near, a periphery of the body portion, which is all that claim 2 requires. (TMG1025, 615 (defining periphery as an "outward bound[ary]: border area,

border, bound"); *see also* TMG1014, 1151 (defining periphery as "a line or surface acting as a boundary").)

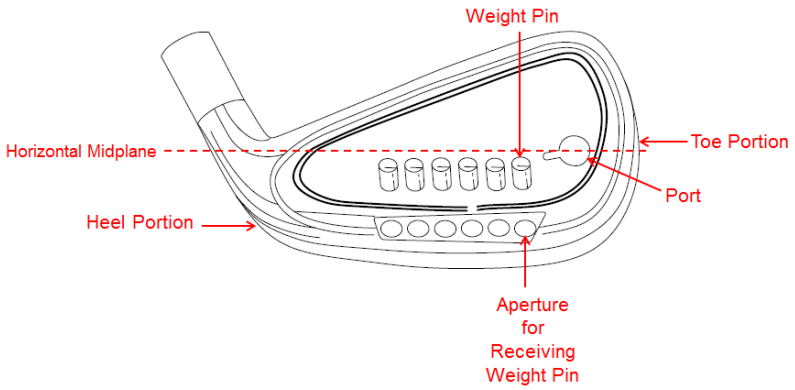


(TMG1004, Fig. 4 (Modified, Annotated).)

134. Furthermore, as discussed above in Section IX.B.4, Wahl also discloses that "the aperture 338 can be located anywhere on the club head body surface other than the front striking face. For example, the aperture 338 can be located on the sole, toe, heel, or top line surfaces." (TMG1004, 10:53-57.) Thus, it would have also been obvious to position the port near the periphery of the head, for example, on the toe, because of the limited space on the back surface of the club. Accordingly, Wahl renders claim 2 obvious.

F. Wahl Renders Claims 3 and 16 Obvious

135. Claims 3 and 16 recite "wherein the at least one port is located at or below the horizontal midplane." As shown below in modified Figure 4 of Wahl, the port is located at or below the horizontal midplane.



(TMG1004, Fig. 4 (Modified, Annotated).)

136. As discussed above in Section IX.B.4, Wahl also discloses that "the aperture 338 can be located anywhere on the club head body surface other than the front striking face. For example, "the aperture 338 can be located on the sole, toe, heel, or top line surfaces." (*Id.*, 10:55-57.) Thus, it would have also been obvious to position the port at or below the horizontal midplane of the head because of the limited space on the back surface of the club. Accordingly, Wahl renders claims 3 and 16 obvious.

G. Wahl Renders Claims 4 and 19 Obvious[3]

137. Claims 4 and 19 recite "wherein the polymer material is an elastic polymer material." Wahl discloses many filler materials, including *viscoelastic*

[3] I note that claim 19 depends on claim 1, as-issued and thus claims 4 and 19 appear to add identical limitations to claim 1. The analysis below applies regardless of whether claim 19 depends from claim 1 or claim 13.

elastomers, vinyl copolymers, polyesters, polyurethanes, thermoset and *thermoplastic rubbers*, and foamed polymers. (*Id*., 4:18-25, 4:51-5:3.) A POSA would have known that these materials include "elastic polymer material[s]." Accordingly, Wahl renders claims 4 and 19 obvious.

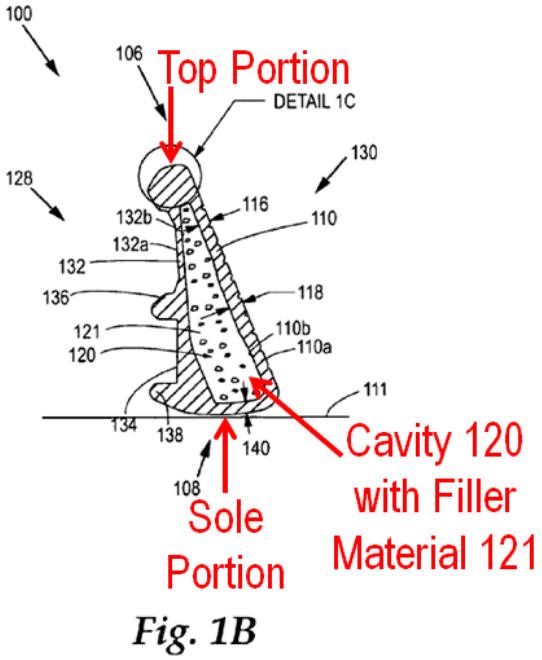


Fig. 1B

(TMG1004, Fig. 1B (Annotated).)

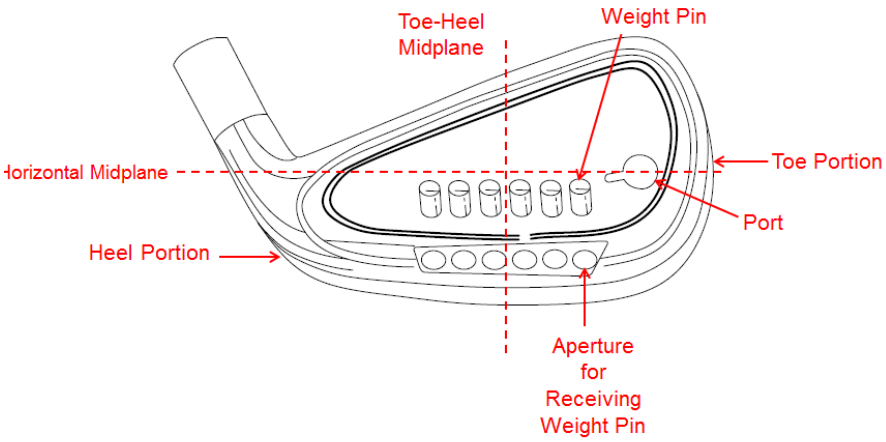
H. Wahl Renders Claims 5 and 17 Obvious[4]

138. Claim 5 recites "wherein the at least one weight portion is located below the horizontal midplane and is located closer to the toe portion than the heel

[4] I note that claim 17 depends on claim 1, as-issued, however, the analysis below applies regardless of whether claim 17 depends from claim 1 or claim 13.

portion" and claim 17 recites "wherein the at least one weight portion is located below the horizontal midplane."

139. The combination of the Wahl '496 weight insert, and corresponding weight pins, with the club head of Wahl, discloses claims 5 and 17. The composite image below illustrates an obvious way to combine the weight insert of Wahl '496 on the back surface of Wahl's club head. It would have been obvious to a POSA to have the fill port in or near a location illustrated in Wahl, such as, for example, the location shown in Figure 2A of Wahl. Likewise, it would have been obvious for a POSA to place the weight insert in approximately the location shown below at least because it is similar to the location of the weight insert in the club head shown in Figure 5A of Wahl '496 and because of the well-known desirability of lowering the CG of a club head. (*Id*., 9:51-57; Sections V.B, V.D.) As shown below, one or more of the weight apertures, and corresponding weight portions, are located below the horizontal midplane and closer to the toe portion than the heel portion. Accordingly, Wahl renders claims 5 and 17 obvious.



(TMG1004, Fig. 4; TMG1005, Fig. 5B (Modified, Annotated).)

I. Wahl Renders Claim 6 Obvious

140. Claim 6 recites "wherein a width of the interior cavity at or below the horizontal midplane and above the at least one weight portion is greater than a width of the interior cavity near the top portion and greater than a width of the interior cavity near the sole portion." The combination of Wahl's embodiments discloses the claimed cavity widths. As discussed above, a POSA would have been motivated to add the weight insert of Wahl '496 into Wahl's club head to optimize the CG. (*Supra* Sections IX.A, IX.C.6.) And so a POSA would have turned to Wahl '496 for ways to integrate the weights into Wahl's club head. Figure 7 of Wahl '496 illustrates a modified embodiment of Figure 5A, previously discussed, and demonstrates one way to incorporate the weight insert of Wahl '496 into a hollow, iron-type club, like Wahl. (TMG1005, 7:38-64.) It would have been obvious to a POSA to modify Wahl's cavity as configured in Figure 7 of Wahl

’496 in order to accommodate the weight portion at least because it would have been the use of a known technique to improve similar devices in the same way. The resulting club head would have the cavity shape shown in Figure 7 of Wahl ’496, filled with a polymer material as disclosed in Wahl. As shown below, a horizontal midplane is drawn parallel to a ground plane tangent to the sole portion and halfway between the ground plane and a plane tangent to the uppermost point of the top portion.

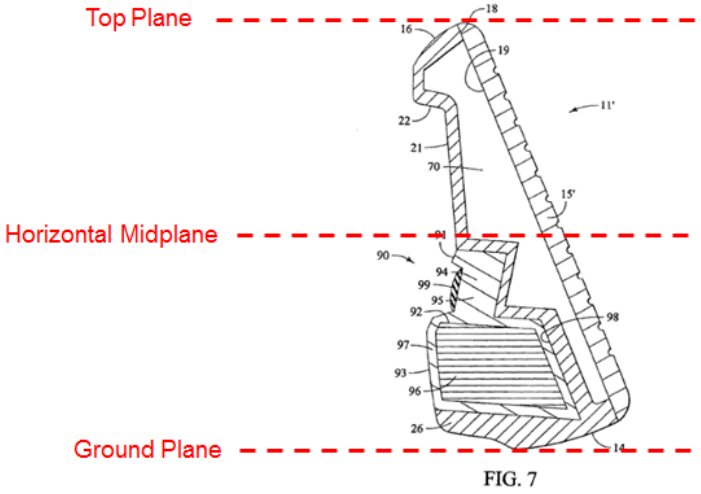


FIG. 7

(TMG1005, Fig. 7 (Annotated.)

141. Again, the ’220 patent does not expressly describe how to measure the distances of the claimed elements to determine which is “closer” to the face portion, nor does the ’220 patent provide specific distances from these features to the face portion. Instead, PXG presumably relies on the Figures as disclosing the relative distances. (TMG1002, 223-224, 232.) As shown below in Figure 38, for

example, lines 3840 and 3842 show the distances being measured from the back surface of the face portion in a direction perpendicular to the back surface. (*See*, *e.g.*, TMG1001, Figs. 37-41.) Furthermore, when discussing absolute distances, a POSA would typically assume the distance in question is the *minimum* distance, measured using lines perpendicular to a planar surface. This is because there is only one minimum distance between any two objects, but there are, of course, many other distances depending on the measurement path taken. Thus, without any other guidance, a POSA would have taken the distance from a feature to the face portion along a line perpendicular to the back surface of the face portion, which also matches the apparent measurement method used in the ’220 patent.

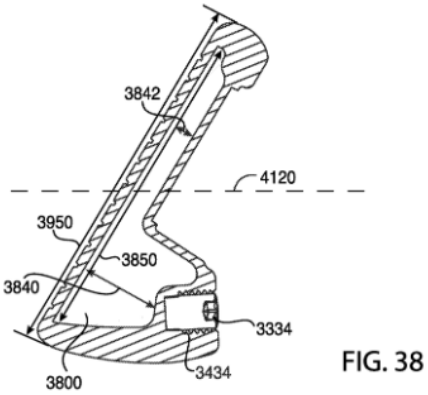


FIG. 38

(TMG1001, Fig. 38.)

142. Even if the drawings in Wahl are not drawn to scale, in my opinion, as shown below, these drawings at least render obvious the features recited in claim 6 as they clearly disclose to a POSA having different widths of the cavity at various locations from the sole portion to the top portion of the club head. As shown

below, cavity width distance "A" near the top portion and cavity width distance "C" near the sole portion are both less than cavity width distance "B," which is located between the horizontal midplane and the weight portion. Accordingly, Wahl renders obvious claim 6.

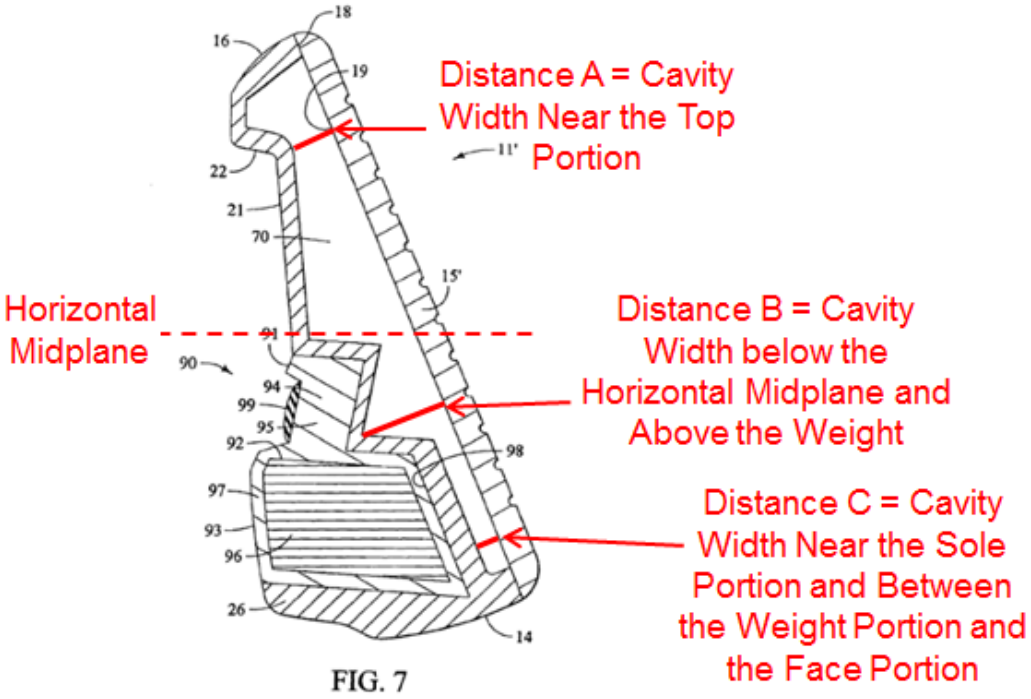


FIG. 7

(TMG1005, Fig. 7 (Annotated).)

J. Wahl Renders Claims 7, 12, and 20 Obvious

143. Claims 7, 12, and 20 recite "wherein the face portion comprises a thickness of less than or equal to 1.9 millimeters (0.075 inch)." Wahl's club head has a face portion. (TMG1004, 3:28-29.) Annotated FIG. 1B identifies the front and back surfaces of Wahl's face portion. (*Id.*, 3:60-61 ("striking face 110 includes

a front surface 110*a* and a rear surface 110*b*.").) "[T]hickness 116" of Wahl's front face can be "between about 1.5 mm and about 2.5 mm, with a *preferred thickness of about 2 mm or less*." (*Id.*, 4:3-5 (emphasis added).) Thus, there is overlap between the claimed thickness range and the range disclosed by Wahl.

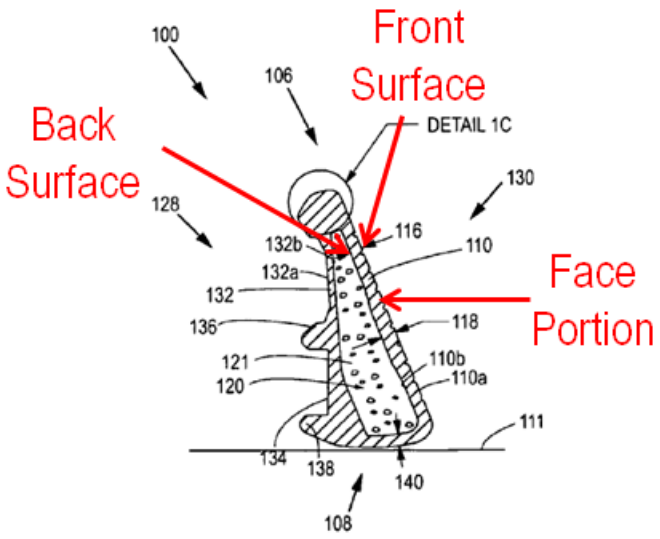


Fig. 1B

(TMG1004, Fig. 1B (Annotated).)

144. Therefore, Wahl renders claims 7, 12, and 20 obvious.

K. Wahl Renders Claim 10 Obvious

145. Claim 10 recites "wherein the interior cavity comprises a cavity having at least 50% filled with a thermoplastic elastomer material." Wahl discloses that "filler material 324 occupies about 50% to about 99% of the total club head cavity volume." (*Id.*, 11:12-13.) Wahl also discloses many filler materials, including *viscoelastic elastomers*, vinyl copolymers, polyesters, polyurethanes,

thermoset and *thermoplastic rubbers*, and foamed polymers. (*Id.*, 4:18-25, 4:51-5:3.) A POSA would have known that these materials include "thermoplastic elastomer material[s]." Accordingly, Wahl renders claim 10 obvious.

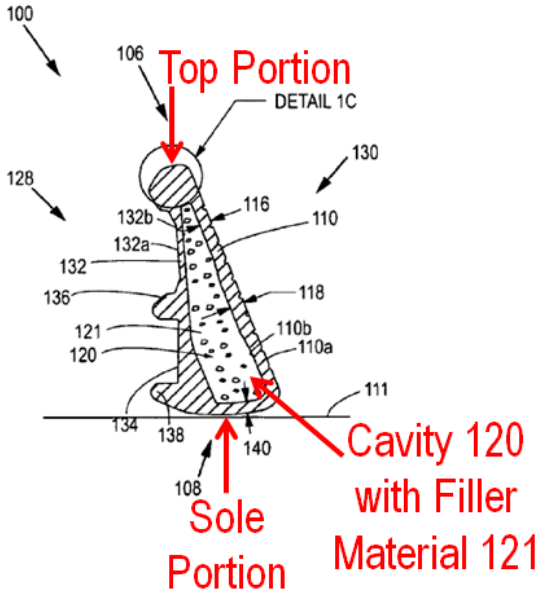


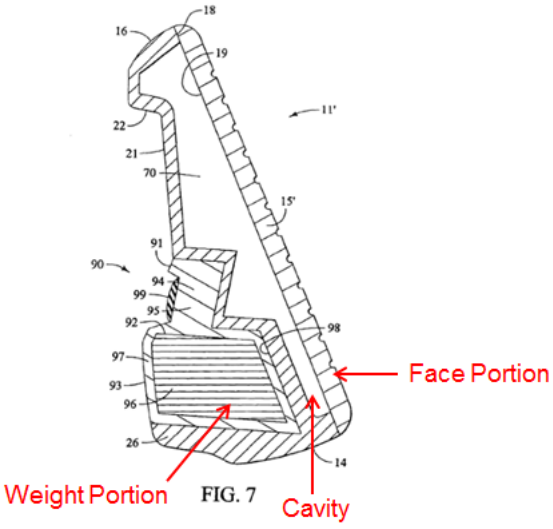
Fig. 1B

(TMG1004, Fig. 1B (Annotated).)

L. Wahl Renders Claim 11 Obvious

146. Claim 11 recites "wherein a portion of the interior cavity is configured to separate the face portion and the at least one weight portion." As discussed above, a POSA would have been motivated to add the weight insert of Wahl '496 into Wahl's club head to optimize the CG. (*Supra* Sections IX.A and IX.C.6.) And so a POSA would have turned to Wahl '496 for ways to integrate the weights into Wahl's club head. Figure 7 of Wahl '496 illustrates a modified embodiment of Figure 5A, previously discussed, and demonstrates one way to incorporate the

weight insert of Wahl ’496 into a hollow, iron-type club, like Wahl. (TMG1005, 7:38-64.) It would have been obvious to a POSA to modify Wahl’s cavity as configured in Figure 7 of Wahl ’496 in order to accommodate the weight portion at least because it would been the use of a known technique to improve similar devices in the same way. The resulting club head would have the cavity shape shown in Figure 7 of Wahl ’496, filled with a polymer material as disclosed in Wahl. And as shown below, the cavity is thus “configured to separate the face portion and the at least one weight portion.” Accordingly, Wahl renders claim 11 obvious.



(TMG1005, Fig. 7 (Annotated).)

M. Wahl Renders Claim 14 Obvious[5]

147. Claim 14 recites "wherein the third width is between the at least one weight portion and the horizontal midplane." Claim 14 depends from claim 1, and as discussed above in that claim, a POSA would have turned to Wahl '496 for ways to integrate the weights into Wahl's club head. Figure 7 of Wahl '496 illustrates a modified embodiment of Figure 5A, previously discussed, and demonstrates one way to incorporate the weight insert of Wahl '496 into a hollow, iron-type club, like Wahl. (*Id*.; *supra* Section IX.B.8.) It would have been obvious to a POSA to modify Wahl's cavity as configured in Figure 7 of Wahl '496 in order to accommodate the weight portion at least because it would have been the use of a known technique to improve similar devices in the same way. Wahl discloses completely filling the interior cavity with filler material, and thus the cavity width and polymer width are equal. (TMG1004, 15:7-8.) The resulting club head would have the cavity shape shown in Figure 7 of Wahl '496, filled with a polymer material as disclosed in Wahl.

[5] I note that claim 14 depends on claim 1, as-issued, however, claim 1 does not recite a "third width." It appears that claim 14 should depend from claim 13. The analysis below applies regardless of whether claim 14 depends from claim 1 or claim 13.

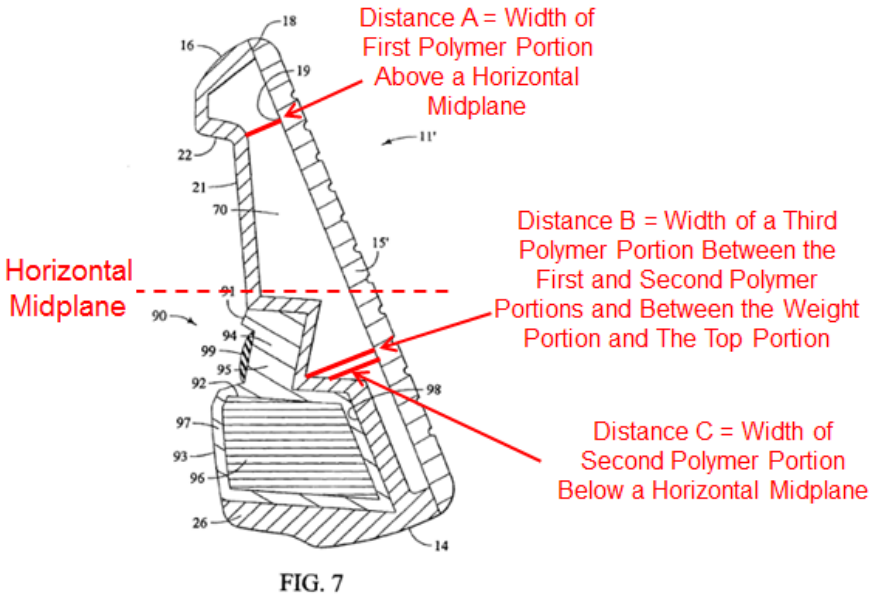


FIG. 7

(TMG1005, Fig. 7 (Annotated).)

148. As shown above, cavity width distance "A" above the horizontal midplane and cavity width distance "C" below the horizontal midplane are both less than cavity width distance "B," which is located between distance "A" and distance "C" and between the weight portion and the horizontal midplane. Accordingly, Wahl renders claim 14 obvious.

N. Wahl Renders Claim 15 Obvious

149. Claim 15 recites "wherein a portion of the at least one weight portion is closer to the face portion than a portion of the polymer material in the interior cavity." As discussed above, a POSA would have been motivated to add the weight insert of Wahl '496 into Wahl's club head to optimize the CG. (*Supra* Sections IX.A and IX.B.5.) And so a POSA would have turned to Wahl '496 for ways to

integrate the weights into Wahl's club head. Figure 7 of Wahl '496 illustrates a modified embodiment of Figure 5A, previously discussed, and demonstrates one way to incorporate the weight insert of Wahl '496 into a hollow, iron-type club, like Wahl. (TMG1005, 7:38-64.) It would have been obvious to a POSA to modify Wahl's cavity as configured in Figure 7 of Wahl '496 in order to accommodate the weight portion at least because it would been the use of a known technique to improve similar devices in the same way. The resulting club head would have the cavity shape shown in Figure 7 of Wahl '496, filled with a polymer material as disclosed in Wahl.

150. Once again, the '220 patent does not expressly describe how to measure the distances of the claimed elements to determine which is "closer" to the face portion, nor does the '220 patent provide specific distances from these features to the face portion. Instead, PXG presumably relies on the Figures as disclosing the relative distances. (TMG1002, 223-224, 232.) As shown below in Figure 38, for example, lines 3840 and 3842 show the distances being measured from the back surface of the face portion in a direction perpendicular to the back surface. (*See, e.g.*, TMG1001, Figs. 37-41.) Furthermore, when discussing absolute distances, a POSA would typically assume the distance in question is the *minimum* distance, measured using lines perpendicular to a planar surface. This is because there is only one minimum distance between any two objects, but there are, of

course, many other distances depending on the measurement path taken. Thus, without any other guidance, a POSA would have taken the distance from a feature to the face portion along a line perpendicular to the back surface of the face portion, which also matches the apparent measurement method used in the ’220 patent.

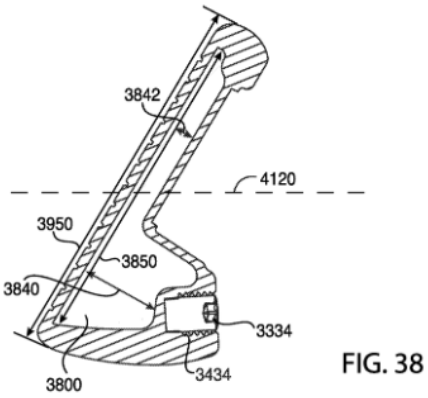


FIG. 38

(TMG1001, Fig. 38.)

151. Even if the drawings in Wahl are not drawn to scale, in my opinion, these drawings at least render obvious the features recited in claim 15, as they clearly disclose to a POSA having different widths of the cavity at various locations from the sole portion to the top portion of the club head.

152. As shown below in annotated Figure 7 of Wahl ’496, a portion of the weight portion is closer to the face portion than a portion of the polymer material in the combined Wahl-Wahl ’496 club head having the cavity configuration in Figure 7 of Wahl ’496, filled with the polymer material as disclosed in Wahl. And although, like the ’220 patent, Wahl ’496 does not disclose these actual distances, a

POSA would have found the relative relationship disclosed by the Figures. As shown below, the distance "A" between a portion of the polymer material and the face portion is greater than the distance "B" between a portion of the weight portion and the face portion, and thus a portion of the weight portion is closer to the face portion than a portion of the polymer material. Accordingly, Wahl renders claim 15 obvious.

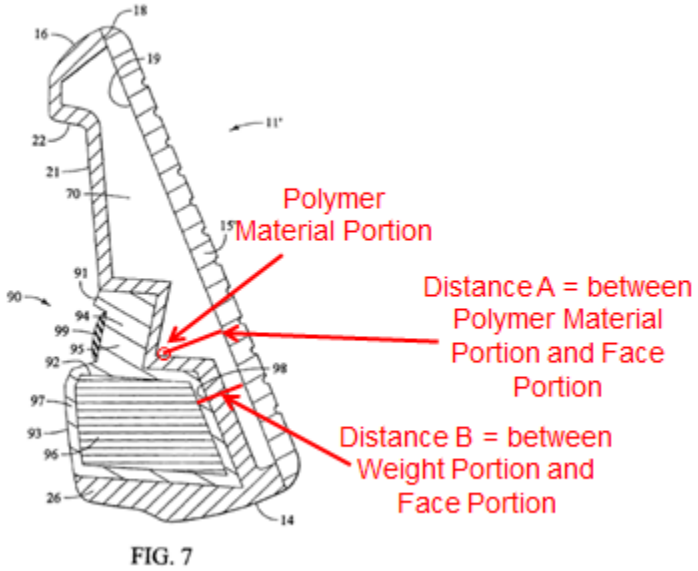


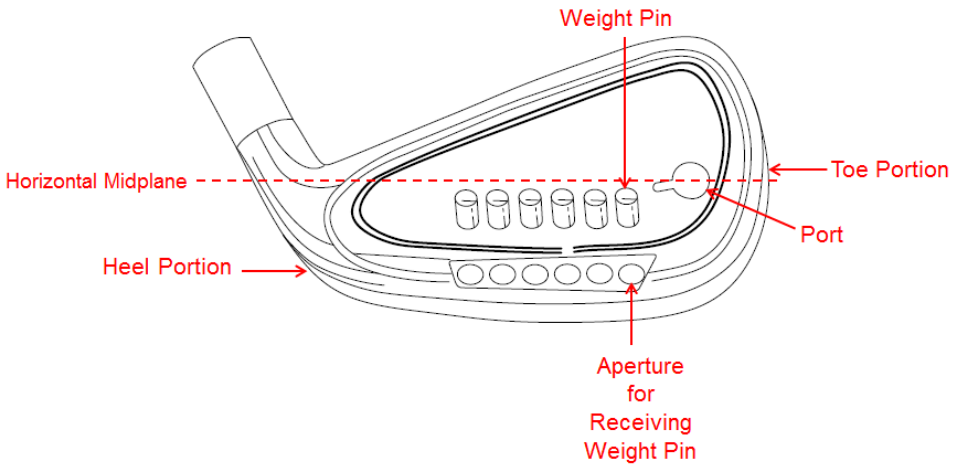
FIG. 7

(TMG1005, Fig. 7 (Annotated).)

O. Wahl Renders Claim 18 Obvious

153. Claim 18 recites "wherein the at least one weight portion is closer to the sole portion than the at least one port." The composite image below illustrates an obvious way to combine the weight insert of Wahl '496 on the back surface of Wahl's club head. It would have been obvious to a POSA to have the fill port in or near a location illustrated in Wahl, such as, for example, the location shown in

Figure 2A of Wahl. Likewise, it would have been obvious for a POSA to place the weight insert in approximately the location shown below at least because it is similar to the location of the weight insert in the club head shown in Figure 5A of Wahl '496 and because of the well-known desirability of lowering the CG of a club head. (TMG1004, 9:51-57; Sections V.B, V.D.) As shown below, the resulting combination discloses a weight port, and corresponding weight portion, that is closer to the sole portion than the port. Accordingly, Wahl renders claim 18 obvious.



(TMG1004, Fig. 4; TMG1005, Fig. 5B (Modified, Annotated).)

X. Ground 2: The Combination of Wahl and Linphone Renders Claim 9 Obvious

A. Motivation for Combining Wahl and Linphone

154. Wahl and Linphone are from the same field of endeavor—iron-type golf clubs. And Wahl recognizes the need for the improvements disclosed Linphone. (TMG1004, 1:28-29, 9:51-57.) For example, Wahl discloses that

"weighting elements, cartridges, and/or inserts or applied bodies" can be utilized for "CG placement, vibration control or damping, or acoustic control or damping." (*Id*., 9:51-53.) Further, Wahl also discloses using an elastic polymer material to dampen vibrations of the club head. (*Id.*, 4:51-5:11, 8:5-19.)

155. A POSA would have recognized Wahl's preferences for minimizing or eliminating "undesirable sounds and vibrations upon impact." (*Id*., 1:29.) One way a POSA would have limited sounds or vibrations was to limit potential movement of the filler material inside the club head and to include an additional cushioning layer. Specifically, a POSA would have applied an adhesive to hold the filler material in place. (*See, e.g.*, TMG1035, 0003.) In addition to reducing the vibrations of the filler material inside the club head, adhering or bonding the filler material to the inside of the club head more efficiently transfers the energy from the hit on the front face into the filler material. This allows the filler material to more quickly dissipate the vibrations of the club head.

156. Linphone discloses such a bonding method. Linphone's disclosed method produces a club head with shock absorbing qualities to minimize undesirable sounds and vibrations. (*Id*.) Linphone teaches bonding the club's filler material to the cavity of the club head using an adhesive. (*Id.*) Linphone's bonding method produces a club head that more effectively dissipates the vibrations of the front face in the filler material by bonding the filler to the face. (*Id.*) A POSA

would have recognized the potential benefits of applying Linphone's bonding method to Wahl's filled club head in order to produce a club head with improved shock absorbing properties. (*Id.*) Accordingly, it would have been obvious to a POSA to combine the teachings of Linphone with those of Wahl.

B. The Combination of Wahl and Linphone Renders Claim 9 Obvious

157. Claim 9 recites "a bonding portion configured to bond the elastic polymer material to the face portion." Linphone discloses a bonding portion, as claimed. (*Id*., 0004.) Linphone describes an iron head 1 formed from a body 11 and striking face 12. (*Id*.) The body 11 and striking face 12 define a hollow cavity 13. (*Id*.) The inner walls of the cavity are sand-blasted to form a rough surface 15, which is depicted in Fig. 3 as including the back surface of the striking face 12. (*Id*.) An adhesive solution 2 is injected into the cavity 13 through a through-hole 14 so that its inner walls and their rough surfaces, including the back surface of the striking face 12, are uniformly coated with the adhesive solution 2. (*Id*.)

158. Linphone describes that the sand-blasting enables the adhesive solution 2 to adhere better to the back surface of the striking face 12. (*Id*.) Thus, a POSA would have understood that the adhesive solution bonds to the back surface of the front face. A POSA would have understood Linphone's adhesive solution to be a bonding portion because it is an adhesive agent, distinct from the elastic

polymer material and the body portion, that joins the elastic polymer material to the body portion.

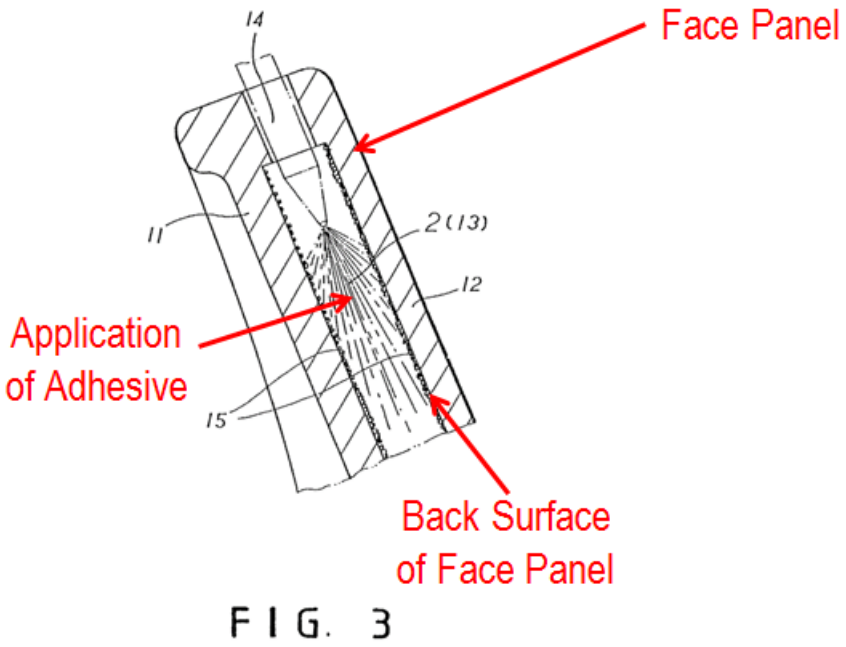


FIG. 3

(TMG1035, Fig. 3 (Annotated).)

159. Linphone describes that a shock-absorbing rubber 3 is injection molded through the through-hole 14 into the adhesive-coated cavity 13 so that it fills the cavity 13, as shown in Fig. 4. (*Id.*) Linphone also states that the disclosed club head manufacturing process "serves to enable the adhesive solution 2, and also the shock-absorbing rubber 4, to adhere better to the inner wall of the cavity 13." (*Id.*)

160. A POSA would have understood that the shock-absorbing rubber described in Linphone can only adhere to the inner wall of the cavity—including the back of the striking face 12—via the intermediary adhesive bonding portion.

That is, a POSA would have understood that when two surfaces are bonded together by an adhesive, each surface bonds to the adhesive. (TMG1042, 8-9.) A POSA would have also understood that Linphone's efficient vibration dissipation relies on bonding the back surface of the front face to the elastic polymer filler material because this facilitates the transmission of energy from the front face to the elastic polymer filler material. Further, a POSA would have recognized that the purpose of adhesive solutions is to bond two or more surfaces together. Therefore, when Linphone describes applying the adhesive solution between the back surface of the face portion and the elastic polymer material, a POSA would have understood that to mean that the adhesive solution bonds to the back surface of the face portion to the elastic polymer material. Thus, Linphone discloses the elastic polymer bonded to the bonding portion. Accordingly, the combination of Wahl and Linphone renders claim 9 obvious.

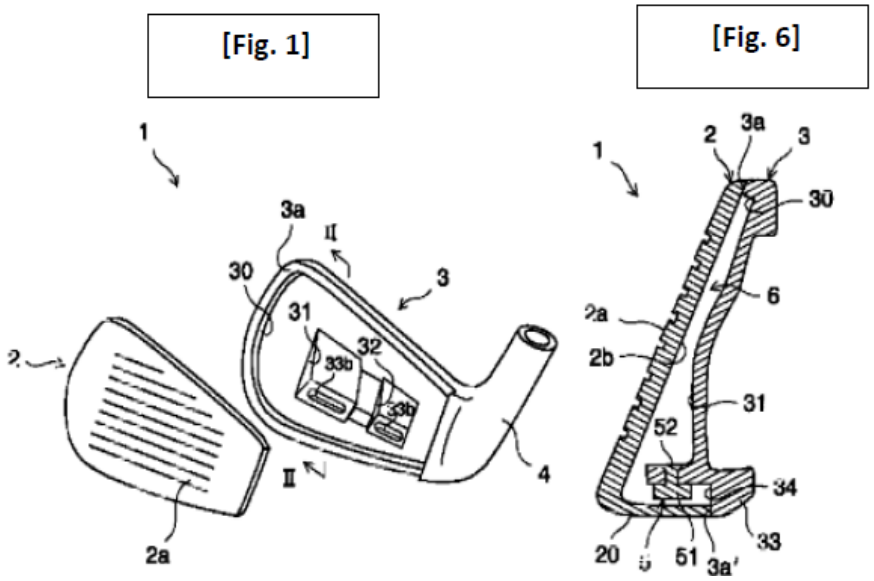
XI. Ground 3: The Combination of Chaen and Lahaix Renders Claims 1-8 and 10-20 Obvious

A. Motivation to Combine Chaen and Lahaix

161. Chaen and Lahaix are both from the same field of endeavor—iron-type golf clubs. (TMG1072, ¶1; TMG1021, 1, 3.) Furthermore, both club heads are, at least initially, hollow. (TMG1072, ¶¶11, 37, 46; TMG1021, 4, Figs. 4-7.)

162. Chaen discloses a hollow, iron-type golf club with weight portions in the sole. (TMG1072, ¶¶11, 37, 46, Fig. 2;.) The weight portions are configured to

lower the center of gravity of the club head. (*Id*., ¶¶11-12, 49-51.) One goal stated in Chaen is maximizing the "repulsive force" of the face portion while maintaining a low center of gravity. (*Id*., ¶10.) This performance characteristic is also known as the "trampoline effect," and is effectively a measure of the "spring" effect of the face, with thinner faces generally having more "spring" to launch the ball at higher velocity. (*See, e.g.*, TMG1023, "Chao", ¶0007.) This effect is measured by the Coefficient of Repulsion, or "COR."



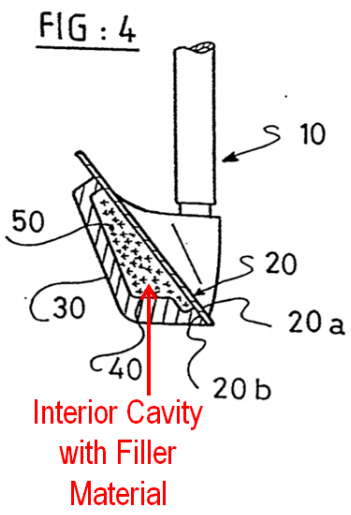
(TMG1072, Figs. 1, 6.)

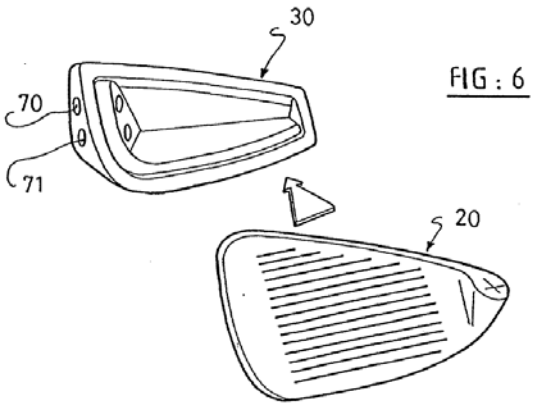
163. Based on Chaen's disclosure, a POSA would have sought to improve the mass distribution and the so-called "trampoline effect" of Chaen's club head to improve club performance. This would have led a POSA to Lahaix, which describes a hollow, iron-type club with a thin face thickness (between one and two millimeters) that is supported by a filled interior cavity. (TMG1021, 2-4.) Lahaix

describes several advantages to using a thin face supported by filling material, as opposed to simply a hollow club head. (*Id.*; *see also supra* Section V.E.) Specifically, a thinner face allows more weight to be distributed to the periphery of the club head, improving the club head's moment of inertia. (TMG1021, 6.) The thinner face also improves club feel on impact and, in combination with the filler material, produces a more pleasing sound. (*Id.*, 2.) And as Lahaix describes, a POSA would have known that with these thinner faces, the filling material "acts as a support in order to prevent the plate from collapsing because of its thinness." (*Id.*, 6.) This allows for a thinner face plate than would otherwise be possible.

164. Accordingly, it would have been obvious to a POSA to combine Chaen and Lahaix because of the advantages that Lahaix's thin face offers. Incorporating Lahaix's thin face and filler into Chaen's club would have simply been a combination of prior art elements according to known methods to yield predictable results. For example, in my opinion, a POSA would have been able to incorporate filling orifices 70 and 71 of Lahaix into the club head of Chaen without difficulty, and then fill Chaen's club head using the reaction injection molding process disclosed in Lahaix. (*Id.*, 5, 7.) Doing so would have improved the function of Chaen's similar device in the same way–optimizing weight distribution, improving club feel, and attenuating sound upon impact. Likewise, the combination would have improved a similar device–Chaen's club head–using a

known method–a thin face plate with a hollow, filled cavity as described in Lahaix. (*Id.*, 6-7.)



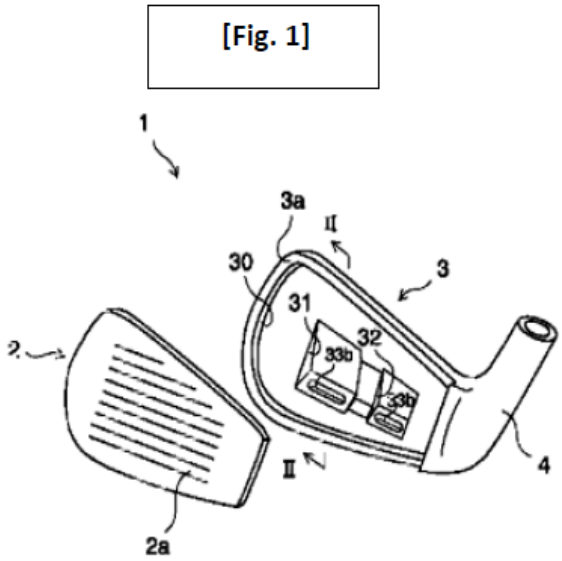


(TMG1021, Figs. 4 (annotated), 6.)

B. The Combination of Chaen and Lahaix Renders Claim 1 Obvious

1. "[a] golf club head" [1.1]

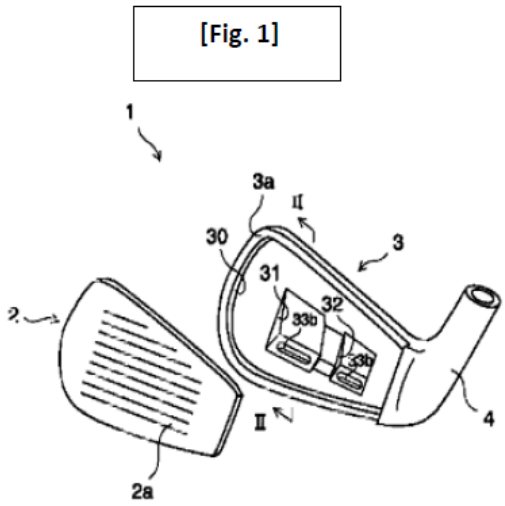
165. Chaen discloses an iron-type golf club head. (TMG1072, ¶¶1, 49, Fig. 1.) Accordingly, the combination of Chaen and Lahaix renders element [1.1] obvious.



(TMG1072, Fig. 1.)

2. "a face portion"[1.2]

166. Chaen's club head includes a "face member 2." (TMG1072, ¶¶ 36, 50, Fig. 1.) Accordingly, the combination of Chaen and Lahaix renders element [1.2] obvious.

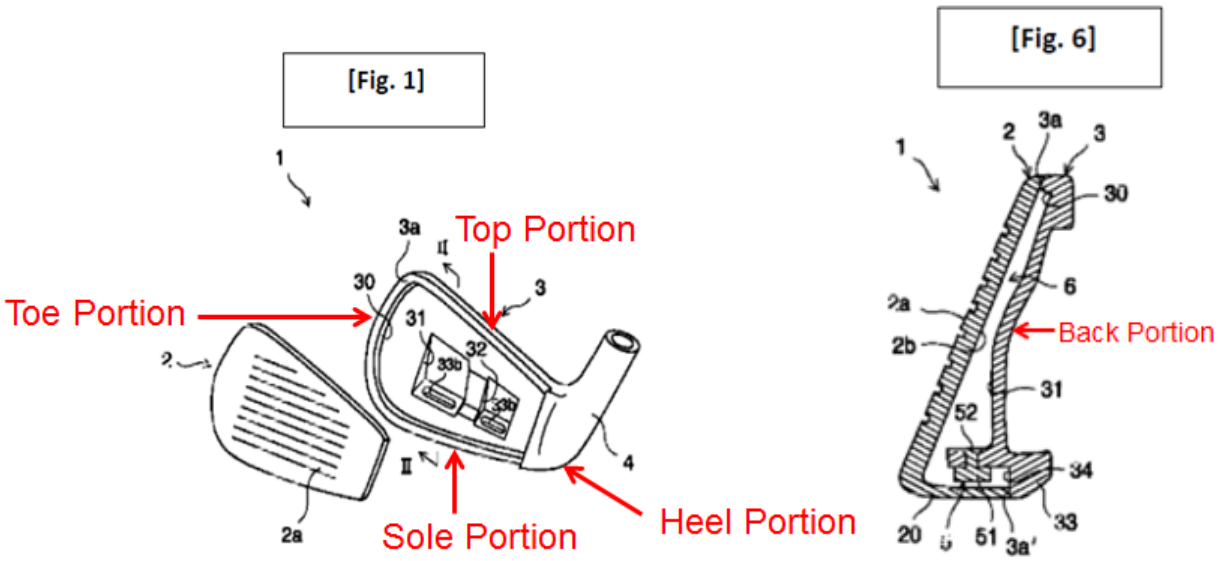


(TMG1072, Fig. 1.)

3. "[1.3a] a body portion having, a toe portion, a heel portion, a top portion, a sole portion, a back portion, and [1.3b] an interior cavity extending between the top and sole portions"

a) Element [1.3a]

167. Chaen discloses a "Sole 33" and a "Back Face Member 3" that a POSA would have understood to be a back portion. (*Id*., ¶¶36, 37, 50.) Like all golf clubs, Chaen's club head also includes a toe portion, heel portion, and top portion, shown below. Accordingly, the combination of Chaen and Lahaix renders element [1.3a] obvious.

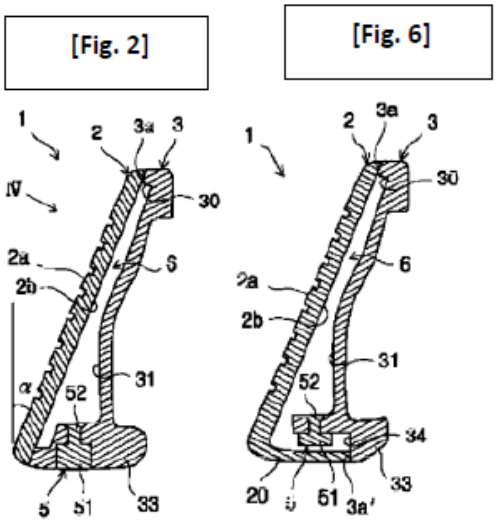


(TMG1072 Figs. 1, 6 (Annotated).)

b) Element [1.3b]

168. Chaen discloses a "[h]ollow [a]rea 6" formed in the interior of the club head. (*Id*., ¶¶37, 50.) As shown below, the hollow portion, or cavity, extends

from the top portion to the sole portion. Accordingly, the combination of Chaen and Lahaix renders element [1.3b] obvious.

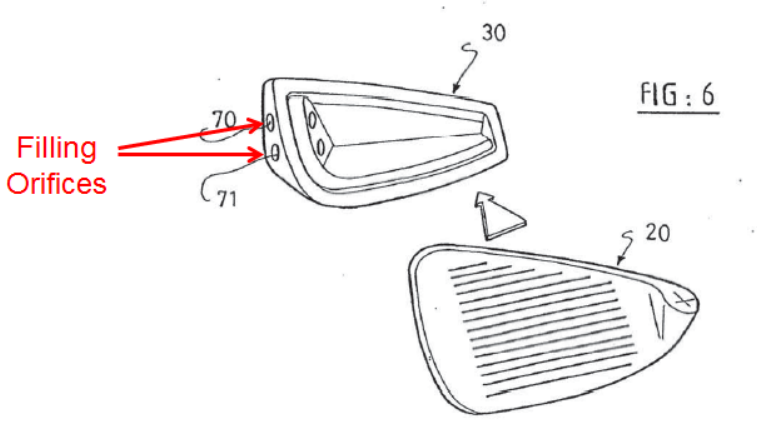


(TMG1072, Figs. 2, 6.)

4. "at least one port located closer to the toe portion than the heel portion and connected to the interior cavity" [1.4]

169. As discussed above, a POSA would have been motivated to fill Chaen's cavity with filler, as disclosed in Lahaix. (Section XI.A.) Thus, it would have been obvious to include Lahaix's filling orifices (70, 71) in Chaen's club head to fill the cavity. A POSA would have found adding Lahaix's filling orifices, located on the toe portion, to Chaen's club head to be a simple modification because of the lack of other significant club features on Chaen's toe portion. The filling orifices would simply extend through the club head material near the toe portion and open into the cavity. Thus, this modification would have been a simple combination of prior art elements. As shown below, Lahaix's orifices are located

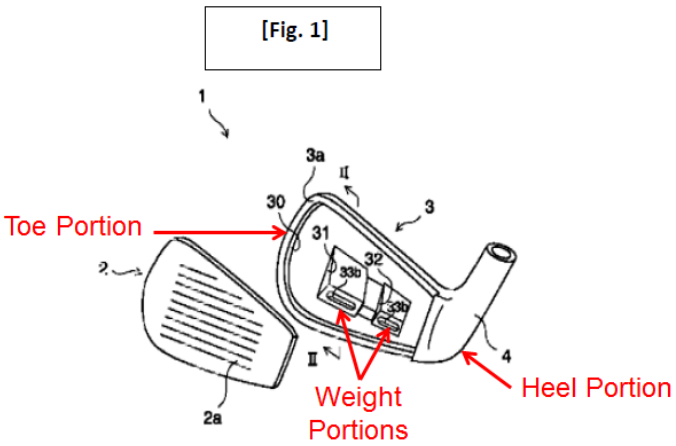
in the toe portion—and thus closer to the toe portion than the heel portion—and are connected to the interior cavity. (TMG1021, Figs. 6, 7.) Accordingly, the combination of Chaen and Lahaix renders element [1.4] obvious.



(TMG1021, Fig. 6 (Annotated).)

5. "at least one weight portion located closer to the heel portion than the at least one port" [1.5]

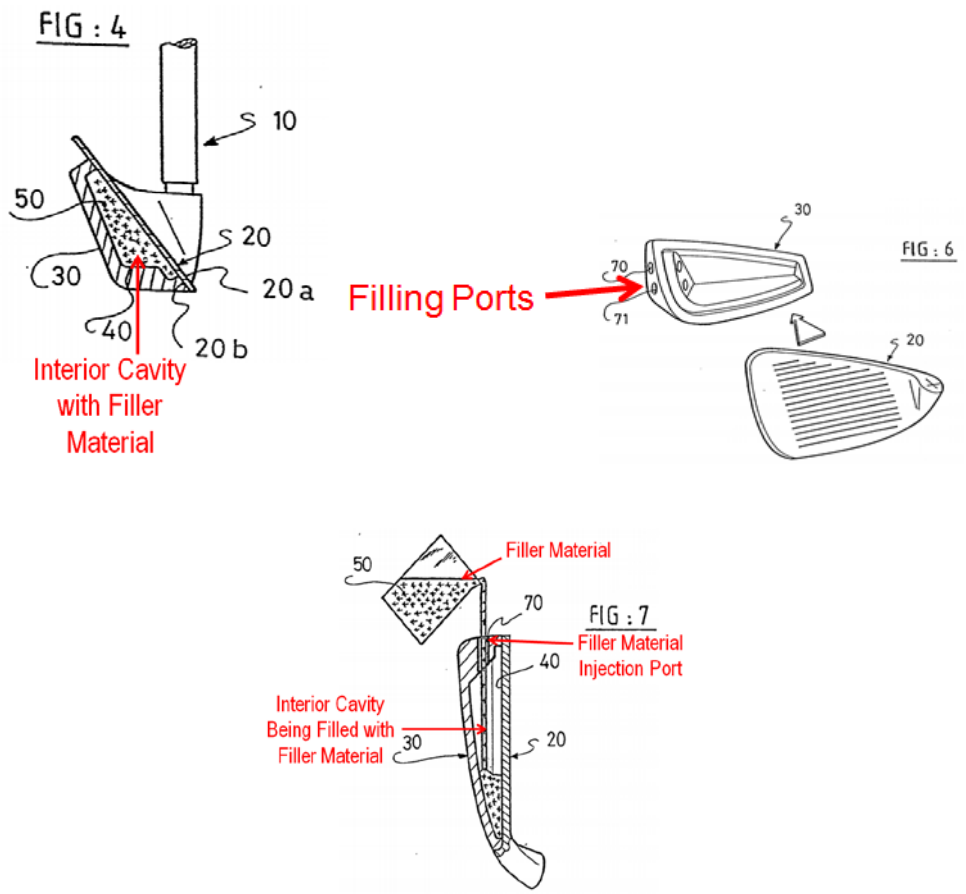
170. As shown below in Figure 1, Chaen discloses weight portions in the sole of the club head. (TMG1072, ¶¶38, 49-51, Figs. 1, 6.) As discussed above in element [1.4], the combined Chaen-Lahaix club head would include the filling orifices in the toe portion. (*Supra* Section XI.B.4.) Thus, both of the weight portions shown below are "located closer to the heel portion than the at least one port" because the port is located in the toe portion–the farthest location from the heel. Accordingly, the combination of Chaen and Lahaix renders element [1.5] obvious.



(TMG1072, Fig. 1 (Annotated).)

6. "wherein the interior cavity is filled with a polymer material from the at least one port" [1.6]

171. Lahaix discloses that internal cavity volume "is occupied by a non-metal filling material" and that the cavity can be "wholly filled by the filling material." (TMG1021, 2, 5, Fig. 4.) Lahaix also discloses that "[t]he filling material may be a thermoplastics or elastomer material," which a POSA would have understood to include "polymer material[s]." (*Id.*, 4.) And Lahaix discloses that elastomers "which can be worked by the RIM (Reaction Injection Moulding) process are preferred" and introducing the filling material "through a filling orifice (70, 71) which communicates with the internal cavity." (*Id.*, 5, 7.) Accordingly, the combination of Chaen and Lahaix renders element [1.6] obvious. (*Id.*)

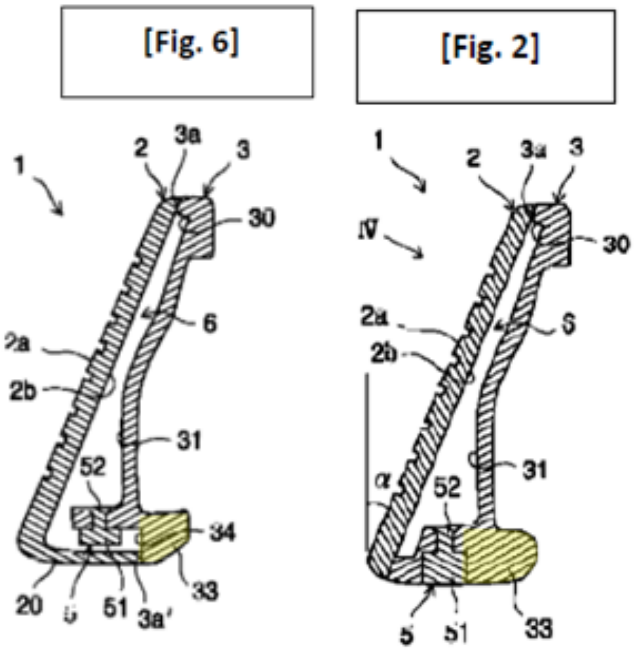


(TMG1021, Figs. 4, 6, 7 (Annotated).)

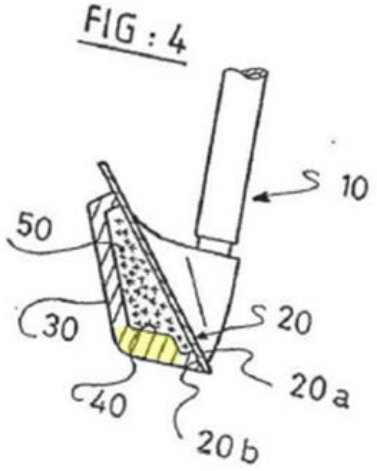
7. "wherein more than 50% of a mass of the body portion is located below a horizontal midplane of the golf club head" [1.7]

172. First, a POSA would have understood that Chaen and Lahaix both disclose club head designs where more than 50% of the mass of the body portion is below the horizontal midplane. (*See*, TMG1031, 61-63 (discussing advantages of hollow clubs similar to those of Chaen and Lahaix, including a lower CG and improved mass distribution.) The horizontal midplane is located halfway between lowest point of the sole and the highest point of the toe when the club is positioned in the normal address position prior to striking the ball. For example, Figures 2 and

6 of Chaen illustrate an enlarged sole bar (highlighted) even with the sole-mounted weight portions. (TMG1072, ¶¶36-39, 49-51.) Likewise, Figure 4 of Lahaix illustrates an enlarged sole bar. (TMG1021, 3-4.) The substantial amount of additional material present in the enlarged sole bars highlighted below at least renders obvious the claimed body portion mass distribution. I also note that the cross sections of Chaen are taken through the weight portion, and based on Figure 1 of Chaen, a POSA would have understood that cross sections of Chaen taken at other locations would include more body portion material near the sole portion because of the absence of the weight portion. Furthermore, a POSA would have understood that even when including weights in the club head, it is advantageous to maintain more than 50% of the mass of the body portion below the horizontal midplane because this requires fewer weights to be added while still maintaining a low CG. Thus, the combination of Chaen and Lahaix renders element [1.7] obvious.



(TMG1072, Figs. 2, 6 (Annotated).)

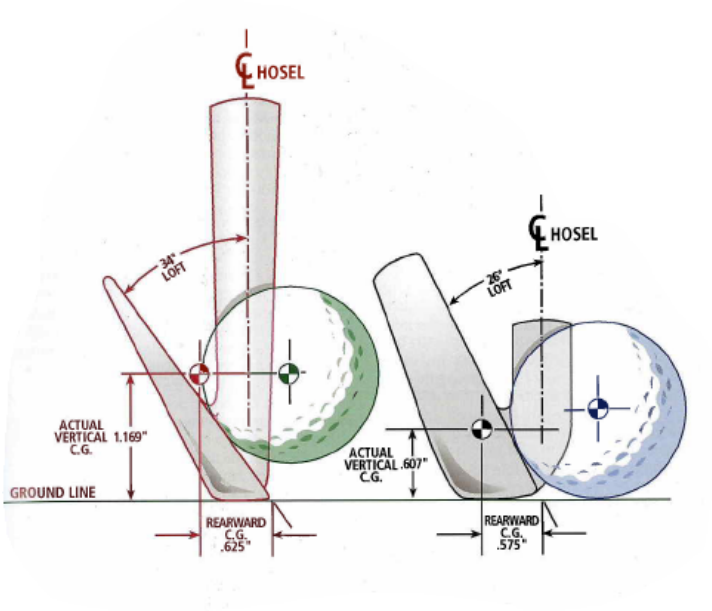


(TMG1021, Fig. 4 (Annotated).)

173. Second, it would have been obvious to a POSA–and in fact, typical–to locate more than 50% of the club head mass below a horizontal midplane. Having more than 50% of the mass of the body portion below the horizontal midplane will

result in a CG that is below the horizontal midplane because CG and mass distribution are directly related. The desirability of a low CG, and thus low mass distribution, was well-known in the art. As discussed above, lowering the CG generally makes it easier to hit the ball with a higher trajectory. (*See supra* Section V.B (*e.g.*, TMG1016, 9:32-44), VI.C.1 (*e.g.*, TMG1022, 1:40-44).) Thus, a POSA would have found element [1.7] obvious in view of well-known design principles.

174. Specifically, Maltby discloses an iron-type club that has a CG below a horizontal midplane as an example of the design principles followed by modern iron-type clubs. (TMG1031, 56-57.) As shown in the image from Maltby below, the modern iron outlined in black has a CG that is much lower than the horizontal midplane. (*Id.*) In fact, Maltby discloses that the iron outlines on pages 56 and 57 are "full scale drawing[s]." (*Id.*) The measured height (by ruler) of the modern iron outlined in black is approximately 2.25 inches, which means that the listed CG height of 0.607 inches results in a CG that is less than one third of the height of the club—well below the horizontal midplane.



(TMG1031, 57.)

175. Maltby also discusses the well-known benefit of having the club head CG at or below the CG of the golf ball, which is located 0.840 inches above the surface the ball is resting on. (*Id.*, 48; *see* TMG1044, App. III, Rule 3.)

Defining Actual Vertical Center Of Gravity (AVCOG) In Irons

AVCOG	Description
.450" to .624"	Highest Technology to Date, Highest Playability
.625" to .699"	Excellent, Solid Hits, Forgiving, Consistent
.700" to .799"	Very Good Playability for Many Golfers
.800" to .874"	.840" is Ball CG, Must Use Down and Through Swing, Expert Golfer's Only
.875" and Up	Avoid

(TMG1031, 48.)

176. Since iron-type clubs are typically used to hit the golf ball when it is resting on the ground, this means that the club head CG should generally be less than about 0.840 inches from the ground. (*Id.*) Typical iron club heights were also well-known in the art—Maltby, for example, discloses a set of irons with body portion heights ranging from 1.94 to 2.13 inches. (TMG1015, 534; *see also* TMG1031, 139-143 (disclosing an iron set with club heights ranging from 2.06 inches to 2.31 inches).) These club heights thus have horizontal midplane heights of approximately 0.97 to 1.07 inches from the ground plane–above the CG of the golf ball. Thus, the height of a standard golf ball dictates that club head CG should generally be located below the horizontal midplane of the club head. Accordingly, a POSA would have been motivated to design a body portion with a CG below the horizontal midplane in order to maximize club performance. And such a CG placement requires at least 50% of the body portion mass to be located below the horizontal midplane.

177. By way of further example, U.S. Patent Application Publication 2013/0316842 (TMG1071 "Demkowski") discloses an iron-type club that is configured to minimize the movement of the CG of the club head when a weight is added to the club. (TMG1071 "Demkowski", Abstract, ¶¶70-73.) To illustrate this point, Demkowski includes CG points for club heads with and without the weight portion, as shown in Figure 2B, with points "CG1" and "CG2" shown on the back

of the club head. (*Id.*, ¶71, Fig. 2B.) CG1 is defined as "the nominal CG before adding the weight," which is the CG of the body portion of the club head of Demkowski (without the weight). (*Id.*, ¶71.) As shown below, CG1 is located below a horizontal midplane of the club head, and thus more than 50% of the body portion mass is below the horizontal midplane.

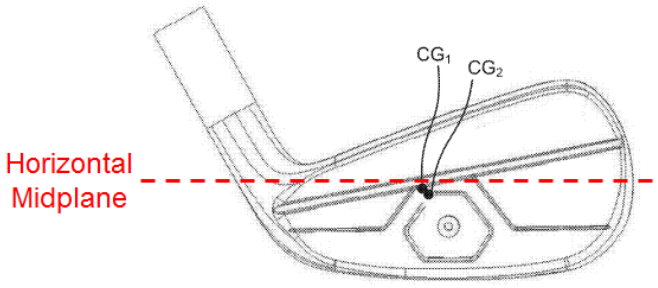


FIG. 2B

(TMG1071, Fig. 2B (Annotated).)

178. Demkowski also includes z-axis measurements of 19.2 mm and 19.6 mm for the nominal CG of embodiments of the club head, where the z-axis is defined as the axis perpendicular to ground plane. (*Id.*, ¶104.) As discussed above, typical horizontal midplane heights range from approximately 0.97 to 1.07 inches from the ground plane, which equals about 24.6 mm to 27.05 mm. These horizontal midplane heights are well above the nominal CGs listed in Demkowski– or put another way, the CG of the club head body (without the weight) is below the midplane. Accordingly, in view of the well-known teachings of locating the CG

below the horizontal midplane, it would have been obvious to distribute more than 50% of the mass of the club head below the horizontal midplane.

179. Additionally, in my opinion, the claimed limitation would have required nothing more than routine experimentation with a well-known variable, the club head mass distribution, that is taught in the prior art. And there are a finite number of options for the club head mass distribution with respect to the horizontal midplane: more than 50% of the club head mass may be above the midplane, below the midplane, or equally distributed above and below the midplane. Thus, it would at least have been obvious for a POSA to optimize the mass distribution through routine experimentation and, in light of the well-known advantages of a low CG, have a body portion configuration with more than 50% of the body portion mass below the horizontal midplane. For these additional reasons, the combination of Chaen and Lahaix renders element [1.7] obvious.

180. Furthermore, I also note that PXG does not describe any criticality to the claimed range of weight distributions. In fact, outside of the claim, I did not find any description in the ’220 patent of a body portion having 50% of its mass below the horizontal midplane. In my opinion, there is nothing critical or novel about the well-known mass distribution recited in this claim element, and thus it would have been obvious to a POSA as nothing more than optimizing a variable

according to a well-known concept that was disclosed in the prior art. Accordingly, the combination of Chaen and Lahaix renders element [1.7] obvious.

8. "wherein a portion of the at least one weight portion is closer to the face portion than a portion of the polymer material in the interior cavity" [1.8]

181. The combination of Chaen and Lahaix discloses the claimed relationship between the weight portion and polymer material. As discussed above, it would have been obvious for a POSA to fill the cavity of Chaen as disclosed in Lahaix. (*Supra* Section XI.A.) Lahaix discloses that the internal cavity volume "is occupied by a non-metal filling material" and that the cavity can be "wholly filled by the filling material." (TMG1021, 2, 5, Fig. 4.) Lahaix also discloses that "[t]he filling material may be a thermoplastics or elastomer material," which a POSA would have understood to include "polymer material[s]." (*Id*., 2.) When filled with a filler material, multiple embodiments of Chaen disclose the claimed relationship between the weight portion and polymer material.

182. The '220 patent does not expressly describe how to measure the distances of the claimed elements to determine which is "closer" to the face portion, nor does the '220 patent provide specific distances from these features to the face portion. Instead, PXG presumably relies on the Figures as disclosing the relative distances. (TMG1002, 223-224, 232.) As shown below in Figure 38, for example, lines 3840 and 3842 show the distances being measured from the back

surface of the face portion in a direction perpendicular to the back surface. (*See, e.g.*, TMG1001, Figs. 37-41.) Furthermore, when discussing absolute distances, a POSA would typically assume the distance in question is the *minimum* distance, measured using lines perpendicular to a planar surface. This is because there is only one minimum distance between any two objects, but there are, of course, many other distances depending on the measurement path. Thus, without any other guidance, a POSA would have taken the distance from a feature to the face portion along a line perpendicular to the back surface of the face portion, which also matches the apparent measurement method used in the ’220 patent.

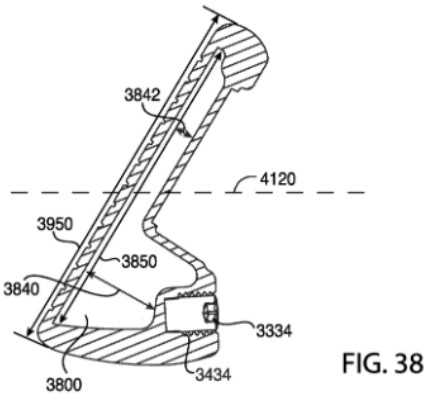
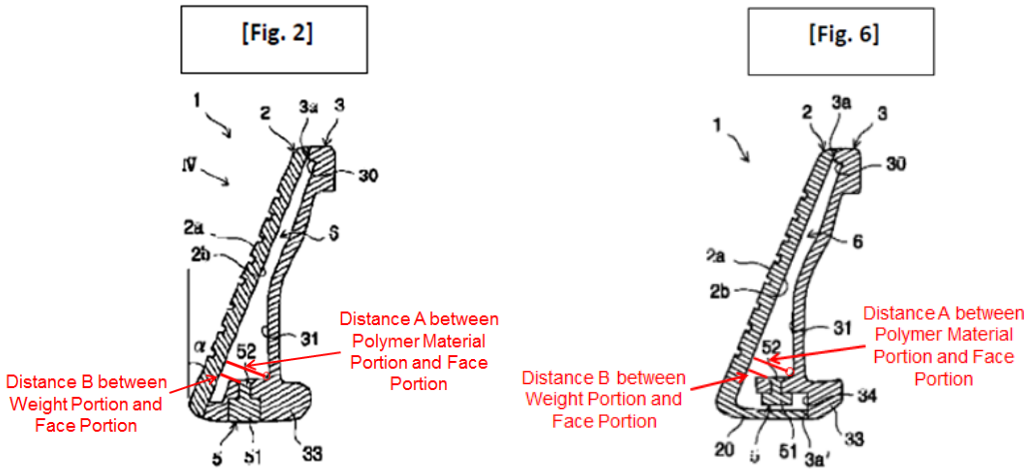


FIG. 38

(TMG1001, Fig. 38.)

183. Even if the drawings in Chaen are not drawn to scale, in my opinion, these drawings at least render obvious the features recited in element [1.8], as they clearly disclose to a POSA having different widths of the cavity at various locations from the sole portion to the top portion of the club head.

184. As shown below in annotated Figures 2 and 6 of Chaen, a portion of the weight portion is closer to the face portion than a portion of the polymer material in Chaen's club head, as modified by Lahaix to include filler material. As shown below by way of example in annotated Figures 2 and 6, when Chaen's cavity is filled, a portion of the weight (e.g., near protrusion member 52) is closer to the face portion than a portion of the polymer material in the interior cavity (e.g., at the back of the cavity). And although, like the '220 patent, Chaen does not disclose these actual distances, a POSA would have found the relative relationship disclosed by the Figures. As shown below, the distance "A" between a portion of the polymer material and the face portion is greater than the distance "B" between a portion of the weight portion and the face portion, and thus a portion of the weight portion is closer to the face portion than a portion of the polymer material. Accordingly, the combination of Chaen and Lahaix renders element [1.8] obvious.



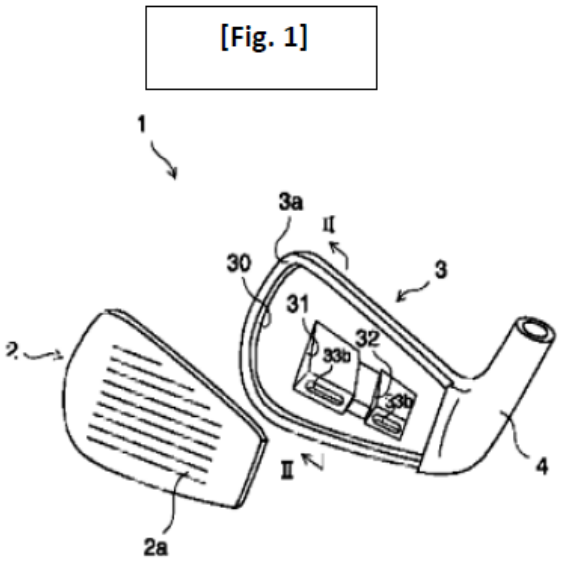
(TMG1072, Figs. 2, 6 (Annotated).)

C. The Combination of Chaen and Lahaix Renders Claim 8 Obvious

185. Many of the elements of independent claim 8 are the same or similar to those in independent claim 1, and so much of my analysis for claim 1 also applies to claim 8.

1. "[a]n iron-type golf club head" [8.1]

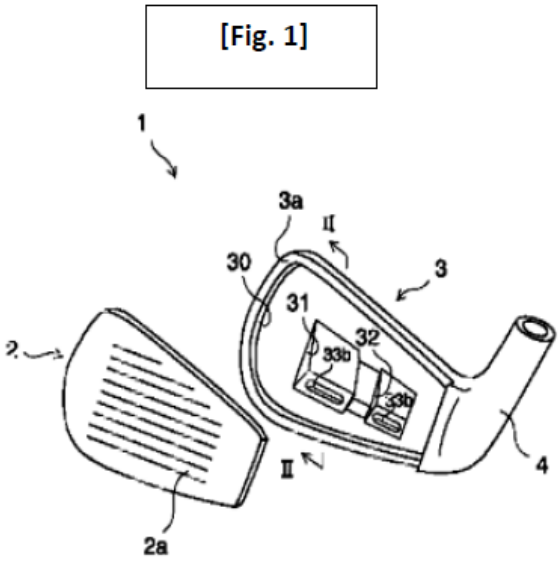
186. Chaen discloses an iron-type golf club head. (TMG1072, ¶¶1, 49, Fig. 1.) Accordingly, the combination of Chaen and Lahaix renders element [8.1] obvious.



(TMG1072, Fig. 1.)

2. "a face portion"[8.2]

187. Chaen's club head includes a "Face Member 2." (*Id.*, ¶¶ 36, 50, Fig. 1.) Accordingly, the combination of Chaen and Lahaix renders element [8.2] obvious.

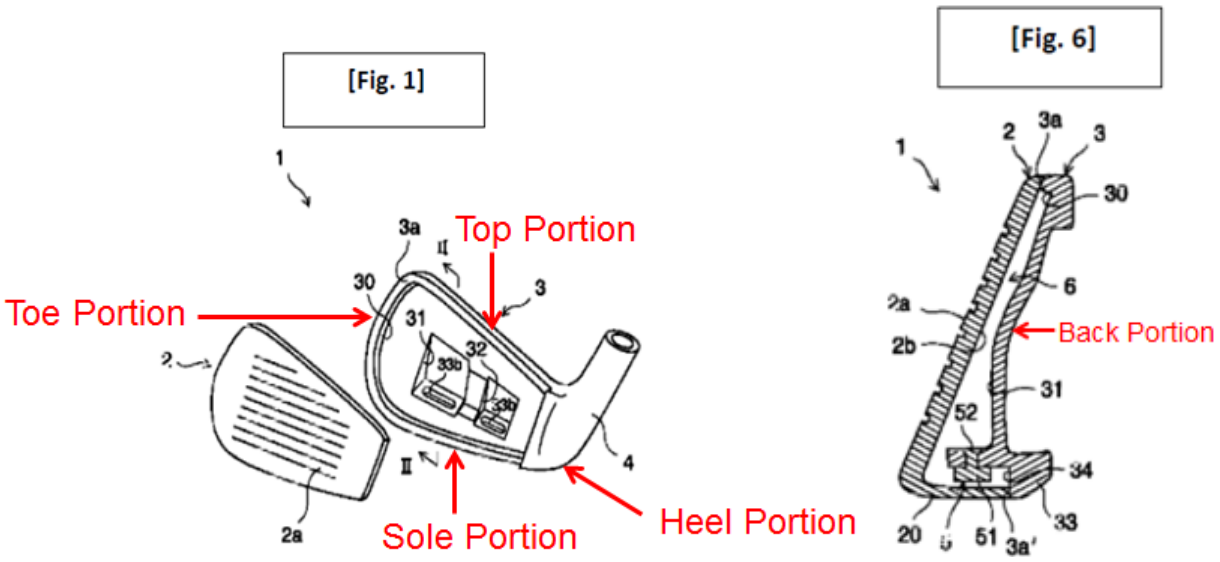


(TMG1072, Fig. 1.)

3. "[8.3a] a body portion having, a toe portion, a top portion, a sole portion, a back portion, and [8.3b] an interior cavity extending between the top and sole portions"

a) Element [8.3a]

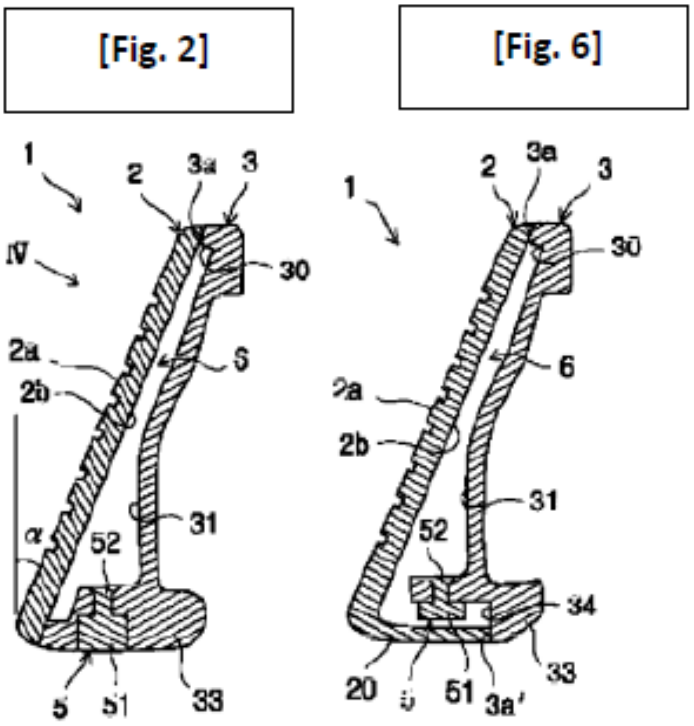
188. Chaen discloses a "Sole 33" and a "Back Face Member 3" that a POSA would have understood to be a back portion. (*Id*., ¶¶36, 37, 50.) Like all golf clubs, Chaen's club head also includes a toe portion, heel portion, and a top portion, shown below. Accordingly, the combination of Chaen and Lahaix renders element [8.3a] obvious.



(TMG1072 Figs. 1, 6 (Annotated).)

b) Element [8.3b]

189. Chaen discloses a "Hollow Area 6" formed in the interior of the club head. (*Id*., ¶¶37, 50.) As shown below, the hollow portion, or cavity, extends from the top portion to the sole portion. Accordingly, the combination of Chaen and Lahaix renders element [8.3b] obvious.

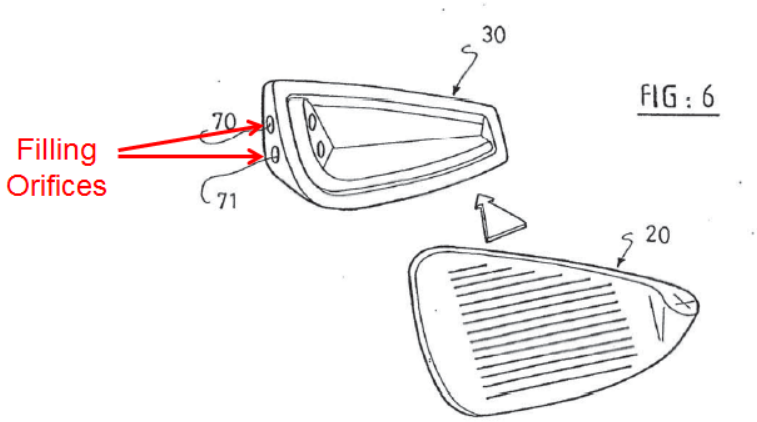


(TMG1072, Figs. 2, 6.)

4. "at least one port connected to the interior cavity" [8.4]

190. As discussed above, a POSA would have been motivated to fill Chaen's cavity with filler, as disclosed in Lahaix. (*Supra* Section XI.A.) Thus, it would have been obvious to include Lahaix's filling orifices (70, 71) in Chaen's club head to fill the cavity. A POSA would have found adding Lahaix's filling orifices, located on the toe portion, to Chaen's club head to be a simple modification because of the lack of other significant club features on Chaen's toe portion. The filling orifices would simply extend through the club head material near the toe portion and open into the cavity. Thus, this modification would have been a simple combination of prior art elements. As shown below, Lahaix's

orifices are located in the toe portion and are connected to the interior cavity. (TMG1021, Fig. 6, 7.) Accordingly, the combination of Chaen and Lahaix renders element [8.4] obvious.

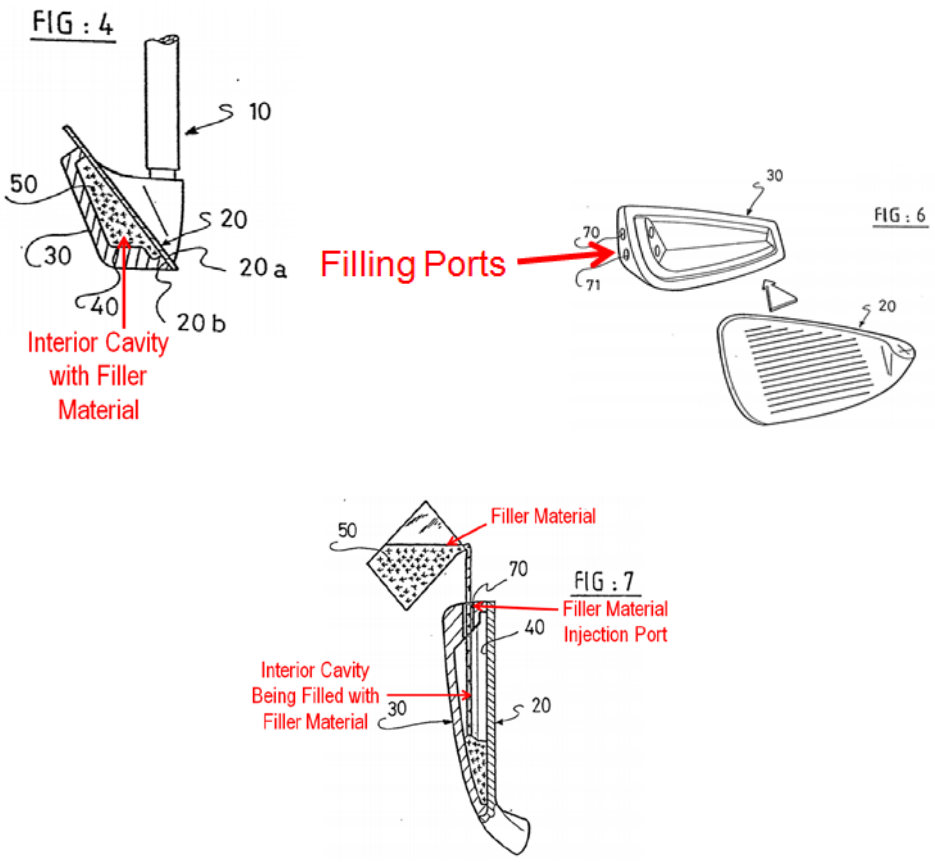


(TMG1021, Fig. 6 (Annotated).)

5. "an elastic polymer material injection molded in the interior cavity through the at least one port" [8.5]

191. Lahaix discloses that internal cavity volume "is occupied by a non-metal filling material" and that the cavity can be "wholly filled by the filling material." (*Id*., 2, 5, Fig. 4.) Lahaix also discloses that "[t]he filling material may be a thermoplastics or elastomer material," which a POSA would have understood to include "elastic polymer material[s]." (*Id*., 4.) And Lahaix discloses that elastomers "which can be worked by the RIM (Reaction Injection Moulding) process are preferred" and introducing the filling material "through a filling orifice (70, 71) which communicates with the internal cavity." (*Id*., 5, 7.) Injection

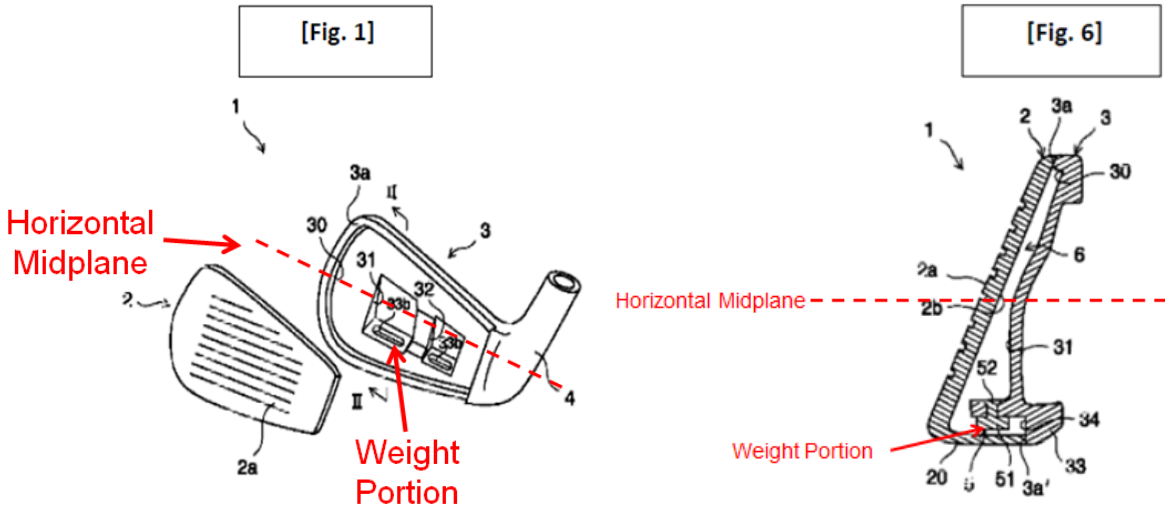
molding was a well-known method of filling club heads that a POSA would have found obvious to try regardless of the disclosure of Lahaix. (*Supra* Section V.E.) Accordingly, the combination of Chaen and Lahaix renders element [8.5] obvious.



(TMG1021, Figs. 4, 6, 7 (Annotated).)

6. "at least one weight portion coupled to the body portion at a location below a horizontal midplane of the golf club head" [8.6]

192. As shown below, Chaen's weight portions are located below the horizontal midplane. Accordingly, the combination of Chaen and Lahaix renders element [8.6] obvious.



(TMG1072, Figs. 1, 6 (Annotated).)

7. "wherein a width of the interior cavity at or below the horizontal midplane and above the at least one weight portion is greater than a width of the interior cavity near the top portion and greater than a width of the interior cavity between the at least one weight portion and the face portion" [8.7]

193. As shown below, multiple embodiments in Chaen disclose the elements of this claim–that a width of the cavity at or below the horizontal midplane and above the weight portion is greater than a width of the cavity near the top portion and greater than a width of the cavity between the weight portion and the face portion.

194. The '220 patent does not expressly describe how to measure the distances of the claimed elements to determine which is "closer" to the face portion, nor does the '220 patent provide specific distances from these features to the face portion. Instead, PXG presumably relies on the Figures as disclosing the

relative distances. (TMG1002, 223-224, 232.) As shown below in Figure 38, for example, lines 3840 and 3842 show the distances being measured from the back surface of the face portion in a direction perpendicular to the back surface. (*See, e.g.*, TMG1001, Figs. 37-41.) Furthermore, when discussing absolute distances, a POSA would typically assume the distance in question is the *minimum* distance, measured using lines perpendicular to a planar surface. This is because there is only one minimum distance between any two objects, but there are, of course, many other distances depending on the measurement path. Thus, without any other guidance, a POSA would have taken the distance from a feature to the face portion along a line perpendicular to the back surface of the face portion, which also matches the apparent measurement method used in the '220 patent.

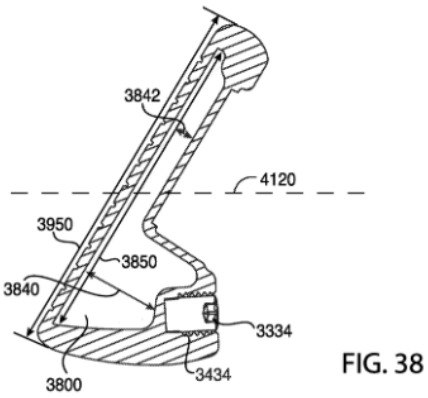
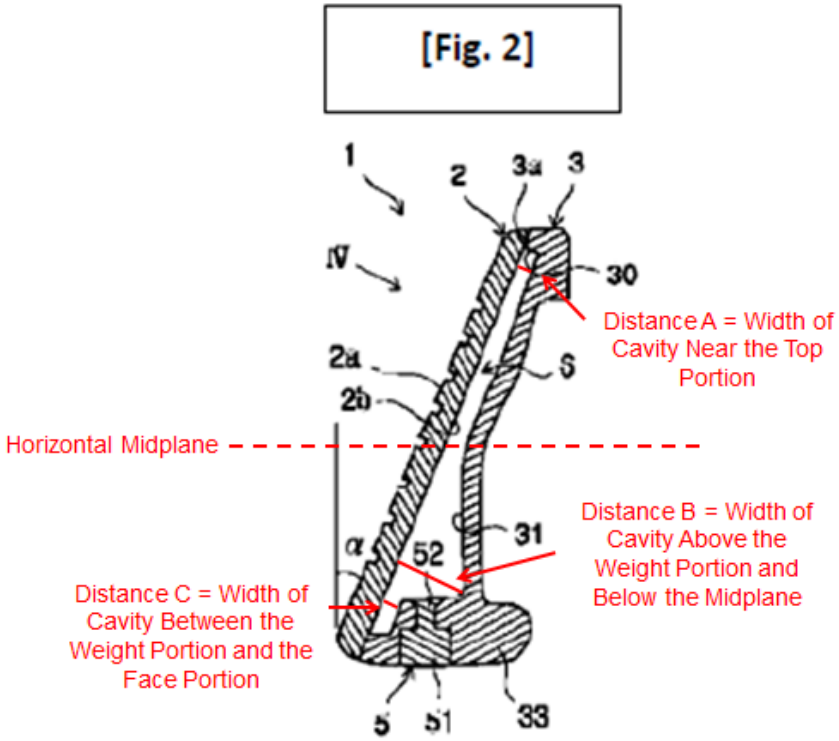


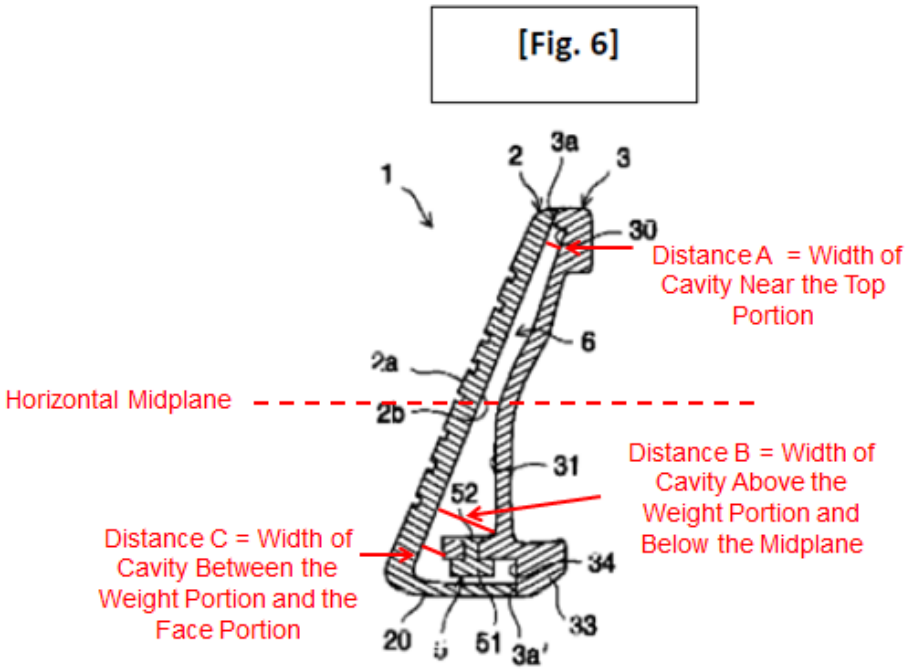
FIG. 38

(TMG1001, Fig. 38.)

195. Even if the drawings in Chaen are not drawn to scale, in my opinion, these drawings at least render obvious the features recited in element [8.8], as they clearly disclose to a POSA having different widths of the cavity at various

locations from the sole portion to the top portion of the club head. As shown below, cavity width distance "A" near the top portion and cavity width distance "C" between the weight portion and the face portion are both less than cavity width distance "B" located between the horizontal midplane and the weight portion. Accordingly, the combination of Chaen and Lahaix renders element [8.7] obvious.





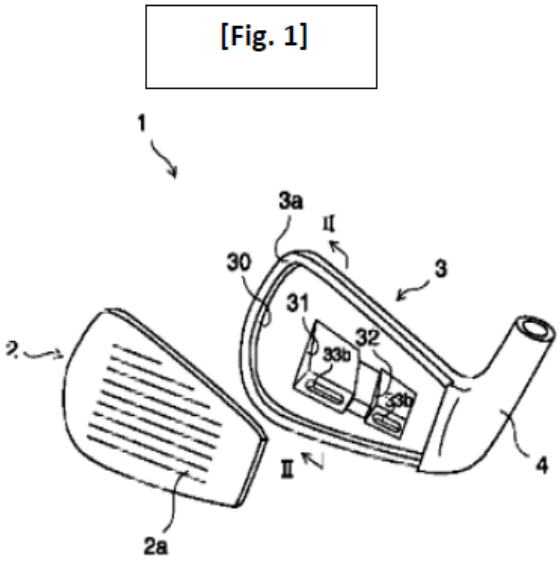
(TMG1072, Figs. 2, 6 (Annotated).)

D. The Combination of Chaen and Lahaix Renders Claim 13 Obvious

196. Many of the elements of independent claim 13 are the same or similar to those in independent claims 1 and 8, and so much of my analysis for claims 1 and 8 also applies to claim 13.

1. "[a] golf club head" [13.1]

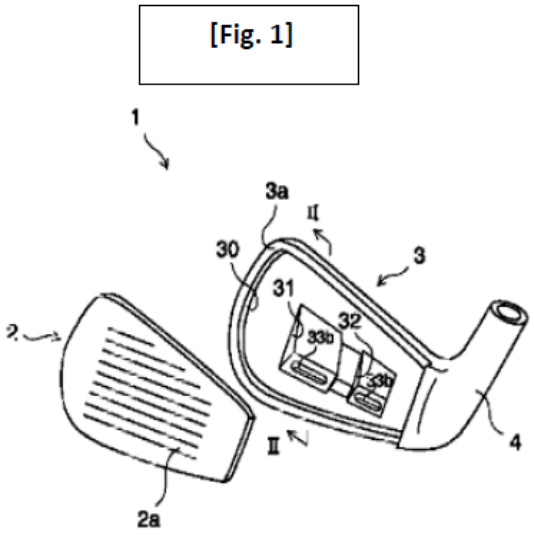
197. Chaen discloses an iron-type golf club head. (TMG1072, ¶¶1, 49, Fig. 1.) Accordingly, the combination of Chaen and Lahaix renders element [13.1] obvious.



(TMG1072, Fig. 1.)

2. "a face portion"[13.2]

198. Chaen's club head includes a "Face Member 2." (*Id*., ¶¶ 36, 50, Fig. 1.) Accordingly, the combination of Chaen and Lahaix renders element [13.2] obvious.

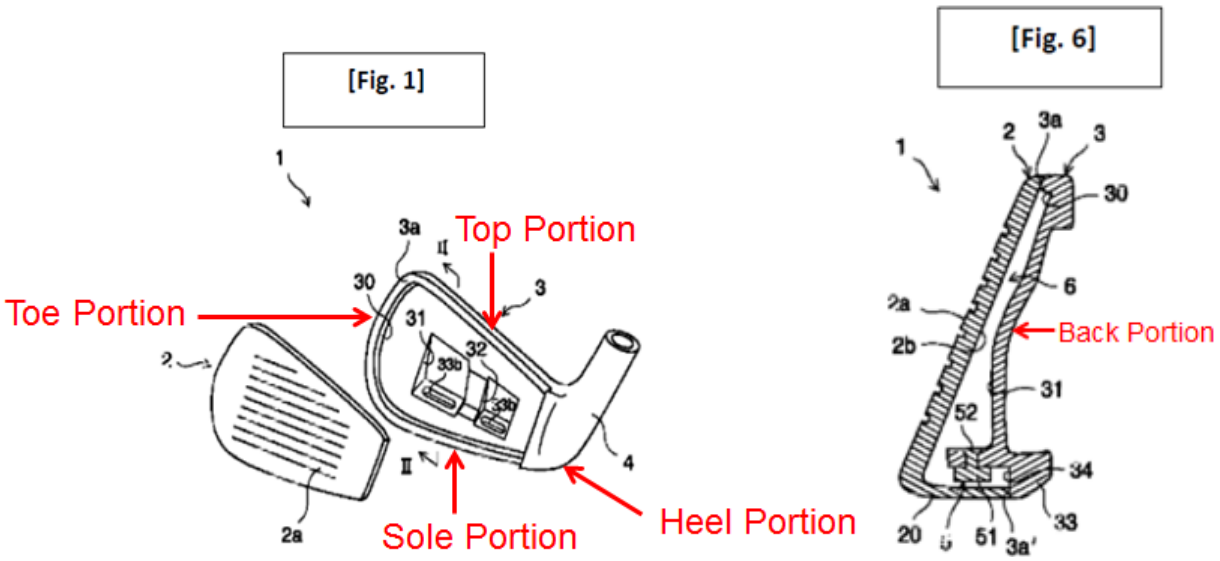


(TMG1072, Fig. 1.)

3. "[13.3a] a body portion having a toe portion, a heel portion, a top portion, a sole portion, a back portion, and [13.3b] an interior cavity extending between the top and sole portions"

a) Element [13.3a]

199. Chaen discloses a "Sole 33" and a "Back Face Member 3" that a POSA would have understood to be a back portion. (*Id*., ¶¶36-37, 50.) Like all golf clubs, Chaen's club head also includes a toe portion, heel portion, and a top portion, shown below. Accordingly, the combination of Chaen and Lahaix renders element [13.3a] obvious.

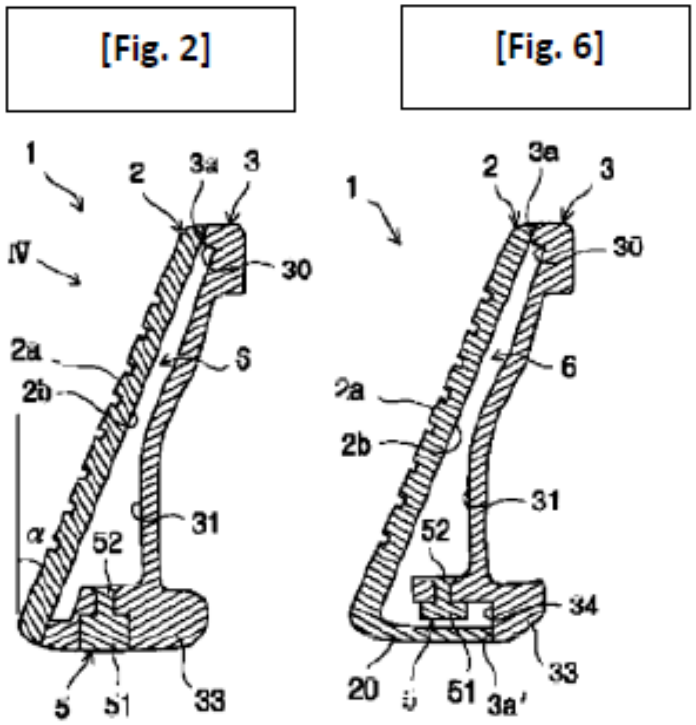


(TMG1072 Figs. 1, 6 (Annotated).)

b) Element [13.3b]

200. Chaen discloses a "Hollow Area 6" formed in the interior of the club head. (*Id*., ¶¶37, 50.) As shown below, the hollow portion, or cavity, extends from

the top portion to the sole portion. Accordingly, the combination of Chaen and Lahaix renders element [13.3b] obvious.

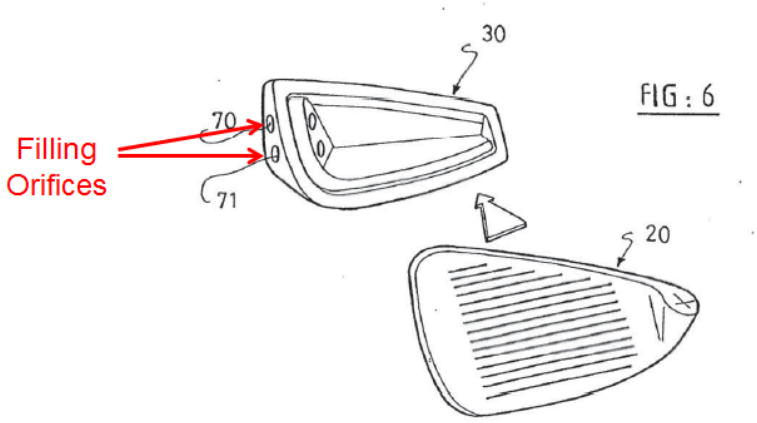


(TMG1072, Figs. 2, 6.)

4. "at least one port located closer to the toe portion than the heel portion and connected to the interior cavity" [13.4]

201. As discussed above, a POSA would have been motivated to fill Chaen's cavity with filler, as disclosed in Lahaix. (Section XI.A.) Thus, it would have been obvious to include Lahaix's filling orifices (70, 71) in Chaen's club head to fill the cavity. A POSA would have found adding Lahaix's filling orifices, located on the toe portion, to Chaen's club head to be a simple modification because of the lack of other significant club features on the toe portion of Chaen.

The filling orifices would simply extend through the club head material near the toe portion and open into the cavity. Thus, this modification would have been a simple combination of prior art elements. As shown below, Lahaix's orifices are located in the toe portion—and thus closer to the toe portion than the heel portion—and are connected to the interior cavity. (TMG1021, Figs. 6-7.) Accordingly, the combination of Chaen and Lahaix renders element [13.4] obvious.

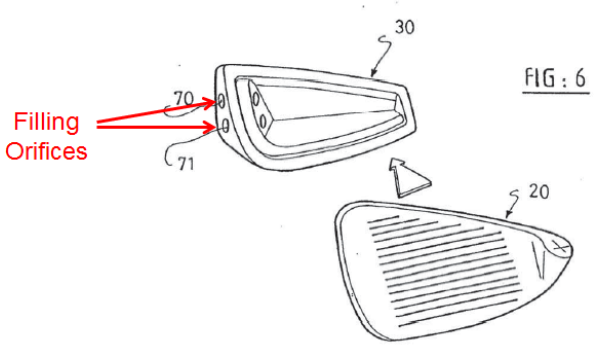


(TMG1021, Fig. 6 (Annotated).)

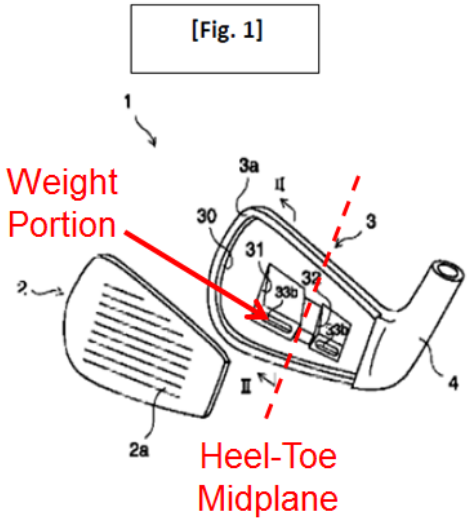
5. "at least one weight portion located closer [to] the toe portion than the heel portion and located between the at least one port and the heel portion" [13.5]

202. As shown below in Figure 1, Chaen discloses weight portions in the sole of the club head. (TMG1072, ¶¶38, 49-51, Figs. 1, 6.) As discussed above in element [1.4], the combined Chaen-Lahaix club head would include the filling orifices in the toe portion. (*Supra* Section XI.D.4.) At least the weight portion located closer to the toe portion in Figure 1 is "located closer [to] the toe portion

than the heel portion," as claimed. As shown below, that weight portion is also "located between the at least one port and the heel portion" because the ports of combined Chaen-Lahaix club head would be located in the toe portion. Accordingly, the combination of Chaen and Lahaix renders element [13.5] obvious.



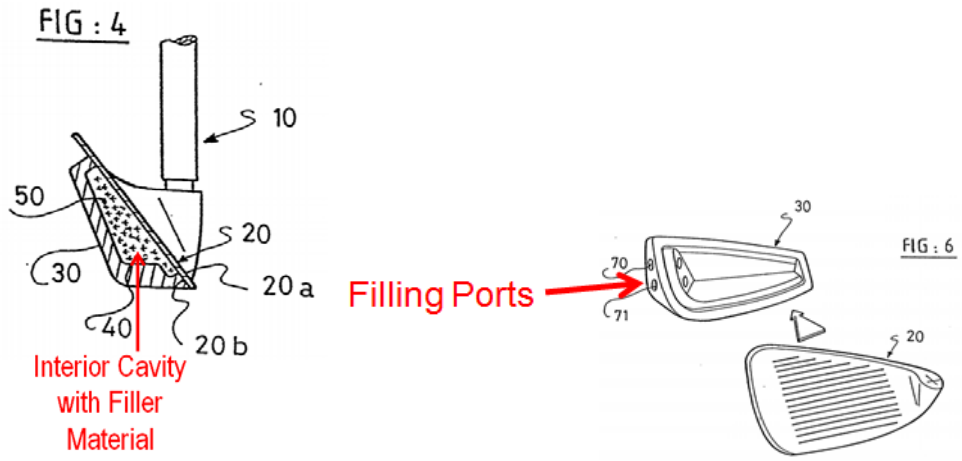
(TMG1021, Fig. 6 (Annotated).)

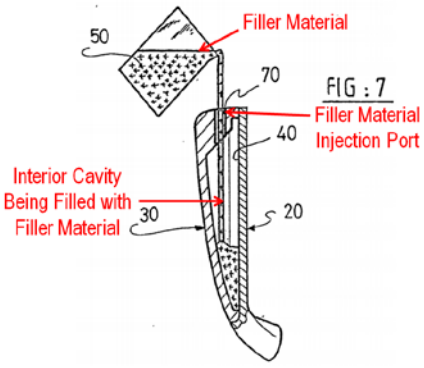


(TMG1072, Fig. 1 (Annotated).)

6. "wherein the interior cavity is filled with a polymer material from the at least one port" [13.6]

203. Lahaix discloses that internal cavity volume "is occupied by a non-metal filling material" and that the cavity can be "wholly filled by the filling material." (TMG1021, 2, 5, Fig. 4.) Lahaix also discloses that "[t]he filling material may be a thermoplastics or elastomer material," which a POSA would have understood to include "polymer material[s]." (*Id*., 4.) And Lahaix discloses "introducing filling material 50 by low pressure pouring or by gravity in the RIM process through a filling orifice (70, 71) which communicates with the internal cavity." (*Id*., 7.) Accordingly, the combination of Chaen and Lahaix renders element [13.6] obvious. (*Id*.)





(TMG1021, Figs. 4, 6, 7 (Annotated).)

7. "wherein a first portion of the polymer material above a horizontal midplane of the body portion has a first width, a second portion of the polymer material below the horizontal midplane has a second width greater than the first width, and a third portion of the polymer material between the first portion and the second portion has a third width greater than the first width and greater than the second width, and wherein the third portion is located between the at least one weight portion and the top portion"[13.7]

204. Element [13.7] is similar to element [8.7], but differs by reciting the polymer material widths instead of the cavity widths and requiring that the second width, located below the horizontal midplane, be greater than the first width in addition to requiring that the third width be greater than both the first and second widths. The combination of Chaen and Lahaix discloses the claimed polymer widths.

205. As discussed above in element [13.6], Lahaix discloses that the interior cavity may be completely filled with polymer material, and thus the cavity

width and the polymer width are equal. (*Supra* Section XI.D.6.) As shown below, multiple embodiments in Chaen disclose the elements of this claim.

206. The ’220 patent does not expressly describe how to measure the distances of the claimed elements to determine which is “closer” to the face portion, nor does the ’220 patent provide specific distances from these features to the face portion. Instead, PXG presumably relies on the Figures as disclosing the relative distances. (TMG1002, 223-224, 232.) As shown below in Figure 38, for example, lines 3840 and 3842 show the distances being measured from the back surface of the face portion in a direction perpendicular to the back surface. (*See, e.g.*, TMG1001, Figs. 37-41.) Furthermore, when discussing absolute distances, a POSA would typically assume the distance in question is the *minimum* distance, measured using lines perpendicular to a planar surface. This is because there is only one minimum distance between any two objects, but there are, of course, many other distances depending on the measurement path. Thus, without any other guidance, a POSA would have taken the distance from a feature to the face portion along a line perpendicular to the back surface of the face portion, which also matches the apparent measurement method used in the ’220 patent.

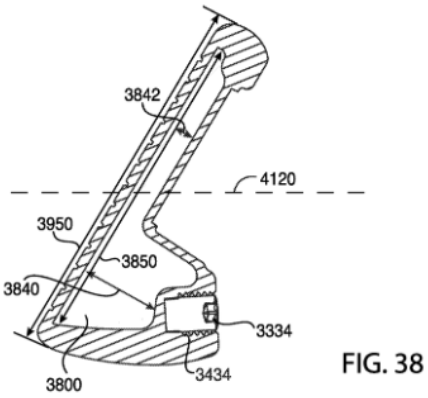
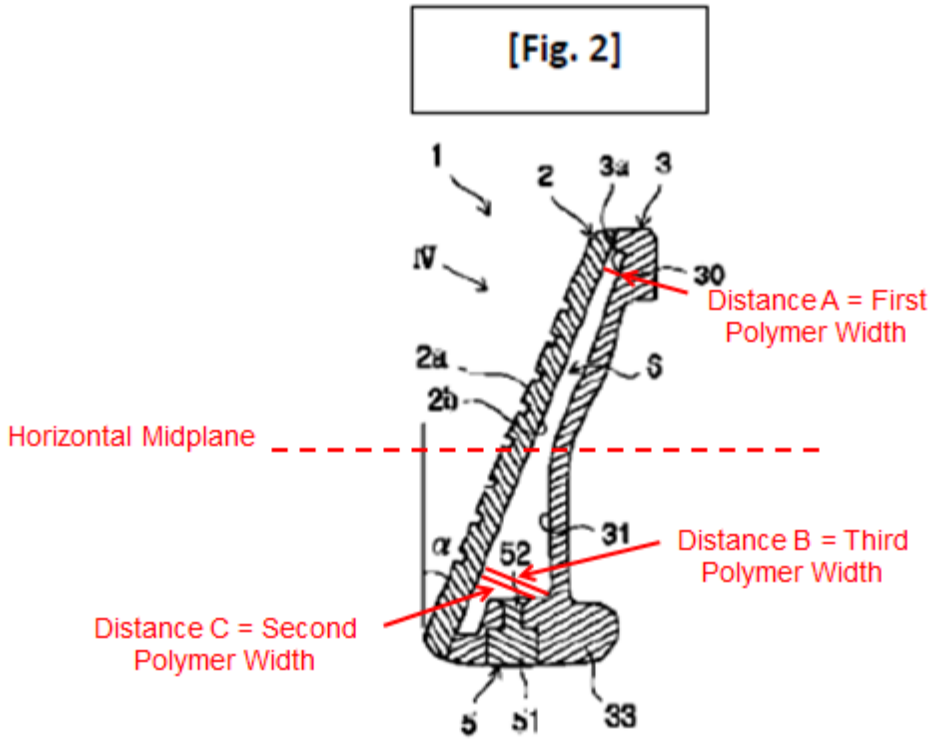


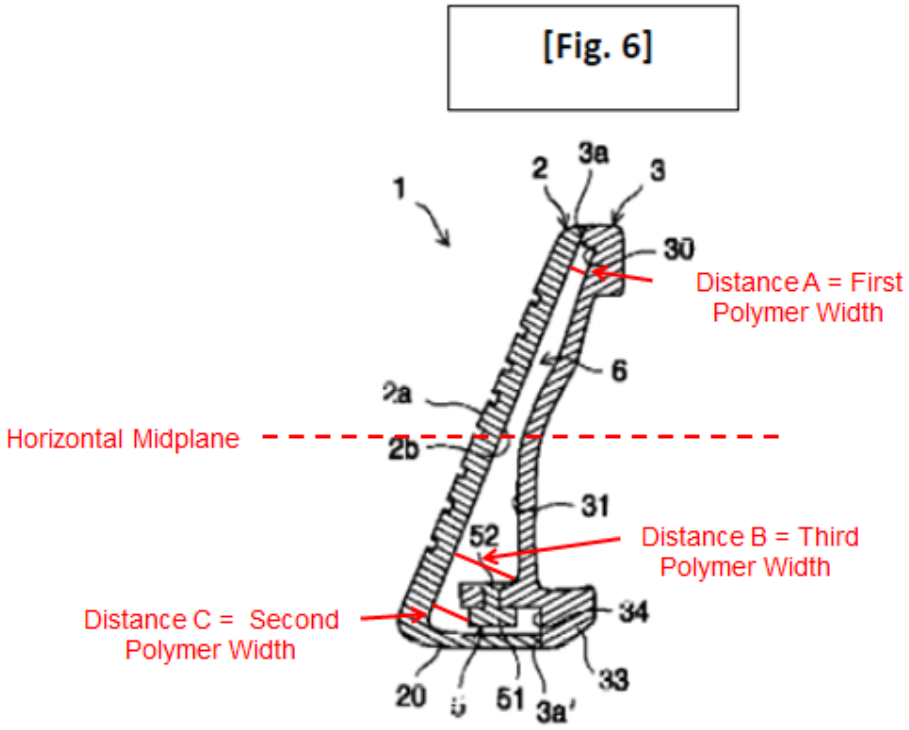
FIG. 38

(TMG1001, Fig. 38.)

207. Even if the drawings in Chaen are not drawn to scale, in my opinion, these drawings at least render obvious the features recited in element [13.7], as they clearly disclose to a POSA having different widths of the cavity at various locations from the sole portion to the top portion of the club head . Indeed, a first portion of the polymer material above the horizontal midplane has a first width, a second portion of the polymer material below the horizontal midplane has a second width greater than the first width, and a third portion of the polymer material between the first portion and the second portion and between the weight portion and the top portion has a third width greater than the first width and the second width. Again, although Chaen does not disclose these actual distances, a POSA would have found the relative relationships disclosed by the Figures. As shown below, cavity width distance "A" above the horizontal midplane is less than cavity width distance "C" below the horizontal midplane, both of which are less than cavity width distance "B," which is located between distance "A" and distance "C"

and between the weight portion and the top portion. Accordingly, the combination of Chaen and Lahaix renders obvious element [13.7].



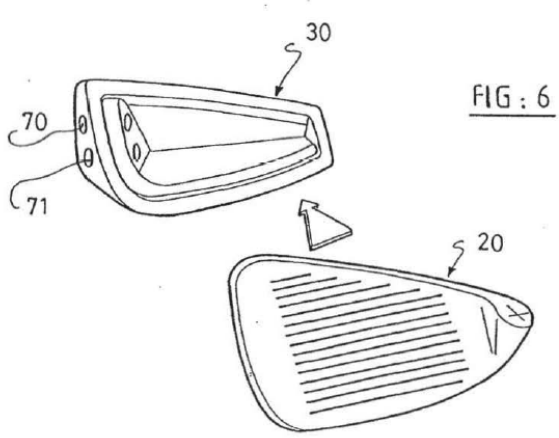


(TMG1072, Figs. 2, 6 (Annotated).)

E. The Combination of Chaen and Lahaix Renders Claim 2 Obvious

208. Claim 2 recites "wherein the at least one port is located at or near a periphery of the body portion." As discussed above in element [1.5], it would have been obvious to combine Lahaix's filling orifices into Chaen's club head. (*Supra* Section XI.B.4.) The '220 patent does not define the term "periphery," but based on the location of the ports in the Figures of the '220 patent and how a POSA would have understood the term "periphery," the port (i.e., in the toe) shown below in Figure 6 of Lahaix is located at or near a periphery of the body portion. (TMG1025, (defining periphery as an "outward bounds: border area, border,

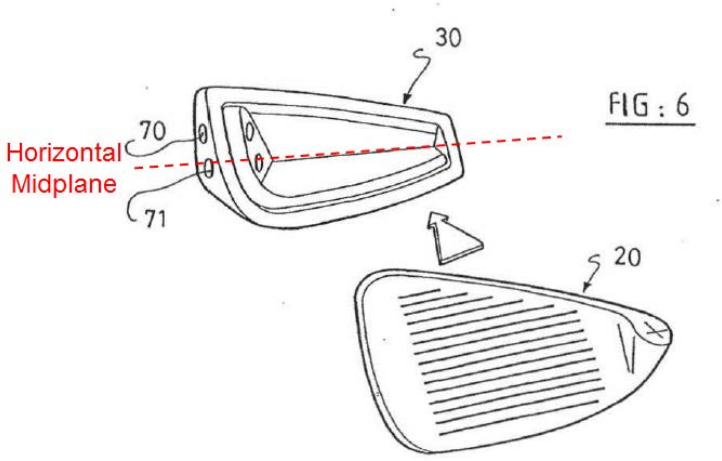
bound"); *see also* TMG1014, (defining periphery as "a line or surface acting as a boundary").) Accordingly, the combination of Chaen and Lahaix renders claim 2 obvious.



(TMG1021, Fig. 6.)

F. The Combination of Chaen and Lahaix Renders Claims 3 and 16 Obvious

209. Claims 3 and 16 recite "wherein the at least one port is located at or below the horizontal midplane." As discussed above, it would have been obvious to combine Lahaix's filling orifices into Chaen's club head. (*Supra* Section XI.B.4.) As shown below, a least one of Lahaix's ports is "at or below the horizontal midplane." Accordingly, the combination of Chaen and Lahaix renders claims 3 and 16 obvious.



(TMG1021, Fig. 6 (Annotated).)

G. The Combination of Chaen and Lahaix Renders Claims 4 and 19 Obvious[6]

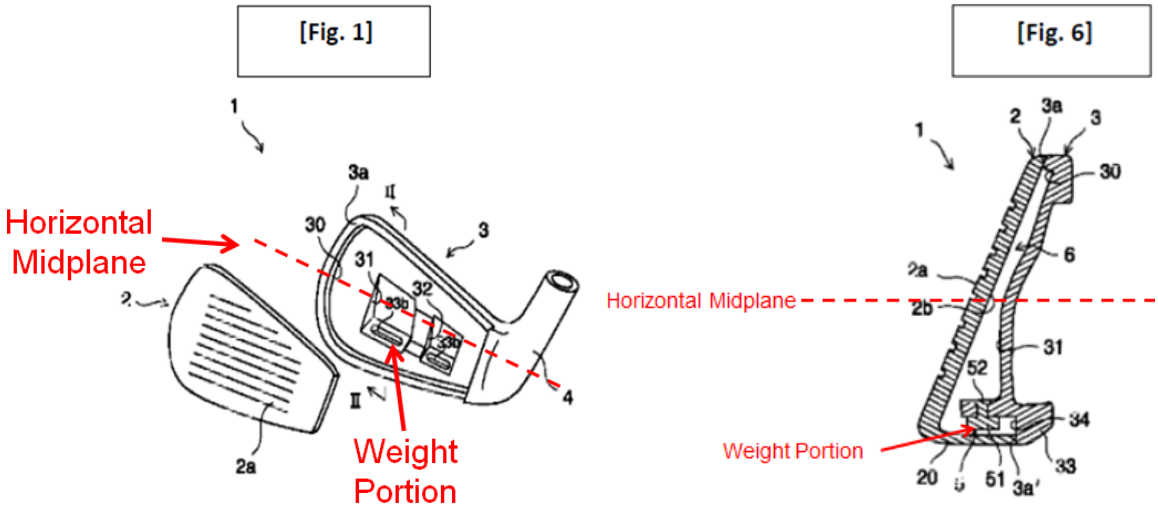
210. Claims 4 and 19 recite "wherein the polymer material is an elastic polymer material." Lahaix discloses that internal cavity volume "is occupied by a non-metal filling material" and that the cavity can be "wholly filled by the filling material." (TMG1021, 2, 5, Fig. 4.) Lahaix also discloses that "[t]he filling material may be a thermoplastics or elastomer material," which a POSA would have understood to include "elastic polymer material[s]." (*Id.*, 4.) Accordingly, the combination of Chaen and Lahaix renders claims 4 and 19 obvious.

[6] I note that claim 19 depends on claim 1, as-issued, and thus claims 4 and 19 appear to add identical limitations to claim 1. The analysis below applies regardless of whether claim 19 depends from claim 1 or claim 13.

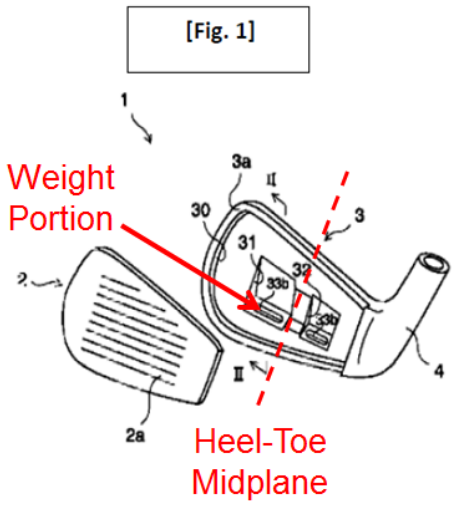
H. The Combination of Chaen and Lahaix Renders Claims 5 and 17 Obvious[7]

211. Claim 5 recites "wherein the at least one weight portion is located below the horizontal midplane and is located closer to the toe portion than the heel portion" and claim 17 recites "wherein the at least one weight portion is located below the horizontal midplane."

212. As shown below, Chaen's weight portions are located below the horizontal midplane, and at least one weight portion is located closer to the toe portion than the heel portion. Accordingly, the combination of Chaen and Lahaix renders claims 5 and 17 obvious.



[7] I note that claim 17 depends on claim 1, as-issued, however, the analysis below applies regardless of whether claim 17 depends from claim 1 or claim 13.



(TMG1072, Figs. 1, 6 (Annotated).)

I. The Combination of Chaen and Lahaix Renders Claim 6 Obvious

213. Claim 6 recites "wherein a width of the interior cavity at or below the horizontal midplane and above the at least one weight portion is greater than a width of the interior cavity near the top portion and greater than a width of the interior cavity near the sole portion." As shown below, multiple embodiments in Chaen disclose the elements of this claim.

214. The '220 patent does not expressly describe how to measure the distances of the claimed elements to determine which is "closer" to the face portion, nor does the '220 patent provide specific distances from these features to the face portion. Instead, PXG presumably relies on the Figures as disclosing the relative distances. (TMG1002, 223-224, 232.) As shown below in Figure 38, for example, lines 3840 and 3842 show the distances being measured from the back surface of the face portion in a direction perpendicular to the back surface. (*See,*

e.g., TMG1001, Figs. 37-41.) Furthermore, when discussing absolute distances, a POSA would typically assume the distance in question is the *minimum* distance, measured using lines perpendicular to a planar surface. This is because there is only one minimum distance between any two objects, but there are, of course, many other distances depending on the measurement path. Thus, without any other guidance, a POSA would have taken the distance from a feature to the face portion along a line perpendicular to the back surface of the face portion, which also matches the apparent measurement method used in the ’220 patent.

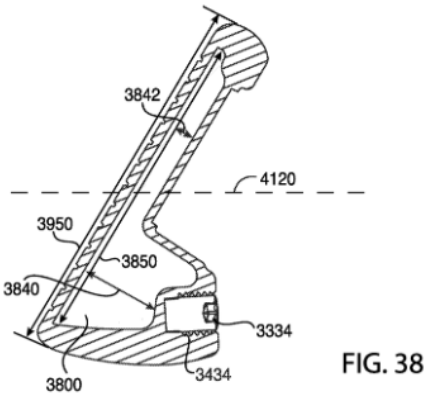
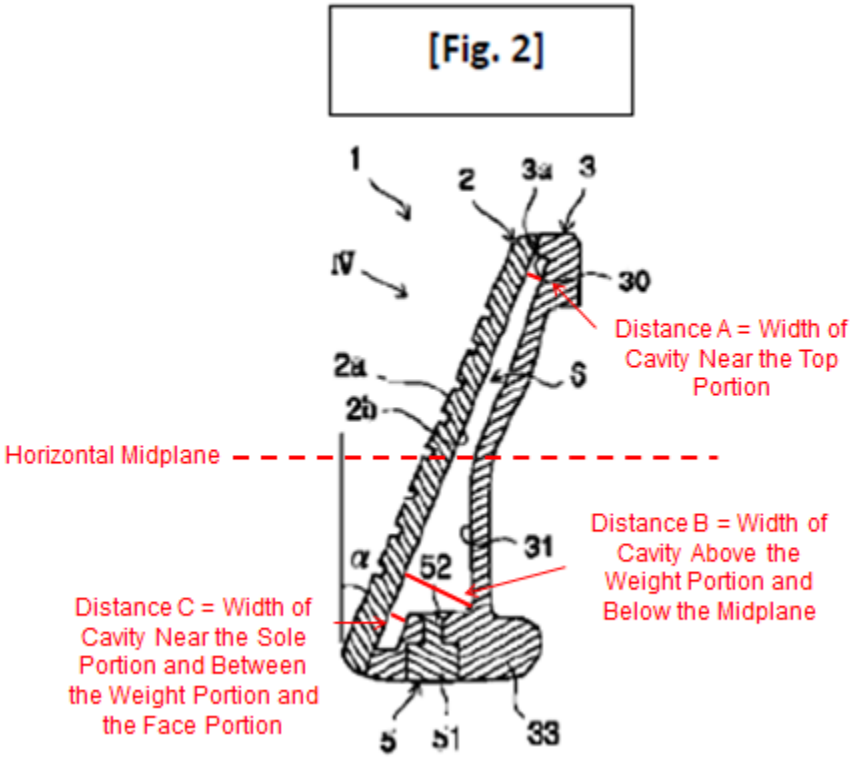


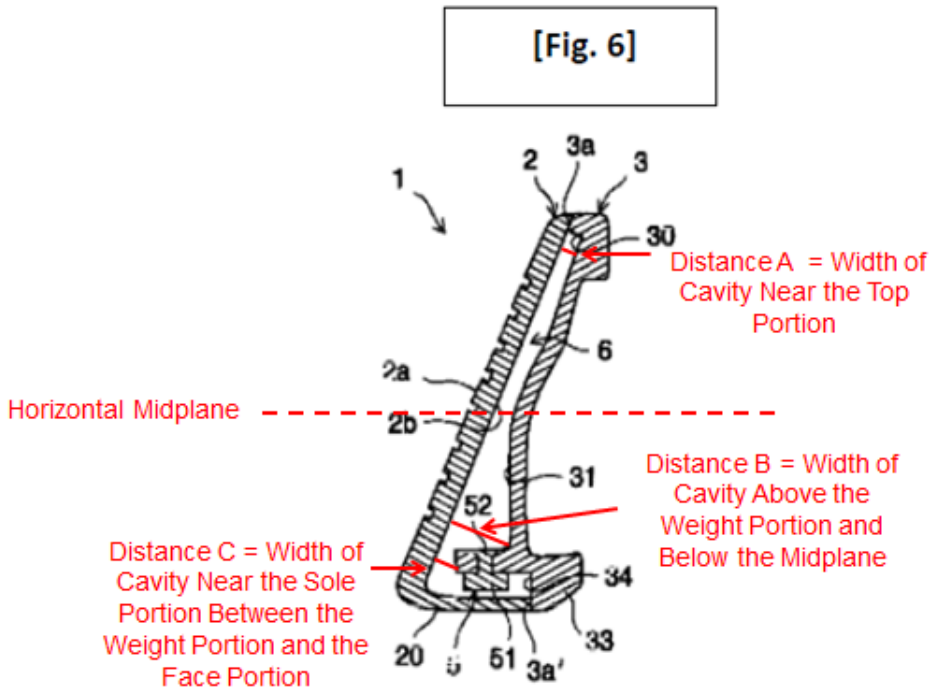
FIG. 38

(TMG1001, Fig. 38.)

215. Even if the drawings in Chaen are not drawn to scale, in my opinion, these drawings at least render obvious the features recited in claim 6, as they clearly disclose to a POSA having different widths of the cavity at various locations from the sole portion to the top portion of the club head. As shown below, cavity width distance “A” above the horizontal midplane and near the top portion and cavity width distance “C” below the horizontal midplane and near the

sole portion are both less than cavity width distance “B,” which is located between distance “A” and distance “C” and between the horizontal midplane and the weight portion. Accordingly, the combination of Chaen and Lahaix renders claim 6 obvious.





(TMG1072, Figs. 2, 6 (Annotated).)

J. The Combination of Chaen and Lahaix Renders Claims 7, 12, and 20 Obvious

216. Claims 7, 12, and 20 recite "wherein the face portion comprises a thickness of less than or equal to 1.9 millimeters (0.075 inch)." Lahaix discloses that "the striking plate preferably has a thickness of between 1 and 2 millimetres." (TMG1021, 4.) Accordingly, the combination of Chaen and Lahaix renders claims 7, 12, and 20 obvious.

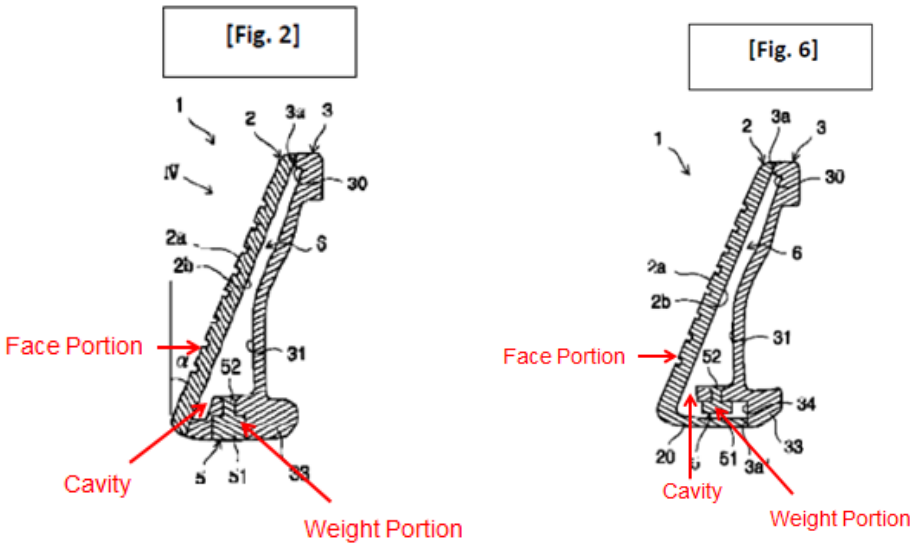
K. The Combination of Chaen and Lahaix Renders Claim 10 Obvious

217. Claim 10 recites "wherein the interior cavity comprises a cavity having at least 50% filled with a thermoplastic elastomer material." As discussed above, Lahaix discloses that the cavity can be "wholly filled by the filling

material," which discloses filling at least 50%. (*Id.*, 5, Fig. 4, Section XI.B.6.) Lahaix also discloses that "[t]he filling material may be a thermoplastics or elastomer material," which a POSA would have understood to include "thermoplastic elastomer material[s]." (*Id.*, 4.) Accordingly, the combination of Chaen and Lahaix renders claim 10 obvious.

L. The Combination of Chaen and Lahaix Renders Claim 11 Obvious

218. Claim 11 recites "wherein a portion of the interior cavity is configured to separate the face portion and the at least one weight portion." Multiple embodiments of Chaen's club head disclose the claimed cavity configuration, as shown below. The interior cavity is configured to separate the face portion and the weight portion. Accordingly, the combination of Chaen and Lahaix renders claim 11 obvious.



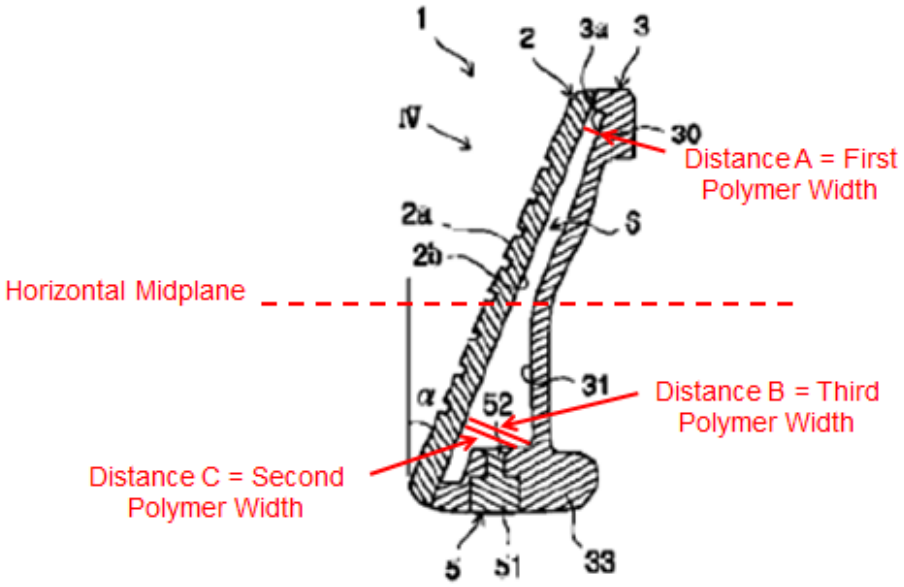
(TMG1072, Figs. 2, 6 (Annotated).)

M. The Combination of Chaen and Lahaix Renders Claim 14 Obvious[8]

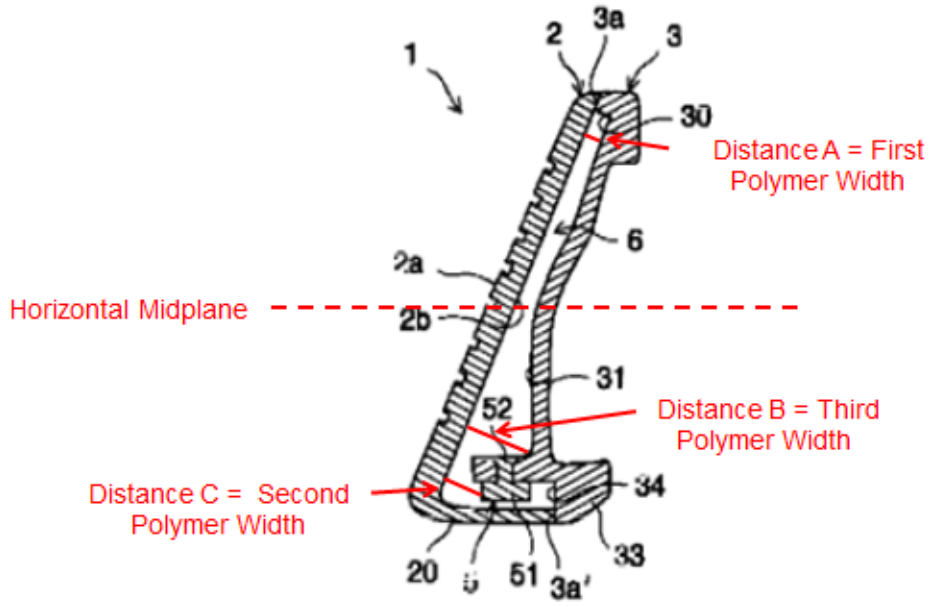
219. Claim 14 recites "wherein the third width is between the at least one weight portion and the horizontal midplane." Claim 14 depends from claim 13, and as discussed above in claim element [13.7], polymer widths and cavity widths are equal when the cavity is filled with polymer material. (*Supra* Section XI.D.7.) As shown below, the embodiments of Chaen shown in [13.7] also disclose the elements of this claim. The third width is between the weight portion and the horizontal midplane. Accordingly, the combination of Chaen and Lahaix renders claim 14 obvious.

[8] I note that claim 14 depends on claim 1, as-issued, however, claim 1 does not recite a "third width." It appears that claim 14 should depend on claim 13. The analysis below applies regardless of whether claim 14 depends from claim 1 or claim 13.

[Fig. 2]



[Fig. 6]



(TMG1072, Figs. 2, 6 (Annotated).)

P. The Combination of Chaen and Lahaix Renders Claim 15 Obvious

220. Claim 15 recites "wherein a portion of the at least one weight portion is closer to the face portion than a portion of the polymer material in the interior cavity." This claim is identical to claim element [1.8]. (*Supra* Section XI.B.8.) As discussed above, it would have been obvious for a POSA to fill the cavity of Chaen as disclosed in Lahaix. (*Supra* Section XI.A.) Lahaix discloses that internal cavity volume "is occupied by a non-metal filling material" and that the cavity can be "wholly filled by the filling material." (TMG1021, 2, 5, Fig. 4.) Lahaix also discloses that "[t]he filling material may be a thermoplastics or elastomer material," which a POSA would have understood to include "polymer material[s]." (*Id*., 4.) When filled with a filler material, multiple embodiments of Chaen disclose the claimed relationship between the weight portion and polymer material.

221. The '220 patent does not expressly describe how to measure the distances of the claimed elements to determine which is "closer" to the face portion, nor does the '220 patent provide specific distances from these features to the face portion. Instead, PXG relies on the Figures as disclosing the relative distances. (TMG1002, 223-224, 232.) As shown below in Figure 38, for example, lines 3840 and 3842 show the distances being measured from the back surface of the face portion in a direction perpendicular to the back surface. (*See, e.g.*, TMG1001, Figs. 37-41.) Furthermore, when discussing absolute distances, a

POSA would typically assume the distance in question is the *minimum* distance, measured using lines perpendicular to a planar surface. This is because there is only one minimum distance between any two objects, but there are, of course, many other distances depending on the measurement path taken. Thus, without any other guidance, a POSA would have taken the distance from a feature to the face portion along a line perpendicular to the back surface of the face portion, which also matches the apparent measurement method used in the ’220 patent.

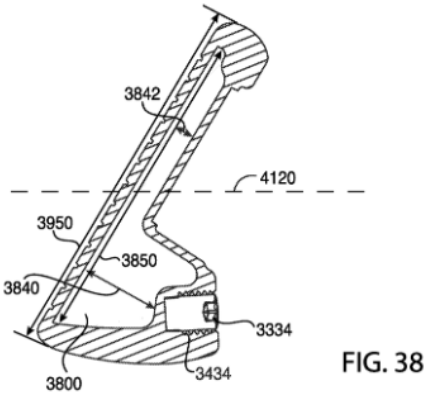


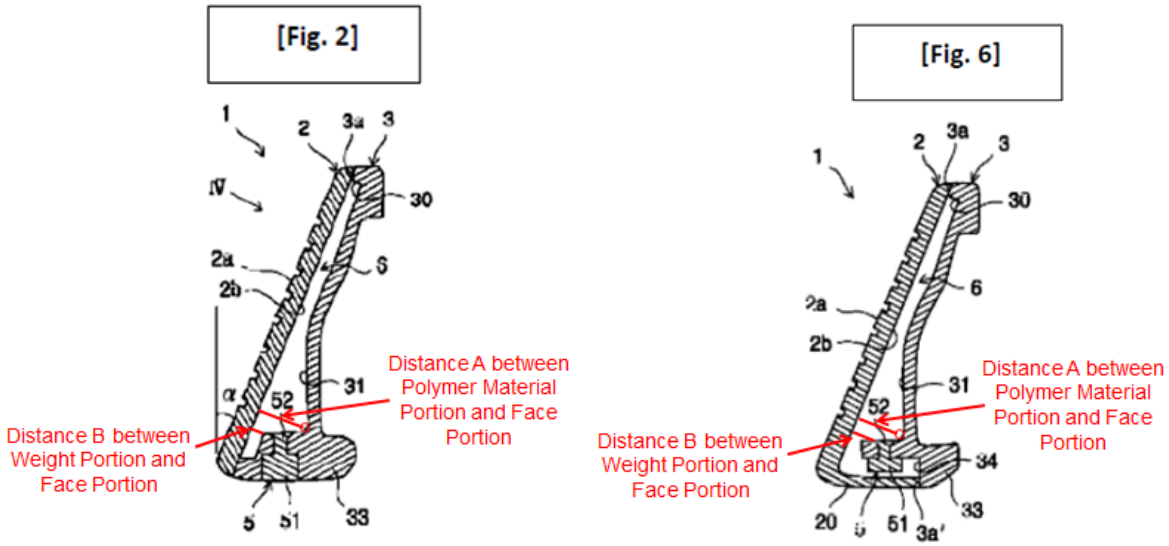
FIG. 38

(TMG1001, Fig. 38.)

222. Even if the drawings in Chaen are not drawn to scale, in my opinion, these drawings at least render obvious the features recited in claim 15, as they clearly disclose to a POSA having different widths of the cavity at various locations from the sole portion to the top portion of the club head.

223. As shown below in annotated Figures 2 and 6 of Chaen, a portion of the weight portion is closer to the face portion than a portion of the polymer material in Chaen’s club head as modified by Lahaix. As shown below by way of

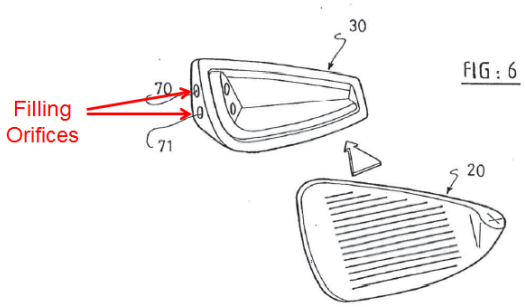
example in annotated Figures 2 and 6, when Chaen's cavity is filled, a portion of the weight (e.g., near protrusion member 52) is closer to the face portion than a portion of the polymer material in the interior cavity (e.g., at the back of the cavity). And although, like the '220 patent, Chaen does not disclose these actual distances, a POSA would have found the relative relationship disclosed by the Figures. As shown below, the distance "A" between a portion of the polymer material and the face portion is greater than the distance "B" between a portion of the weight portion and the face portion, and thus a portion of the weight portion is closer to the face portion than a portion of the polymer material. Accordingly, the combination of Chaen and Lahaix renders claim 15 obvious.



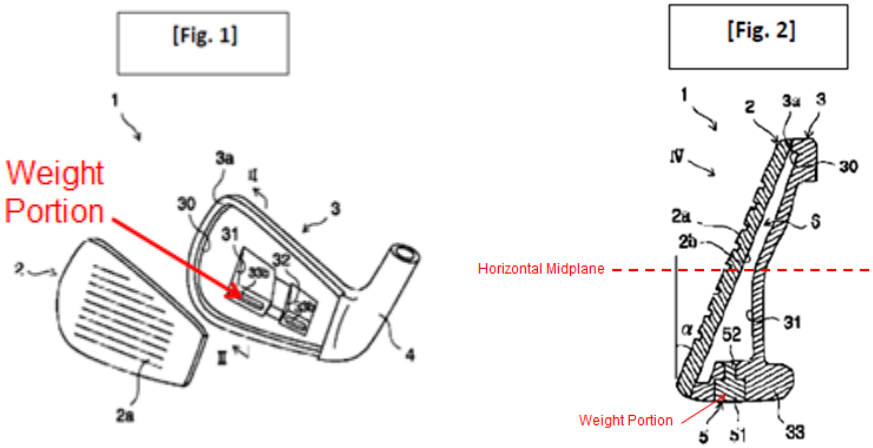
(TMG1072, Figs. 2, 6 (Annotated).)

Q. The Combination of Chaen and Lahaix Renders Claim 18 Obvious

224. Claim 18 recites "wherein the at least one weight portion is closer to the sole portion than the at least one port." As discussed above in element [13.4], the combined Chaen-Lahaix club head would include the filling orifices in the toe portion. (*Supra* Section XI.D.4.) As shown below, both of Chaen's weight portions would be located closer to the sole portion than the port of the club head of Chaen as modified to include the filling orifices disclosed in Lahaix. Accordingly, the combination of Chaen and Lahaix renders claim 18 obvious.



(TMG1021, Fig. 6 (Annotated).)



(TMG1072, Figs. 1, 2 (Annotated).)

XII. Ground 4: The Combination of Chaen, Lahaix, and Linphone Renders Claim 9 Obvious

A. Motivation for Combining Chaen, Lahaix, and Linphone

225. Chaen, Lahaix, and Linphone are from the same field of endeavor—iron-type golf clubs. The motivation for combining Chaen and Lahaix discussed above applies equally here. (*Supra* Section XI.A.) Lahaix discloses the desirability of improving club feel and sound on impact with a golf ball. (TMG1021, 2.) And Lahaix discloses using "a non-metal filling material" in a hollow, iron-type club to help attenuate unwanted sounds and improve the performance and feel of the club. (*Id*., 2-3.)

226. A POSA would have recognized Lahaix's goals of improving the sound and feel of the club during use. One way a POSA would have limited sounds or vibrations was to limit potential movement of the filler material inside the club head and to include an additional cushioning layer. Specifically, a POSA would have applied an adhesive to hold the filler material in place. In addition to reducing the vibrations of the filler material inside the club head, adhering or bonding the filler material to the inside of the club head more efficiently transfers the energy from the hit on the front face into the filler material. This allows the filler material to more quickly dissipate the vibrations of the club head.

227. Linphone discloses such a bonding method. Linphone's disclosed method produces a club head with shock absorbing qualities to minimize

undesirable sounds and vibrations. (TMG1035, 0003.) Linphone teaches bonding the club's filler material to the cavity of the club head using an adhesive. (*Id.*, 0004.) Linphone's bonding method produces a club head that more effectively dissipates the vibrations of the front face in the filler material by bonding the filler to the face. (*Id.*) A POSA would have recognized the potential benefits of applying Linphone's bonding method to Wahl's filled club head to produce a club head with improved shock absorbing properties. (*Id.*) This would have been nothing more than improving a similar device–Chaen's club head as modified by Lahaix–using a known method–Linphone's bonding method–to achieve predictable results. Accordingly, it would have been obvious to a POSA to combine the teachings of Linphone with those of Chaen and Lahaix.

B. The Combination of Chaen, Lahaix, and Linphone Renders Claim 9 Obvious

228. Claim 9 recites "a bonding portion configured to bond the elastic polymer material to the face portion." Linphone discloses a bonding portion, as claimed. (*Id*..) Linphone describes an iron head 1 formed from a body 11 and striking face 12. (*Id*.) The body 11 and striking face 12 define a hollow cavity 13. (*Id*.) The inner walls of the cavity are sand-blasted to form a rough surface 15, which is depicted in Fig. 3 as including the back surface of the striking face 12. (*Id*.) An adhesive solution 2 is injected into the cavity 13 through a through-hole

14 so that its inner walls and their rough surfaces, including the back surface of the striking face 12, are uniformly coated with the adhesive solution 2. (*Id*.)

229. Linphone describes that the sand-blasting enables the adhesive solution 2 to adhere better to the back surface of the striking face 12. (*Id*.) Thus, a POSA would have understood that the adhesive solution bonds to the back surface of the front face. A POSA would have understood Linphone's adhesive solution to be a bonding portion because it is an adhesive agent, distinct from the elastic polymer material and the body portion, that joins the elastic polymer material to the body portion.

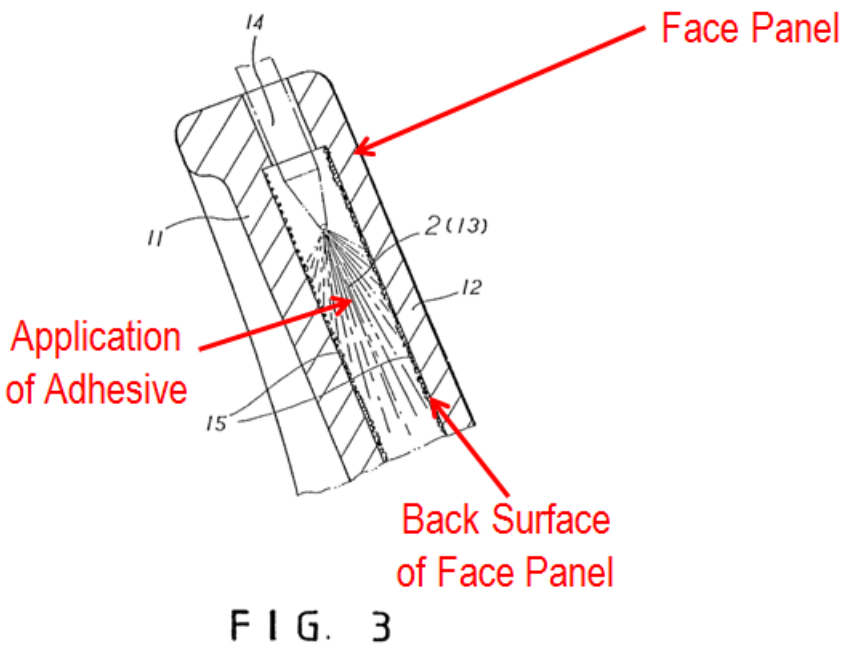


FIG. 3

(TMG1035, Fig. 3 (Annotated).)

230. Linphone describes that a shock-absorbing rubber 3 is injection molded through the through-hole 14 into the adhesive-coated cavity 13 so that it

fills the cavity 13, as shown in Fig. 4. (*Id*.) Linphone also states that the disclosed club head manufacturing process "serves to enable the adhesive solution 2, and also the shock-absorbing rubber 4, to adhere better to the inner wall of the cavity 13." (*Id*.)

231. A POSA would have understood that the shock-absorbing rubber described in Linphone can only adhere to the inner wall of the cavity—including the back of the striking face 12—via the intermediary adhesive bonding portion. That is, a POSA would have understood that when two surfaces are bonded together by an adhesive, each surface bonds to the adhesive. (TMG1042, 8-9.) A POSA would have also understood that Linphone's efficient vibration dissipation relies on bonding the back surface of the front face to the elastic polymer filler material because this facilitates the transmission of energy from the front face to the elastic polymer filler material. Further, a POSA would have recognized that the purpose of adhesive solutions is to bond two or more surfaces together. Therefore, when Linphone describes applying the adhesive solution between the back surface of the face portion and the elastic polymer material, a POSA would have understood that to mean that the adhesive solution bonds to the back surface of the face portion to the elastic polymer material. Thus, Linphone discloses the elastic polymer bonded to the bonding portion. Accordingly, the combination of Chaen, Lahaix, and Linphone renders claim 9 obvious.

XIII. Objective Indicia of Non-Obviousness

232. I understand that PXG has made some allegations of copying, commercial success, and industry praise for its 0311 iron product in related district court litigation. (*See, e.g.*, TMG1011, 2-4.) It is my understanding that any objective indicia of non-obviousness must have a nexus, or causal relationship, with claimed elements in order to be relevant. Here, I am not aware of any evidence linking the claims of the ’220 patent to any of the alleged objective indicia. As I have explained above, such features are well known, obvious, and unrelated to any such objective indicia. In my opinion, there is no relevant evidence of objective indicia for consideration, and therefore my opinion remains that all of the claims of the ’220 patent are invalid.

XIV. Conclusion

233. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

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

Executed this 30 day of October, 2018.

Respectfully submitted,

Dr. George Thomas Mase