

Filed on behalf of: Fitbit, Inc.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FITBIT, INC.
Petitioner

v.

ALIPHCOM, INC. D/B/A JAWBONE
Patent Owners

U.S. Patent No. 8,529,811

DECLARATION OF DR. DARRAN CAIRNS

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I, Darran Cairns, declare as follows:

I. INTRODUCTION

1. I have been retained by Fitbit Inc. (“Petitioner”) as an independent expert consultant in this proceeding before the U.S. Patent and Trademark Office regarding U.S. Patent No. 8,529,811 (“the ’811 patent”), which I understand is labeled as Ex. 1001 in this proceeding. I have been asked to consider, among other things, whether certain references teach or suggest the features recited in claims 1–26 of the ’811 patent. My opinions are set forth below.

2. I am being compensated at my normal consulting rate for the time I spend on this matter. No part of my compensation is dependent on the outcome of this proceeding or any other proceeding involving the ’811 patent. I have no other interest in this proceeding.

II. QUALIFICATIONS

3. I am the CEO of Tailored Surfaces, a technology development and consulting company focused on functional coatings for the technology industry, and an Adjunct Associate Professor of Mechanical and Aerospace Engineering at West Virginia University, where I have served on the faculty since 2006. I was an Associate Professor with Tenure at West Virginia University until August 2014.

4. My undergraduate degree in Physics (1995) and PhD in Materials Science and Engineering (1999) are from the University of Birmingham in the

United Kingdom. From 1998 to 2001 I was a postdoctoral research associate in engineering at Brown University. During my time at the University of Birmingham, I performed research on multi-layer polymer encapsulated optical fibers and optical fiber sensors and worked closely with engineers at Pirelli Cables. During my time at Brown University, I performed research on the use of polymeric materials for optoelectronic and display devices including flexible electronics, conformable displays, encapsulated liquid crystal devices, and touch sensors.

5. In 1995, I entered the graduate program at the University of Birmingham in Materials Science and Engineering, where I received my Ph.D. in 1999. In graduate school, I instructed lab courses in polymer processing including molding, extrusion and rheology. My dissertation research concerned the mechanical reliability of multi-layer polymer encapsulated optical fibers.

6. At West Virginia University my research focused on the fabrication of flexible devices utilizing protective coatings, liquid crystal materials, composites and the like. My work was funded by federal agencies: The National Science Foundation, NASA, the Air Force Office of Sponsored Research, the Department of Energy; and provide companies: EuropTec USA, Grote Industries, Kopp Glass, Eastman Chemical and Articulated Technologies. I have worked closely with engineers at each of these companies and assisted them in developing and commercializing encapsulated polymer and coated glass products including a

durable multi-layer reflecting window film; encapsulated electronic lighting for automotive use; hydrophobic and oleophobic glass for displays; and flexible backlights for displays.

7. In my own research program, I am developing patented technologies on functional coatings for electronic and energy applications. I am a named inventor on 11 issued U.S. patents.

8. At West Virginia University, I have taught students in both the graduate and undergraduate programs. For example, I offer a large classroom-based graduate course entitled, “Thermodynamics and Kinetics of Materials,” where I teach how time and temperature impact materials and their processing. I also have offered undergraduate classroom-based courses entitled “Mechanics of Materials” and “Intermediate Mechanics of Materials” where I teach students to design mechanical systems, components or processes, and introduce them to manufacturing processes used for materials including molding, forming and deposition.

9. Prior to joining the faculty at West Virginia University, I worked for five years as a Research Specialist at 3M. My research there focused on nanocomposite materials for wear resistant optical coatings used for touchscreen applications. My work at 3M included the development of patented and proprietary technologies to protect the electronic touch surfaces using

encapsulation and coating methods and associated manufacturing processes. My work at 3M included the use of surface treatments and materials to impart hydrophobicity, oleophobicity and anti-microbial properties.

10. I am a member of the Society of Information Display (SID), the Institute of Physics (IOP) and the American Society of Mechanical Engineers (ASME).

11. My students have been awarded prestigious fellowships for work performed in my laboratory including NSF Graduate Fellowships (3 students), NDSEG Fellowship (1 student) and the RUBY graduate Fellowship (1 student).

12. I have served as a consultant to Corning, Arkema and Crossville Ceramics.

13. My *curriculum vitae* documents more than 79 scientific publications in journals, books, and peer-reviewed conferences, as well as invited presentations on my work in polymer materials for electronic devices and surfaces, and is provided as Exhibit 1022.

III. SUMMARY OF OPINIONS

14. All of the opinions contained in this Declaration are based on the documents I reviewed and my knowledge and professional judgment. In forming the opinions expressed in this Declaration, I reviewed the documents mentioned in this declaration, including the '811 patent (Ex. 1001), the prosecution history file

of the '811 patent (Ex. 1019), U.S. Patent Application Publication Nos. 2006/0264756 to Lo et al. ("*Lo*") (Ex. 1003), 2009/0047797 to Anderson et al. ("*Anderson*") (Ex. 1004), 2009/0295596 to Downey et al. ("*Downey*") (Ex. 1005), 2006/0110537 to Huang et al. ("*Huang*") (Ex. 1007), and 2010/0178834 to Toyoda et al. ("*Toyoda*") (Ex. 1008), U.S. Patent Nos. 5,286,330 to Azuma et al. ("*Azuma*") (Ex. 1009), 5,844,523 to Brennan et al. ("*Brennan*") (Ex. 1010), 6,361,870 to Steffl et al. ("*Steffl*") (Ex. 1011), and 6,447,886 to Mohammed et al. ("*Mohammed*") (Ex. 1012), several industry references including the "Handbook of Thermoplastic Elastomers" by Jiri G. Drobny (Ex. 1006), the third edition of "Handbook of Plastics, Elastomers, and Composites" by Charles A. Harper (Ex. 1023), and "Thermoplastic Elastomers" by Geoffrey Holden et al. (Ex. 1025), trade publications by SRI International entitled "Anti-Smudge, Easy-to-Clean Product Coatings" (Ex. 1014) and by Eric L. Bruner and Edward Hughes entitled "Surfaces Matter" (Ex. 1013), and product brochures from Henkel & Co. entitled "Electronic Solutions" (Ex. 1015), DuPont Engineering Polymers entitled "Electric/Electronic Thermoplastic Encapsulation" (Ex. 1026), and Dow Corning entitled "Information about Dow Corning Brand[®] Conformal Coatings" (Ex. 1027). My opinions are additionally guided by my appreciation of how a person of ordinary skill in the art would have understood the claims of the '811 patent at the time of the alleged invention, which I have been asked to assume is June 10, 2011.

15. Based on my experience and expertise, it is my opinion that certain references teach or suggest all the features recited in claims 1–26 of the '811 patent.

IV. LEVEL OF ORDINARY SKILL IN THE ART

16. At the time of the alleged invention, in 2011, a person of ordinary skill in the art would have had at least two years of relevant college-level coursework in an engineering field with one to two years of post-education relevant work experience.

17. In determining the level of ordinary skill, I have been asked to consider, for example, the types of problems encountered in the art, prior solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level of active workers in the field. Active workers in the field would have had at least two years of college-level coursework in a relevant engineering field, as noted above. Depending on the level of education, it would have taken between 1–2 years for a person to become familiar with the problems encountered in the art and to become familiar with the prior and current solutions to those problems.

18. In my capacity as a professor at the West Virginia University, a large proportion of the students whom I train and supervise would also be considered to

be persons of ordinary skill in the art under the above level of skill at the relevant timeframe.

19. In June 2011, a person of ordinary skill in the art of overmolding electronic devices would have been familiar with a wide range of methods for applying protective, decorative, and structural moldings and coatings to form consumer electronic devices used in a variety of product applications. A person of ordinary skill in the art would also have been familiar with the use of a variety of materials that may be applied, either alone or with known additives, to impart particular properties to an end product. Such an artisan would likewise have been aware of what sort of properties and materials are desirable for particular product application or end use.

V. BACKGROUND OF THE RELEVANT FIELD

20. The '811 patent claims are addressed to basic techniques that were well-understood fundamentals of plastic manufacturing long before the '811 patent. The materials and properties recited in the various claims were likewise predictable choices that were well known and readily implemented by those in the art before the '811 patent's priority date.

21. By June 2011, the field involving the application of plastics and other coatings to build, protect, and finish products and devices was mature and well developed. Persons of ordinary skill working in this space had knowledge of a

variety of long-standing manufacturing and design techniques and fundamentals. These included a number of methods of applying substances to produce a desired structure or coating and a variety of well-understood materials useful for producing desired properties and how to apply them. Such methods include overmolding, which, in contrast to separately forming a coating and then affixing it to an underlying article, involves using a mold to apply material directly to (and form a molding on) the surface of an underlying article or previously formed layer.

22. A typical project for a person of ordinary skill in the art in June 2011 would have been determining the end use requirements for a given product (*e.g.*, contact with a user's skin, flexibility or rigidity, protection of underlying electronic components, shock resistance, water-resistance, exposure to sunlight, texture, color, tamper resistance) and choosing a combination of known materials and application techniques to design and fabricate a product meeting such requirements. By June 2011, the challenges faced by those skilled in the art were chiefly economic (*i.e.*, cost effective application to mass production) rather than technical.

23. In addressing such projects, those skilled in the art had a variety of resources at their disposal. These included industry reference handbooks that catalogued the properties and applications for a wide range of materials and

additives and manufacturing methods for applying them, including preferred techniques and operating conditions.

24. One such reference guide is the *Handbook of Thermoplastic Elastomers* by Jiri Drobny (Ex. 1006), a nearly 400 page book published in 2007, that is illustrative of the sort of reference materials available to and the knowledge of skilled artisans. As it explains in its preface:

The goal of this work is to compile in one place the current working knowledge of chemistry, processing, physical, and mechanical properties, as well as the applications of thermoplastic elastomers.

* * *

A rather comprehensive review of processing methods applicable generally to thermoplastic elastomers is in Chapter 4. . . . In some cases processing conditions for individual thermoplastic elastomers are in corresponding chapters. Additional processing data for most commercial TPEs are in Appendix 4.

* * *

The focus is more on practical than on theoretical subjects. The goal has been to provide a useful reference and resource of learning the basics for those entering the field and updated references for those already involved in polymerization, processing, and part manufacture. The work is also intended to be a solid resource for end users as well as a comprehensive

textbook for students specializing in polymer science and technology or material science.

Ex. 1006 at xvii (Preface).

25. The handbook includes a 125-page chapter explaining a range of molding and other manufacturing techniques. It addresses material preparation and treatment, a variety of available molding and extrusion techniques, and secondary manufacturing processes, such as finishing and decorative techniques. It also includes “individual detailed chapters describing individual groups of TPEs containing specifics as to the industrial preparation properties, processing methods, and conditions for each group.” *Id.*

26. As its title implies, the *Handbook of Thermoplastic Elastomers* is focused on thermoplastic elastomer materials and manufacturing. A number of similar reference guides were available for other types of plastics and polymers, such as *Handbook of Plastics, Elastomers, and Composites* by Charles Harper (Ex. 1023) and *Thermoplastic Elastomers* by Geoffrey Holden, Hans R. Kricheldorf & Roderic P. Quirk (Ex. 1025).

27. Individuals of ordinary skill in the art also had access to and familiarity with a variety of resources and solutions from industry suppliers. Many of the materials used to fabricate consumer devices were off-the-shelf products marketed by a number of chemical suppliers (*e.g.*, Henkel, Dow, DuPont) with

guidance and instructions from suppliers as to how and in what products to apply the materials. See e.g., Marketing Materials, Henkel Corporation, *Electronic Solutions* (2005) (Ex. 1015); Marketing Materials, DuPont Engineering Polymers, *Electrical/Electronic Thermoplastic Encapsulation* (1997) (Ex. 1026); Marketing Materials, Dow Corning, *Information About Dow Corning Brand[®] Conformal Coatings* (2008) (Ex. 1027).

28. In addition to such products and product literature, chemical suppliers often provided design and engineering support to assist in the selection of combinations of materials and manufacturing techniques that would fit the requirements of a particular product. See e.g., Ex. 1027 at 2; Ex. 1015 at 2.

29. A May 2005 brochure from Henkel & Co. illustrates the knowledge and understanding those of skill in the art had of coating electronic components as well as the type of industry-specific information and off-the-shelf solutions readily available to skilled artisans. In my experience, comparable materials were provided by a number of competing suppliers (e.g., Dow, DuPont) for a number of different product segments. Exemplary brochures from DuPont and Dow are provided as Exhibits 1026 and 1027. For example, Dow advertises services such as “tutorials,” “equipment recommendations,” and “consultation with experts” wherein “our experts visit your facility or [you can] join us at one of our global application centers to work together on your material and processing needs” in its

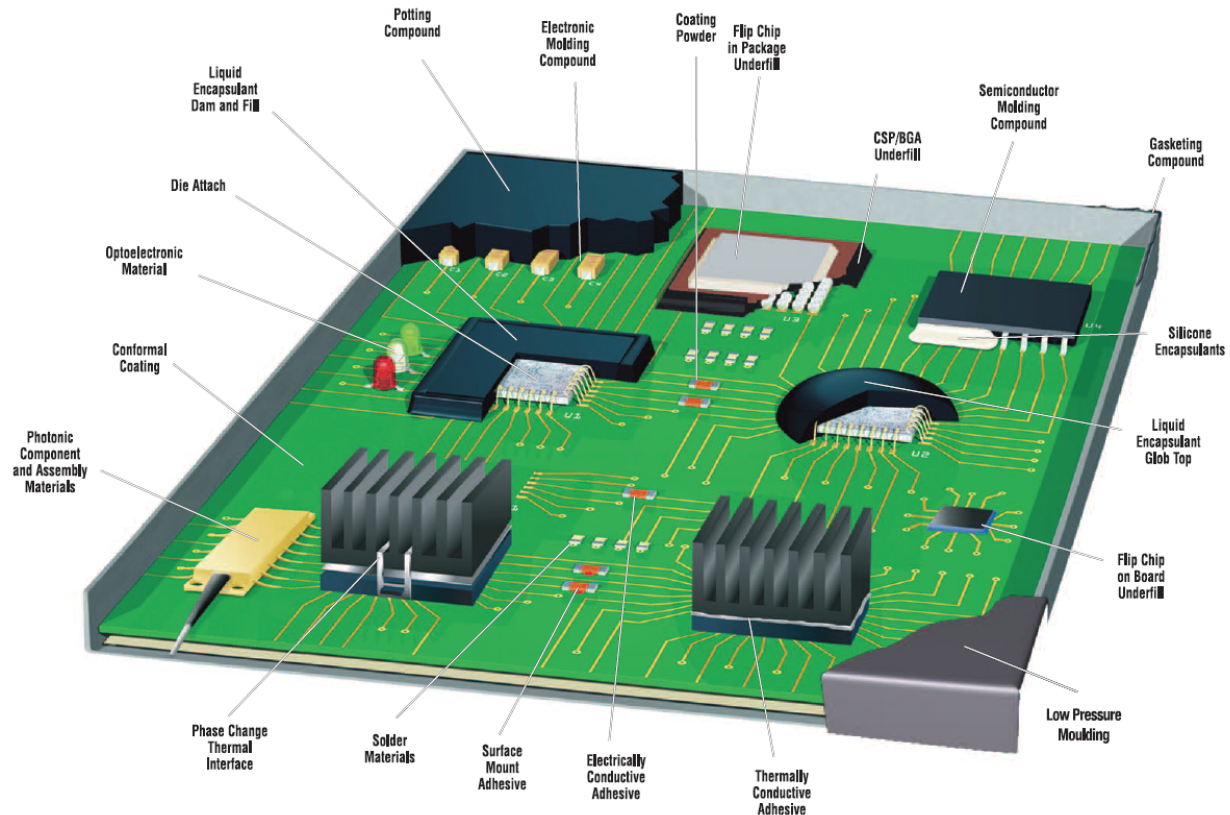
product guide advertising its conformal coatings. Ex. 1027 (2008 Dow Corning Conformal Coatings Product Information) at 2; *id.* at 1 (“Long-term, reliable protection of sensitive circuits and components has become increasingly more important in many delicate and demanding electronic applications. . . . In addition to sustaining their physical and electrical properties over a broad range of operating conditions, silicones are resistant to ozone and ultraviolet degradation”); *id.* (“Conformal coatings are materials applied in thin layers . . . onto printed circuits or other electronic substrates. . . . [to] protect electronic printed circuit boards from moisture and contaminants”); *id.* (“Dow Corning coatings are particularly useful for protecting circuitry in severe-service environments . . . [including] everyday temperature and humidity extremes seen in consumer electronics”). DuPont similarly markets its materials. See Ex. 1026 (1997 DuPont Electrical/Electronic Thermoplastic Encapsulation product guide).

30. The Henkel brochure explains its various product solutions for the coating, protection, and packaging of electronic devices including elements coupled to a circuit board. Ex. 1015. This was a common product application addressed by those skilled in the art in 2011. One of the Henkel product lines discussed in the brochure, Loctite, was a widely used commercial product that the

'811 patent itself indicates may be used to form the sort of protective coatings that the brochure described six years earlier.¹

31. As highlighted by the figure below, the Henkel brochure identifies a number of off-the-shelf products used to encapsulate a printed circuit board and electronic elements mounted on one:

¹ The Henkel brochure is dated May 2005. It may be found at the following URL: http://www.loctite.ph/php/content_data/LT4145_Electronic_Solutions.pdf. The brochure was returned as Google search result for materials from prior to January 1, 2010. The metadata on the pdf of the brochure at the above address indicates it was created and modified on May 11, 2005, which is consistent with the date found on the last page of the brochure. The contents of the brochure are consistent with my recollection of available products around this timeframe.



32. The Henkel brochure is indicative of the knowledge had by those of skill in the art. It illustrates a variety of well-known protective coatings and moldings that those skilled in the art understood could be applied, alone or in combination, to electronic elements on a circuit board as well as to the board itself. The benefits of such coatings and moldings were likewise well understood. As the brochure explains:

Our potting and encapsulation compounds protect PCBs and electrical devices by enhancing mechanical strength, providing electrical insulation, and increasing vibration and shock resistance. . . . And Loctite® conformal coatings protect circuit boards from thermal shock, moisture, humidity, corrosive

materials, and many other adverse conditions, extending their longevity in harsh marine, automotive, aerospace and consumer electronic applications.

Id. at 29.

33. The benefits identified in the Henkel brochure were well understood by those skilled in the art and it was likewise known in what sort of end products and uses particular properties would be desired.

34. In addition to Henkel, a number of other suppliers sold materials marketed for the particular properties they could impart to coatings and moldings for particular end-use products. For example, oleophobic and hydrophobic materials were available commercially from a number of sources. *See, e.g.*, Ex. 1013 (describing products that “create[] a water-repellant (hydrophobic) and oil-repellant (oleophobic) surface[]”) and Ex. 1014 (marketing products for “rendering [surfaces] to be hydrophobic, hydrophilic, oleophobic or oleophilic by design”); *see also* Ex. 1011 at 1:16–21 (“Polymer surfaces typically have hydrophobic . . . properties”). Similarly, a number of off-the-shelf materials or additives were available to provide protection against degradation caused by ultraviolet radiation or bacteria and other microbes. *See, e.g.*, Ex. 1006 at 13–14 (§§ 3.2–3.2.2) (discussing “[t]he most widely used UV absorbers”) and 23–24 (§ 3.12) (referencing list of commercially available antimicrobial additives).

VI. BACKGROUND OF THE '811 PATENT

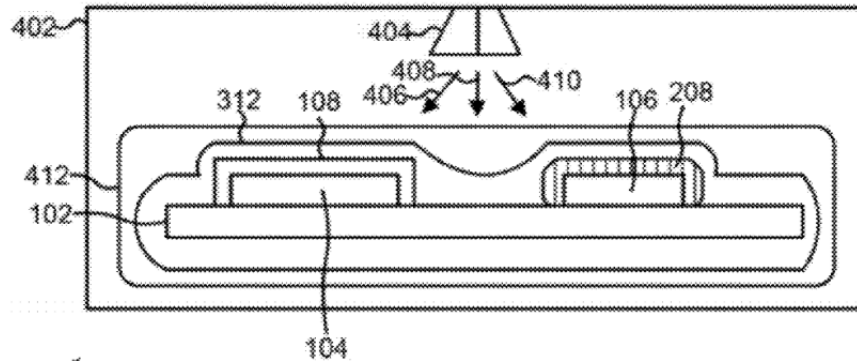
35. The '811 patent describes a method of applying a number of coating layers—some of them protective—on top of one or more electronic elements including a sensor that are “coupled with a framework for a wearable device.” Ex. 1001 at 2:14–18, 12:36–39, 13:40–54, and 14:24–38. The framework may include, *inter alia*, a printed circuit board. *Id.* at 3:36–40 (“In some examples, framework 102 may be referred to interchangeably as a substrate, wafer, board (printed, unprinted, or otherwise), or other surface upon which elements 104-106 may be mounted, placed, or otherwise fixed.”). The elements are described generally as “electrical and electronic components such as microprocessors, processors, data storage and computer memory, [or] sensors.” *Id.* at 10:30–32.

36. The '811 patent describes applying three types of layers to the elements and framework, including: (1) a “covering” or “protective material” over one or more of a plurality of elements; (2) one or more “inner moldings” substantially over the covering or protective material, the framework, and the plurality of elements; and (3) an “outer molding” covering “all or substantially all” of the one or more inner moldings. *Id.* at 13:40–54 and 14:24–38. The purposes of such layers include protection from “various conditions such as use, weather, shock, temperature, or other environmental conditions to which finished products . . . may be subjected.” *Id.* at 9:39–44.

37. The first coating layer is described as a “covering” (claims 1-15) or “protective material” (claims 16-25) that is applied “substantially over one or more of a plurality of elements coupled with a framework.” *Id.* at 13:41–43 and 14:24–26. The patent does not specify whether this layer must be molded or what material must be used. Rather it “may be” any of a number of materials including “coatings, adhesives, gels, [or] liquids” as well as “epoxies, polymers, elastomers, and the like, without limitation.” *Id.* at 4:44–47, 6:48–51, and 8:1–12.

38. The second type of layer is one or more “inner moldings” substantially over the first coating layer, plurality of elements, and the framework. *Id.* at 13:46–48 and 14:29–33. The ’811 patent does not specify a molding technique or material that must be used for the inner moldings, but rather discloses that “a variety of molding techniques” may be implemented, using “any . . . organic or inorganic material that can be molded in a mold cavity.” *Id.* at 5:19–24.

39. The third type of layer, an “outer molding,” covers “all or substantially all” of the one or more inner moldings and is “configured to be positioned in contact with the user.” *Id.* at 13:51–54 and 14:34–37. The layers are depicted in Figure 4:



40. In all, the '811 patent includes 26 claims, with two independent claims: claim 1 and claim 16. Ex. 1001 at 13:40–54 and 14:23–38. Both independent claims are directed to the number of layers applied and the method of applying them. *Id.* The twenty four dependent claims are directed to the materials used in the framework (claims 10–14), *id.* at 14:10–20, the quality control steps of inspecting for defects and removing then reapplying defective layers (claims 8, 9, and 25), *id.* at 14:3–9 and 14:60–62, and the qualities given to the layers such as making them “anti-bacterial” or “oleophobic” or giving them a pattern (claims 2-7, 15, 18–24, and 26), *id.* at 13:55–14:2, 14:21–22, 14:42–59, and 14:63–64. One dependent claim also discloses that the elements mentioned in independent claim 16 are configured to perform some unspecified operation with the data from the sensor. *Id.* at 14:39–41.

VII. CLAIM CONSTRUCTION

41. I understand that in this proceeding, a claim receives its broadest reasonable construction in light of the specification of the patent in which it appears. I also understand that in these proceedings, any term that is not construed

should be given its plain and ordinary meaning under the broadest reasonable construction. I have followed these principles in my analysis below.

42. Claims 1 and 16 recite a process for forming layers that includes “forming a . . . molding.” Ex. 1001 at 13:46–54 and 14:29–38.

43. I have been asked to analyze the claims of the ’811 patent and the prior art under various possible constructions. First, I have been asked to assume that “forming a . . . molding” does not require further construction and carries the ordinary meaning it would have to one skilled in the art in 2011 in light of the specification. Second, I have also been asked to analyze “forming a . . . molding” under the following constructions: “using a . . . mold to apply material;” “making with a mold . . . a molding;” and “using a mold to form a . . . material.”

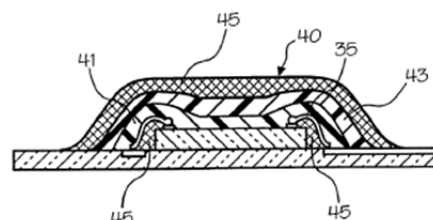
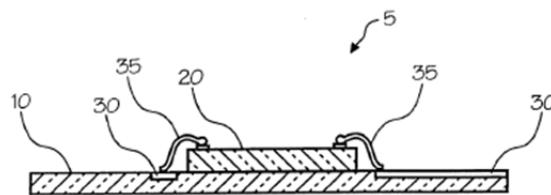
44. I have analyzed the prior art and the ’811 claims under these constructions and my opinion is that the prior art references discussed below teach or suggest every element of the ’811 patent claims under any of these meanings.

VIII. PRIOR ART

A. Anderson

45. *Anderson* teaches processes for producing a “microelectronic device . . . resistant to: tampering, inspection (visual and electromagnetic), moisture, vibration, shocks and other environmental hazards.” See Ex. 1004 at ¶ 0046. To provide such protection, *Anderson* teaches applying a series of protective coatings

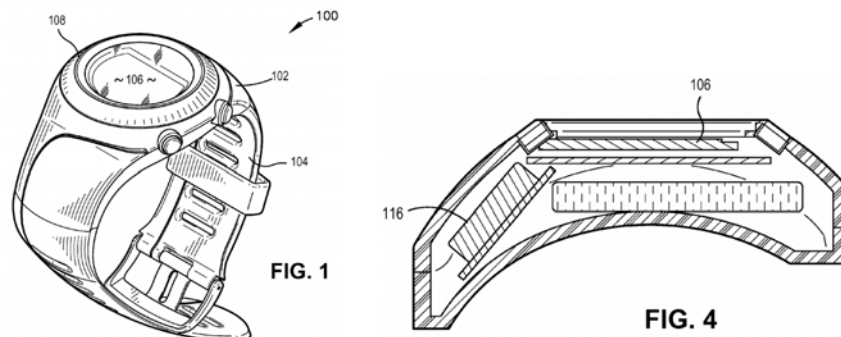
to “[a] chip, integrated circuit, memory, or any combination thereof” mounted on a substrate. *Id.* at ¶ 0026. *Anderson* teaches that the coatings may be applied using “molded encapsulation methods.” *Id.* at ¶ 0049. Such coatings or moldings include: (1) an initial layer applied to protect the microelectronic elements during the application of subsequent coatings (*id.* at ¶ 0031); (2) a tamper-resistant coating (*id.* at ¶¶ 0033 and 0049); (3) an encapsulant coating to fill gaps and protect against shock and vibration (*id.* at ¶ 0041); and (4) an outer encapsulant layer that provides a “moisture resistant and durable handling surface for the microelectronic device” (*id.* at ¶ 0044). *Id.* at Fig. 1b and Fig. 4b:



46. *Anderson* teaches that its multi-layer coating techniques for protecting microelectronic elements (*e.g.*, integrated circuits) may be beneficially applied to applications where a high tolerance to impact, shock, and vibration as well as protection from moisture and environmental hazards is desired. Ex. 1004 at Abstract and ¶ 0046.

B. Downey

47. *Downey* teaches a wearable exercise watch containing a variety of microelectronic elements (*e.g.*, inertial and GPS sensors and processors) that may track the activity and location of a user, even while swimming. *See e.g.*, Ex. 1005 at ¶¶ 0034–0035. *Downey* teaches that the wearable device’s components require protection against “environmental contaminants, moisture, vibration, and the like.” *Id.* at ¶ 0026. However, *Downey* does not apply protective coatings to its internal microelectronic elements, but rather relies on mechanical seals on the exterior housing that are “substantially waterproof or water-resistant to prevent the intrusion of liquids and other foreign objects within the housing.” *Id.* at ¶ 0022.



C. Lo

48. *Lo* teaches a “wrist-worn” ultrasonic monitor system 200 with ultrasonic monitor module 210, strap 220, display device 230 and transmission medium 240. Ex. 1003 at ¶ 0063. The *Lo* wearable wrist monitor detects blood flow through the radial artery of the user’s wrist in order to provide heart rate data to display 230. *Id.* A user’s blood flow is detected by ultrasonic transducer

elements. *Id.* at ¶ 0057. These transducer sensors and other circuitry elements are mounted directly to a printed circuit board. *See id.* at ¶ 0060.

49. To protect its underlying microelectronic circuitry, *Lo* teaches the application of three layers of material over the sensors and other elements coupled to the circuit board. These layers include: (1) a “protective layer” that covers the transducers and printed circuit board framework (*id.* at ¶ 0115); (2) a “plastic housing” molded so that it “encapsulates the entire ultrasonic monitor, including [the] protective layer” (*id.* at ¶ 0125); and (3) an outer layer “transmission medium” that is “over-molded onto . . . the plastic housing” and positioned to be in contact with the user’s skin (*id.* at ¶¶ 0101, 0109–0110, and 0114). *Id.* at Figs. 2A and 14C:

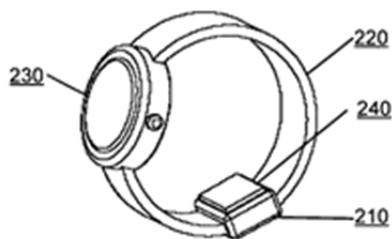


Figure 2A

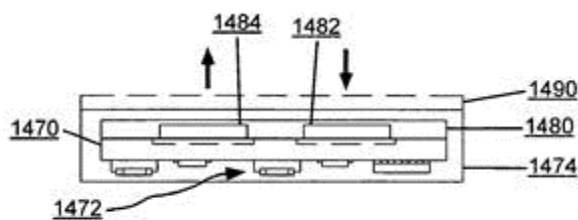


Figure 14C

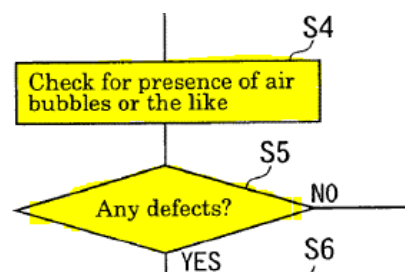
D. Huang

50. *Huang* teaches the application of a fingerprint resistant outer coating with anti-bacterial properties “[that] is environmental friendly and suitable for application to both a metal surface and a nonmetal surface of an electronic device.” Ex. 1007 at ¶ 0006. The coating may be applied to “a plastic material, glass, a

ceramic material, [or] a polymer” that “may be part of an enclosure or an outer housing of” a variety of electronic devices that contact a user’s skin. *Id.* at ¶ 0014. *Huang* explains that, among other benefits, its coating “has good . . . antibacterial properties.” *Id.* at ¶ 0019. *Id.*

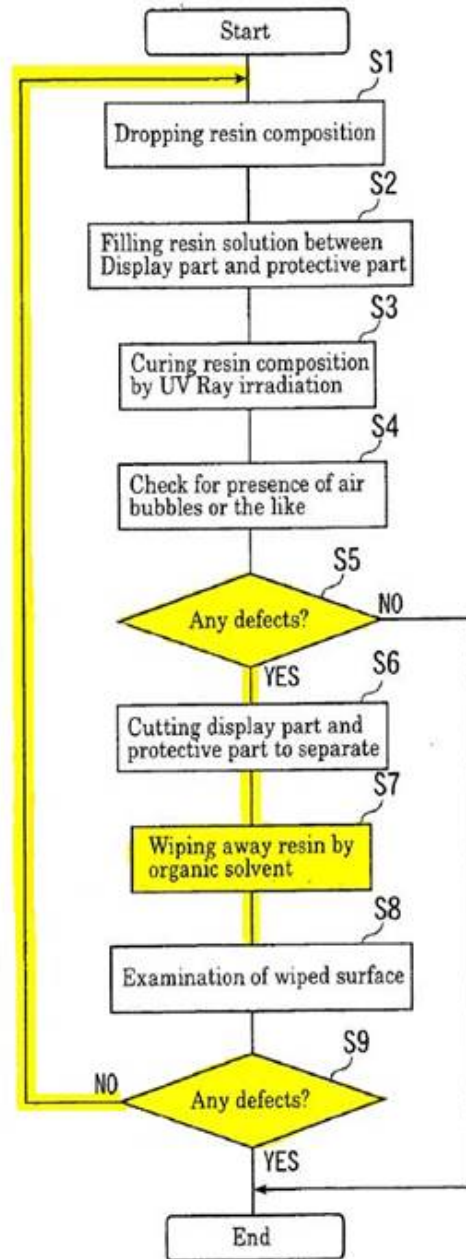
E. Toyoda

51. *Toyoda* teaches a method of forming resin layers on electronics that includes the step of performing an inspection to determine whether the resin layer is defective and, if a defect is found, removing and re-forming the layer. Ex. 1008 at Abstract. According to steps S2 and S3 of the process taught by *Toyoda*, the resin layer is arranged and then cured. *Id.* at ¶ 0055. In the next steps, S4 and S5, the cured resin layer is “checked” for defects such as the presence of foreign substances or air bubbles. *Id.* at ¶ 0062. *See also id.* at Fig. 1 (steps S4 and S5).



52. *Toyoda* then teaches removing and reforming an outer resin molding on electronic components where a defect is detected. *Id.* at Abstract. In *Toyoda*’s process depicted in Figure 1, an applied resin layer is “checked” for defects such as the presence of foreign substances or air bubbles (*id.* at ¶ 0062) and, if a defect is found, the resin layer is separated and removed (*id.* at ¶¶ 0064–65). The device is

then checked for any further underlying defects and, if none are detected at step S9, a resin layer is re-formed by returning to step S1 of the process. *Id.* at ¶ 0085.



F. Azuma

53. *Azuma* teaches a particular method of manufacturing a printed circuit board that utilizes copper cladding to prevent sticking and staining during fabrication of a circuit board's laminar structure. *See, e.g.*, Ex. 1009 at 1:54–60.

54. In its background section, *Azuma* teaches established techniques used in manufacturing printed circuit boards. These include forming a laminar layer “by permeating a thermosetting resin . . . in a fabric or nonwoven fabric of a glass fiber, an aramid fiber, a polyester fiber, a carbon fiber, or paper, and drying the resultant structure.” Ex. 1009 at 1:32–38.

G. Brennan

55. *Brennan* teaches an improved design and properties for patterned laminate structures of electrical or electromagnetic apparatuses, such as printed circuit boards or antennae, by the inclusion of a thermoplastic elastomer. *See, e.g.*, Ex. 1010 at Abstract, 1:8–13.

56. *Brennan* teaches “patterned laminated structures having at least one thermoplastic elastomeric layer . . . such as antennas or printed circuit boards.” Ex.1010 at 1:8–13. *Brennan* teaches that embodiments using thermoplastic elastomers in such applications “exhibit[] many desired properties, such as flexibility, conformability and weatherability.” *Id.* at Abstract. *Brennan* further teaches that “thermoplastic elastomer material is particularly well suited for use

outdoors, as it is weatherable and its electrical properties, such as dielectric constant and loss tangent, experience little change over a wide temperature range.”

Id. at 15:20–24.

IX. CERTAIN REFERENCES TEACH OR SUGGEST ALL THE CLAIMED FEATURES OF CLAIMS 1–26 OF THE ’811 PATENT

57. In my opinion, the combination of *Anderson* and *Downey* teaches or suggests all the features recited in claims 1, 6, and 15 of the ’811 patent. In my opinion, the combination of *Anderson* and *Downey* with *Huang* teaches or suggests all the features recited in claims 2, 3, and 5 of the ’811 patent. In my opinion, the combination of *Anderson* and *Downey* with the *Handbook of Thermoplastic Elastomers* teaches or suggests all the features recited in claims 4 and 7 of the ’811 patent. In my opinion, the combination of *Anderson* and *Downey* with *Toyoda* teaches or suggests all the features recited in claims 8 and 9 of the ’811 patent. In my opinion, the combination of *Anderson* and *Downey* with *Azuma* teaches or suggests all the features recited in claims 10–12 of the ’811 patent. In my opinion, the combination of *Anderson* and *Downey* with *Brennan* teaches or suggests all the features recited in claims 13 and 14 of the ’811 patent. In my opinion, *Lo* teaches all the features recited in claims 16–19, 23, and 26 of the ’811 patent. In my opinion, the combination of *Lo* and *Huang* teaches or suggests all the features recited in claims 20–22 of the ’811 patent. In my opinion, the combination of *Lo* with the *Handbook of Thermoplastic Elastomers* teaches or suggests all the

features recited in claim 24 of the '811 patent. In my opinion, the combination of *Lo* and *Toyoda* teaches or suggests all the features recited in claim 25 of the '811 patent.

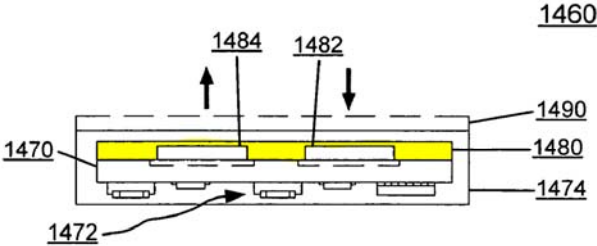
A. Ground 1: *Lo* Teaches All the Features of Claims 16-19, 23, and 26

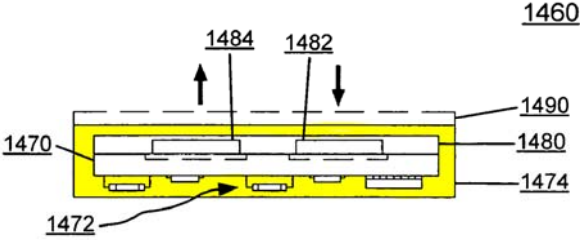
1. Claim 16

58. As described below, *Lo* teaches the features of claim 16:

Claim Language	<i>Lo</i>
A method, comprising: [16A] selectively applying at least one protective material substantially over one or more of a plurality of elements coupled with a framework for a wearable device configured to be worn by a user, the plurality of elements including at least a sensor;	<i>Lo</i> teaches a method of forming a wrist-worn ultrasonic monitor (<i>i.e.</i>, a wearable device) that includes a number of electronic processing components and ultrasonic transducer sensors mounted to a printed circuit board (<i>i.e.</i>, a plurality of elements coupled with a framework). <i>Lo</i> further describes applying a “protective layer” selectively over the transducer sensors (<i>i.e.</i>, at least one protective material substantially over one or more of a plurality of elements). In particular, <i>Lo</i> teaches a “wrist-worn” ultrasonic monitor system 200 with module 210, strap 220, display device 230 and transmission medium 240 (<i>i.e.</i>, a wearable device configured to be worn by a user). Ex. 1003 at ¶ 0063. <i>Id.</i> at Fig. 2A:

Claim Language	<i>Lo</i>
	The <i>Lo</i> wearable monitor utilizes ultrasonic transducer elements as sensors to monitor blood flow through the radial artery of the user's wrist in order to provide heart rate data to display 230. <i>Id.</i> at ¶¶ 0057, 0060, and 0063. These transducers and other circuitry elements are mounted to a printed circuit board (<i>i.e.</i>, a plurality of elements coupled with a framework, including at least one sensor). <i>Id.</i> at ¶¶ 0060, and 0075. <i>Lo</i> also teaches applying a “protective layer [that] may be molded such that it encompasses the transducers and a portion of the PCB outer surface” (<i>i.e.</i>, selectively applying at least one protective material). <i>Id.</i> at ¶ 0115. As illustrated in Figure 14C of <i>Lo</i>, excerpted below, protective layer 1480 (<i>i.e.</i>, a protective coating) is applied substantially over the transducer sensors 1482 and 1484 mounted on the printed circuit board 1470 (<i>i.e.</i>, substantially over one or more elements coupled to a framework). <i>Id.</i> at ¶ 0125.

Claim Language	<i>Lo</i>
	 Figure 14C
[16B] forming one or more inner moldings substantially over a subset or all of the framework, the at least one protective material and the plurality of elements, after the selectively applying, at least one of the one or more inner moldings having a protective property; and	<i>Lo</i> teaches a method of forming a plastic molding layer (<i>i.e.</i>, an inner molding) substantially over the protective layer, the transducer sensors, and the printed circuit board (<i>i.e.</i>, the protective material, the plurality of elements, and the framework). <i>Lo</i> further teaches that this plastic layer or housing helps to protect the device (<i>i.e.</i>, it has a protective property). In particular, <i>Lo</i> teaches forming a plastic housing 1474 (<i>i.e.</i>, inner molding) that “encapsulates the entire ultrasonic monitor, including protective layer 1480 [<i>i.e.</i>, protective material], PCB 1470 [<i>i.e.</i>, framework] and circuitry 1472 [<i>i.e.</i>, a plurality of elements which includes transducer sensors].” <i>Lo</i> at ¶ 0125. <i>Lo</i> teaches forming the plastic housing by applying material using a mold: “PCB 1410 and circuitry 1412 are molded and sealed in plastic (such as ABS plastic) housing 1414.” <i>Id.</i> at ¶ 0123. <i>Lo</i> further teaches applying the ABS plastic to the wearable monitor “to make it water resistant” (<i>i.e.</i>, it has a protective

Claim Language	<i>Lo</i>
	property). <i>Id.</i> at ¶ 0121. As shown in Fig. 14C below, <i>Lo</i> teaches applying the plastic housing 1474 substantially over the circuit board framework 1470, the plurality of sensor elements 1482 and 1484, and the previously applied protective material 1480: 
[16C] forming an outer molding of the wearable device that covers all or substantially all of the one or more inner moldings, the outer molding configured to be positioned in contact with the user.	<i>Lo</i> teaches forming a transmission medium (<i>i.e.</i>, an outer molding) on the wearable monitor that covers substantially all of the plastic housing (<i>i.e.</i>, the inner molding) that is configured to be in contact with the user. In particular, <i>Lo</i> teaches forming a transmission medium layer on the exterior of the ultrasonic wrist monitor by applying material using a mold. <i>See, e.g., Id.</i> at ¶ 0114. <i>Lo</i> teaches that this “transmission medium can be . . . over-molded onto . . . the plastic housing” and that “[o]il-based transmission media having a fixed or balm-like consistency are well suited for over-molding.” <i>Id.</i> at ¶¶ 0114–0118 (emphasis added). The transmission medium (<i>i.e.</i>, the outer molding) can “adhere to . . . the plastic housing” (<i>i.e.</i>, an inner molding) through this process or an adhesive may be used. <i>Id.</i> at ¶ 0114. The ’811 patent similarly describes

Claim Language	<i>Lo</i>
	forming its layers, including the outer molding, through an “overmolding” process. <i>See</i> Ex. 1001 at Title (“Component Protective Overmolding Using External Coatings”), 5:47–49 (“FIG. 4 illustrates another cross-sectional view of an exemplary process for forming an outer molding in data-capable strapband overmolding.”) <i>Lo</i> further teaches that the transmission medium molded to the exterior of the wearable monitor is configured to be in contact with a user’s skin: “The outer surface of the oil-based transmission medium can then be placed in contact with a subject’s skin.” Ex. 1003 at ¶ 0118. <i>See also id.</i> at ¶¶ 0101, 0109–0110, and Fig. 15A. As depicted in Figures 14C and 15A below, the transmission medium (<i>i.e.</i>, outer molding) covers substantially all of the plastic housing 1474 (<i>i.e.</i>, the inner molding) and is configured to be in contact with the user. Figure 14C Figure 15A

2. Claim 17

59. As described below, *Lo* teaches the features of claim 17:

Claim Language	<i>Lo</i>
17. The method of claim 16, wherein the plurality of elements are configured to perform an operation using data from the sensor.	As I discussed above in connection with claim 16, <i>Lo</i> teaches a plurality of elements mounted to the printed circuit board, including transducer sensors and electronic processing elements. The processing elements are configured to perform various electronic and analytical operations on data from the transducer sensors. In particular, <i>Lo</i> teaches that the transducer sensor elements relay data measuring the movement of blood at the user’s wrist. <i>See, e.g.</i>, Ex. 1003 at ¶¶ 0006, 0011, and 0055. This data is relayed from the sensors to electronic processing elements, also coupled to the printed circuit board, that are configured to perform operations on the data from the sensors to “determine blood flow rate, heart rate, or pulse rate” of the user. <i>Id.</i> at ¶ 0055. These elements “include[] the electrical components required to transmit, receive, and process the ultrasonic signals . . . [p]rocessing may include amplifying, filtering, demodulating, digitizing, squaring, and other functions” on the sensor data. <i>Id.</i> at ¶ 0058. These elements are depicted as “circuitry” 960 in Figures 9A–C and 760 and 860 in Figures 7 and 8B respectively, and “include[] surface mount ICs and electrical components such as resistors and capacitors that can implement the electrical system of the ultrasonic monitor.”

Claim Language	<i>Lo</i>
	<i>Id.</i> at ¶ 0080. The general arrangement of the ultrasonic monitor’s components, including the sensor and processing elements, is depicted in Figure 3, and the operations the elements are configured to perform on the data from the transducer sensors are summarized in Figures 4 and 5. <i>Id.</i> at Fig. 3 (items 310, 340, 350, 360, 370, and 390), Fig. 4 (items 430–470), and Fig. 5 (items 510–540).

3. Claim 18

60. As described below, *Lo* teaches the features of claim 18:

Claim Language	<i>Lo</i>
18. The method of claim 16, wherein the protective property is waterproofing.	<i>Lo</i> teaches that the protective property of the plastic housing discussed in connection with Claim 16 (<i>i.e.</i>, the inner molding) is waterproofing. In particular, <i>Lo</i> teaches that “[t]he entire ultrasonic monitor may be encapsulated in plastic, a transmission medium, or both to provide water resistant properties.” <i>Lo</i> at Abstract. <i>Lo</i> further teaches that the molded plastic housing (<i>i.e.</i>, the inner molding) applied over the protective layer is sealed to “make it water resistant.” <i>Id.</i> at ¶ 0121. <i>See also id.</i> at ¶¶ 00125 (“Plastic housing 1474 encapsulates the entire ultrasonic monitor”), 0062, and Fig. 14C.

4. Claim 19

61. As described below, *Lo* teaches the features of claim 19:

Claim Language	<i>Lo</i>
19. The method of claim 16, wherein the protective property is water-resistance.	<i>Lo</i> teaches the protective property of the plastic housing discussed in connection with Claim 16 (<i>i.e.</i>, the inner molding) is water-resistance. In particular, <i>Lo</i> teaches that “[t]he entire ultrasonic monitor may be encapsulated in plastic, a transmission medium, or both to provide water resistant properties.” <i>Lo</i> at Abstract. <i>Lo</i> further teaches that the molded plastic housing (<i>i.e.</i>, the inner molding) applied to the protective layer is sealed so as to “make it water resistant.” <i>Id.</i> at ¶ 0121. <i>See also id.</i> at ¶¶ 0125 (“Plastic housing 1474 encapsulates the entire ultrasonic monitor . . .”), 0062, and Fig. 14C.

5. Claim 23

62. As described below, *Lo* teaches the features of claim 23:

Claim Language	<i>Lo</i>
23. The method of claim 16, wherein the at least one protective material is configured to protect the one or more of	As I discussed above in connection with Claim 16, <i>Lo</i> teaches first applying a “protective layer” (<i>i.e.</i>, a protective material) to cover the ultrasonic transducer elements coupled to the printed circuit board (<i>i.e.</i>, one or more of the plurality of elements) before applying subsequent coatings. This protective layer is configured to protect such elements

Claim Language	<i>Lo</i>
the plurality of elements from damage occurring during the forming of the one or more inner moldings.	from damage during the subsequent forming of additional moldings. In particular, <i>Lo</i> teaches that a “protective layer may be molded such that it encompasses the transducers and a portion of the PCB outer surface.” <i>Id.</i> at ¶ 0115. This protective layer is applied to protect the electronic elements coupled to the circuit board prior to application of the molded plastic housing (<i>i.e.</i>, an inner molding) and possesses “firmness” that “can prevent damage to the transducer elements due to contact with the oil-based transmission medium or other objects.” <i>Id.</i> at ¶ 0115 and Fig. 14C (protective layer 1480 underlying plastic housing 1474). <i>Lo</i> further teaches that the protective layer “may be comprised of a room temperature vulcanizing (RTV) . . . silicones, which are used to encapsulate and protect transducers” or “other types of materials so long as they provide adequate mechanical strength” <i>Id.</i> at ¶ 0116.

6. Claim 26

63. As described below, *Lo* teaches the features of claim 26:

Claim Language	<i>Lo</i>
26. The method of	<i>Lo</i> teaches that the protective layer (<i>i.e.</i> , the at least one

Claim Language	<i>Lo</i>
claim 16, at least one protective material comprises a curable coating.	protective material) is a curable coating. In particular, <i>Lo</i> teaches that “the protective layer may be comprised of a room temperature vulcanizing (RTV) silicone rubber layer adhesive” or “suitable substitutes” that may be “moisture cured” or cured through “chemical reactions ... or ultraviolet light.” <i>Lo</i> at ¶ 0116.

B. Ground 2: *Lo* and *Huang* Teach or Suggest All the Features of Claims 20–22

1. Claim 20

64. As described below, the combination of *Lo* and *Huang* teaches or suggests the features recited in claim 20:

Claim Language	<i>Lo</i> and <i>Huang</i>
20. The method of claim 16, wherein the protective property is being hydrophobic.	The use of hydrophobic materials as a molding on an electronic device was well known to those of ordinary skill in the art before the priority date of the '811 patent. For example, <i>Huang</i> teaches the application of a hydrophobic coating that is “environmentally friendly and suitable for application to both a metal surface and a nonmetal surface of an electronic device.” Ex. 1007 at ¶ 0006. The coating may be applied to “a plastic material, glass, a ceramic material, [or] a polymer” that “may be part of an enclosure or an outer housing of” a variety of

Claim Language	<i>Lo and Huang</i>
	electronic devices that contact a user’s skin. <i>Id.</i> at ¶ 0014. <i>Huang</i> further teaches that the coating may be “a layer formed of . . . a hydrophobic nano-composite material” that prevents a user’s sweat from adhering to the electronic device. <i>Id.</i> at ¶¶ 0014, 0015, and 0019. The use of a variety of hydrophobic materials in coatings, such as the one described in <i>Huang</i>, was well understood by those of ordinary skill in the art prior to the ’811 patent’s priority date. A number of common molding materials were known by those of ordinary skill in the art to be inherently hydrophobic. <i>See, e.g.</i>, Ex. 1011 at 1:16–21 (“Polymer surfaces typically have hydrophobic . . . properties”). In addition, hydrophobic coating materials were commercially available from a variety of vendors. <i>See, e.g.</i>, Ex. 1014 (marketing products for “rendering [surfaces] to be hydrophobic, hydrophilic, oleophobic or oleophilic by design”), Ex. 1013 (describing products that “create[] a water-repellant (hydrophobic) and oil-repellant (oleophobic) surfaces [<i>sic</i>]” on a variety of materials for a variety of applications). The plastic housing of <i>Lo</i>’s heart rate monitor would be in prolonged exposure adjacent to a user’s skin, likely during exercise, and is designed to “keep[] the system of the

Claim Language	<i>Lo and Huang</i>
	ultrasonic monitor protected from . . . water.” <i>Lo</i> at ¶ 0062. It is my opinion that one of ordinary skill in the art would have recognized the benefits of applying well understood hydrophobic materials, such as in <i>Huang</i>, to impart protective properties to the plastic housing in <i>Lo</i>. This would have been a natural design choice for an individual of ordinary skill in the art because it is nothing more than the combination of a known technique, according to its known function, to predictably improve a known device — here the wearable heart rate monitor of <i>Lo</i>.

2. Claim 21

65. As described below, the combination of *Lo* and *Huang* teaches or suggests the features recited in claim 21:

Claim Language	<i>Lo and Huang</i>
21. The method of claim 16, wherein the protective property is being oleophobic.	The use of plastic materials with oleophobic properties (commonly used for fingerprint resistance) as a molding on an electronic device—particularly one that would contact a user’s skin—was well known to those of ordinary skill in the art before the priority date of the ’811 patent. For example, <i>Huang</i> teaches the application of an oleophobic coating “[that] is environmentally friendly and suitable for application to both a metal surface and a nonmetal surface of an electronic device.” Ex. 1007 at

	¶ 0006. <i>Huang</i> teaches that the coating may be applied to “a plastic material, glass, a ceramic material, [or] a polymer” that “may be part of an enclosure or an outer housing of” a variety of electronic devices that contact a user’s skin. <i>Id.</i> at ¶ 0014. <i>Huang</i> further teaches that the coating may be “a layer formed of . . . an oleophobic nano-composite material” that protects against “sweat or/and grease” from the user’s skin adhering to the electronic device. <i>Id.</i> at ¶¶ 0014, 0015, and 0019. The use of a variety of oleophobic materials in coatings, such as the one described in <i>Huang</i>, was well understood by those of ordinary skill in the art prior to the ’811 patent’s priority date. As a patent observed in 2002, “[n]umerous . . . compositions for oleophobicizing of polymer or porous surfaces are already known.” Ex. 1011 at 1:22–24. Such oleophobic coating materials were commercially available from a variety of vendors. <i>See, e.g.</i>, Ex. 1014 (marketing products for “rendering [surfaces] to be hydrophobic, hydrophilic, oleophobic or oleophilic by design”), and Ex. 1013 (describing products that “create[] a water-repellant (hydrophobic) and oil-repellant (oleophobic) surfaces [<i>sic</i>]” on a variety of materials for a variety of applications). It is my opinion that it would have been natural for one of
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	ordinary skill in the art to use one of the widely available oleophobic materials, such as the one described in <i>Huang</i>, to impart protective properties to the plastic housing of the wrist worn monitor in <i>Lo</i>. One of ordinary skill in the art would have been well aware of the benefits of applying an oleophobic coating to a wearable device like <i>Lo</i>'s heart rate monitor, which may be "a valuable tool during physical exercise," Ex. 1003 at ¶ 0008, in order to protect against "sweat or/and grease" from the user's skin, as taught in <i>Huang</i>. In addition, oleophobic properties would have been particularly useful to protect the internal components in <i>Lo</i> given its suggestion that "an oil, such as baby oil or mineral oil, may be applied between" the user and the monitor. <i>Id.</i> at ¶ 0120. To a person of ordinary skill in the art, combining the oleophobic coating taught in <i>Huang</i> with the plastic housing of the wrist worn monitor in <i>Lo</i> would have been nothing more than the application of a known technique to predictably improve the known heart rate monitoring device of <i>Lo</i>.
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3. Claim 22

66. As described below, the combination of *Lo* and *Huang* teaches or suggests the features recited in claim 21:

Claim Language	<i>Lo</i> and <i>Huang</i>
22. The method of	The use of anti-bacterial or anti-microbial plastic material

claim 16, wherein the protective property is being anti-bacterial.	as a molding on an electronic device—particularly one that would contact a user skin—was well known to those of ordinary skill in the art before the priority date of the ’811 patent. For example, <i>Huang</i> teaches the application of a fingerprint resistant outer coating with anti-bacterial properties “[that] is environmentally friendly and suitable for application to both a metal surface and a nonmetal surface of an electronic device.” Ex. 1007 at ¶ 0006. The coating may be applied to “a plastic material, glass, a ceramic material, [or] a polymer” that “may be part of an enclosure or an outer housing of” a variety of electronic devices that contact a user’s skin. <i>Id.</i> at ¶ 0014. <i>Huang</i> teaches that, among other benefits, its coating “has good . . . antibacterial properties.” <i>Id.</i> at ¶ 0019 (emphasis added). The use of a variety of anti-bacterial coatings, such as the one described in <i>Huang</i>, was well understood by those of ordinary skill in the art prior to the ’811 patent’s priority date. An industry reference handbook, <i>Handbook of Thermoplastic Elastomers</i>, teaches that molded antimicrobial outer layers (layers protective against not only bacteria, but also viruses and/or fungi) were well-known and widely used throughout the industry at the time. <i>See</i> Ex. 1006 at 23–24 (§ 3.12). Indeed, the handbook
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	refers readers to a comprehensive list of commercially available antimicrobial additives that was published in 2001, more than a decade before the priority date of the '811 patent. <i>Id.</i> (referencing H. Zweifel, Plastic Additive Handbook ch. 11 (Hanser Publishers, 5th ed. 2001)). It is my opinion that one of ordinary skill in the art would have recognized the benefit of applying one of the widely available anti-bacterial materials, such as the one taught by <i>Huang</i>, to the plastic housing of the wearable heart rate monitor of <i>Lo</i>. It is my opinion that, to a person of ordinary skill in the art, this combination would have been nothing more than the predictable application of a known solution to the problem of bacterial buildup on the heart rate monitor described by <i>Lo</i>—a monitor that was intended to be in prolonged contact with a user's skin, including during exercise.
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C. Ground 3: *Lo* and the *Handbook of Thermoplastic Elastomers* Teach or Suggests All the Features of Claim 24

1. Claim 24

67. As described below, the combination of *Lo* and the *Handbook of Thermoplastic Elastomers* teaches or suggests the features recited in claim 24:

Claim Language	<i>Lo</i> and the <i>Handbook of Thermoplastic Elastomers</i>
24. The method of claim 16, wherein at	<i>Lo</i> teaches that coatings of the transmission medium in contact with a user's skin should preferably be made from

Claim Language	<i>Lo and the Handbook of Thermoplastic Elastomers</i>
least one of the one or more inner moldings comprises a medical-grade thermoplastic elastomer.	“medical grade” materials to avoid skin irritation. <i>See</i> Ex. 1003 at ¶ 0109 (“It is also preferable that the pressure sensitive adhesive is medical grade that does not cause skin sensitization.”) and ¶ 0110 (“This is particularly convenient if a biocompatible fluid such as medical grade mineral oil is used as the diluent in the gel. Such oil, if migrates into the skin, does not cause adverse effect to the living tissues.”). Surfaces of <i>Lo</i>’s plastic housing (<i>i.e.</i>, the inner molding) are exposed in proximity to a user’s skin on a wristband. <i>See id.</i> at Figs. 2A, 15A, and 15B. It is my opinion that one of ordinary skill in the art would have naturally realized the benefit of forming the plastic housing from a medical grade plastic, based on <i>Lo</i>’s teachings. A number of medical-grade thermoplastic elastomers were known in the art before the priority date of the ’811 patent. For example, an industry reference handbook, the <i>Handbook of Thermoplastic Elastomers</i>, identifies materials suitable for medical applications, teaching that certain of “[t]hese applications employ grades approved by U.S. Food and Drug Administration.” Ex. 1006 at 293 (§ 15.3.3.6.) <i>See also id.</i> at 303 (§ 15.7.2.8) at (“[t]hermoplastic polyurethanes are compatible with human

Claim Language	<i>Lo and the Handbook of Thermoplastic Elastomers</i>
	blood and tissue and therefore can be used in medical devices”), at 309 (§ 15.9.2.5) (discussing “Medical Applications” for polyamide thermoplastic elastomers), and at 174–175 (§ 5.3.2) (styrenic block copolymers demonstrate potential for “medical and biomedical applications”). It is my opinion that to one of ordinary skill in the art, using a medical grade thermoplastic elastomer would have been nothing more than the predictable application of a known solution to the problem of skin sensitization and irritation sometimes caused by the use of such materials in wearable devices, especially given the known use of medical grade thermoplastic elastomers in biomedical applications.

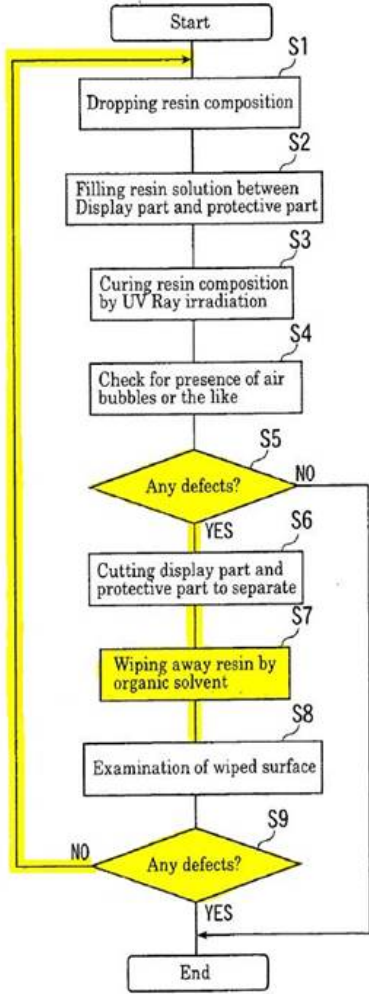
Ground 4: *Lo* and *Toyoda* Teach or Suggests All the Features of Claim 25

2. Claim 25

68. As described below, the combination of *Lo* and *Toyoda* teaches or suggests the features recited in claim 25:

Claim Language	<i>Lo and Toyoda</i>
25. The method of claim 16, further comprising removing	Inspecting a product for defects, particularly a device’s still visible, recent molding, is a standard and fundamental step of manufacturing processes that was well understood long

Claim Language	<i>Lo and Toyoda</i>
and re-applying at least one of the one or more inner moldings after an inspection of the one or more inner moldings.	before the '811 patent's priority date. Techniques for the removal and re-application of defective moldings were likewise well understood by persons having ordinary skill in the art before the '811 patent's priority date. For example, <i>Toyoda</i> teaches a method of forming resin layers on electronic devices that includes inspecting whether the resin layer is defective, and if defects are found, removing and re-applying the layer. Ex. 1008 at Abstract. <i>Toyoda</i>'s process is generally depicted in Figure 1 below:

Claim Language	Lo and Toyoda
	 <pre> graph TD Start([Start]) --> S1[S1: Dropping resin composition] S1 --> S2[S2: Filling resin solution between Display part and protective part] S2 --> S3[S3: Curing resin composition by UV Ray irradiation] S3 --> S4[S4: Check for presence of air bubbles or the like] S4 --> S5{S5: Any defects?} S5 -- YES --> S6[S6: Cutting display part and protective part to separate] S5 -- NO --> S9{S9: Any defects?} S6 --> S7[S7: Wiping away resin by organic solvent] S7 --> S8[S8: Examination of wiped surface] S8 --> S9 S9 -- YES --> S6 S9 -- NO --> S1 S9 --> End([End]) </pre> In <i>Toyoda</i>'s steps S2 and S3, a resin layer is applied and then cured. <i>Id.</i> at ¶ 0055. In step S4, the cured resin layer is “checked” for defects such as the presence of foreign substances or air bubbles. <i>Id.</i> at ¶ 0062. If a defect is found, the resin layer is separated and removed at steps S6 and S7. <i>Id.</i> at ¶¶ 0064–0065 and 0073. The device is then checked for any further underlying defects and, if none are detected at step S9, a resin layer is re-applied by returning to step S1 of the process. <i>Id.</i> at ¶ 0085.

Claim Language	<i>Lo and Toyoda</i>
	It is my opinion that one skilled in the art would have recognized the benefit of utilizing the fundamental manufacturing inspection steps of <i>Toyoda</i> when molding the plastic housing of <i>Lo</i> (<i>i.e.</i>, the inner molding)—particularly given the role the plastic housing plays in providing water resistant protection to <i>Lo</i>’s internal circuitry that could be compromised by an unaddressed defect. It was well understood by persons having ordinary skill in the art long before the ’811 patent’s priority date that a defective molding leaves designers with two primary options: (1) discard the entire device, or (2) remove and re-apply the molding. It was also well understood that the choice between these options was generally dictated by the cost of the device’s constitute components. Given the electronic components protected by the plastic housing in <i>Lo</i> (<i>e.g.</i>, ultrasonic transducers, wireless transmitter, amplifiers, microcontroller), one of ordinary skill in the art would have found it beneficial to remove and re-apply a defective outer molding rather than to scrap the entire device. It is my opinion that to one of ordinary skill in the art, using the inspection steps of <i>Toyoda</i> would have been nothing more than the application of a known solution to

Claim Language	<i>Lo and Toyoda</i>
	predictably improve the reliability of <i>Lo</i> 's moldings.

D. Ground 5: *Anderson* and *Downey* Teach or Suggest All the Features of Claims 1, 6, and 15

1. Claim 1

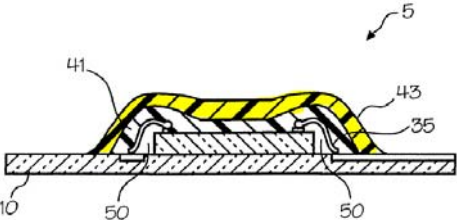
69. As described below, the combination of *Anderson* and *Downey* teaches or suggests the features of claim 1:

Claim Language	<i>Anderson and Downey</i>
1. A method, comprising: [1A] selectively applying at least one covering substantially over one or more of a plurality of elements coupled with a framework for a wearable device configured to be worn by a user, the plurality of elements including at least a sensor;	<i>Anderson</i> teaches a method of selectively applying a primer layer (<i>i.e.</i> , a protective covering) substantially over circuit components coupled with a substrate (<i>i.e.</i> , elements coupled with a framework). Ex.1004 at ¶¶ 0027, 0041. In particular, <i>Anderson</i> teaches selectively applying an “intermediate layer (primer coating)” (<i>i.e.</i> , at least one covering) to one or more microelectronic components coupled to a substrate (<i>i.e.</i> , elements coupled to a framework). <i>Id.</i> at ¶¶ 0025, 0026, and 0031. The microelectronic elements may be “any type of chip, integrated circuit, memory, or any combination thereof that is desired to be attached to substrate 10.” <i>Id.</i> at ¶ 0026. The substrate or framework is “any material suitable for mounting a circuit die 20 thereon and is preferably an interconnecting laminate substrate.” <i>Id.</i>

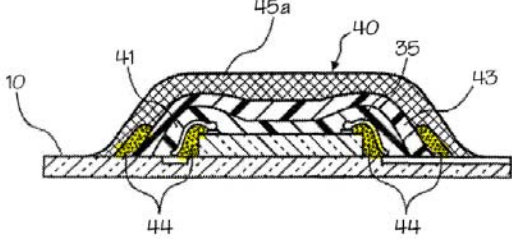
Claim Language	<i>Anderson and Downey</i>
	The primer coating 41 promotes adhesion of subsequent layers and serves as insulation “to protect circuit 5 components (20, 35) from being damaged” during the application of subsequent layers. <i>Id.</i> at ¶ 0031. The coating covering 41 may be a suitable material “for providing the adhesion and/or insulation properties” needed. <i>Id.</i> As shown in Fig. 2B below, coating 41 (<i>i.e.</i>, at least one covering) is selectively applied substantially over one or more of the elements on the substrate framework: A cross-sectional diagram of a substrate framework. A horizontal base layer, labeled 10, is shown with a stippled texture. On top of this base, there are two raised, rectangular components labeled 50. Between and around these components is a layer of material labeled 41, which is filled with diagonal hatching. This layer 41 covers the top surfaces of the components 50 and the surrounding base area. Above the hatched layer 41, there are two more components labeled 35, which are shown in cross-section with a solid black fill. These components 35 are positioned on top of the hatched layer 41. A label 43 points to the top surface of the rightmost component 35. A label 5 with a curved arrow points to the entire assembly above the base layer 10. Although <i>Anderson</i> does not expressly mention that the framework is part of a wearable device to be worn by a user, it teaches the use of techniques that may be generally applied to “produc[e] a microelectronic device resistant to . . . damage from surrounding environment or operating conditions” such as “moisture, vibration, shocks and other environmental hazards.” <i>Id.</i> at Abstract, ¶ 0046. <i>Downey</i> teaches a wearable exercise watch that tracks a user’s activity and location, even while swimming. Ex.

Claim Language	Anderson and Downey
	1005 at ¶¶ 0034–0035. The watch taught by <i>Downey</i> includes a housing that contains a variety of microelectronic elements and sensors coupled to frameworks, “one or more printed circuit boards which may support a processing system 110, a location determining component 112, a memory, an inertial sensor 114, wireless transmission components” <i>See e.g.</i> Ex. 1005 at Abstract, ¶¶ 0026, 0031, and Figs. 1 and 4. <i>Downey</i> teaches that its wearable device’s microelectronic components require protection against “environmental contaminants, moisture, vibration, impact, and the like”—the same protections taught by <i>Anderson</i>. Ex. 1005 at ¶ 0026. However, <i>Downey</i> does not teach the application of protective coatings to its internal elements, but rather relies on mechanical seals on the exterior housing that are “substantially waterproof or water-resistant to prevent the intrusion of liquids and other foreign objects within the housing 102.” <i>Id.</i> at ¶ 0022. FIG. 1 FIG. 4

Claim Language	<i>Anderson and Downey</i>
	The swim watch disclosed in <i>Downey</i> would be regularly subjected to moisture, vibration, impacts, shocks, and environmental hazards during exercise or swimming. Given the added protection the <i>Anderson</i> method would provide to the expensive and sensitive circuit elements used in the <i>Downey</i> swim watch, it is my opinion that a person of ordinary skill in the art would have been motivated to apply the method taught by <i>Anderson</i> to the swim watch taught by <i>Downey</i>. Such an artisan would have recognized that using the <i>Anderson</i> method to provide added protection to the expensive and sensitive circuitry of the <i>Downey</i> swim watch would have been a simple application of a known prior art method according to its established function to predictably improve the swim watch taught by <i>Downey</i>.
[1B] selectively forming a first inner molding that covers all or substantially all of the at least one covering, the plurality of elements, and the framework;	<i>Anderson</i> teaches selectively forming a tamper-resistant coating (<i>i.e.</i>, a first inner molding) that covers substantially all of the primer coating, the circuit elements, and/or the printed circuit board (<i>i.e.</i>, the at least one covering, the plurality of elements, and the framework). In particular, <i>Anderson</i> teaches the application of a tamper-resistant coating (TRC) 43 over the intermediate primer layer 41 using, for example, a thermal spray process or

Claim Language	<i>Anderson and Downey</i>
	“molded encapsulation methods.” Ex. 1004 at ¶¶ 0033, 0049 and Fig. 2B. It is my opinion that <i>Anderson</i>’s teaching of “molded encapsulation,” which it contrasts against “liquid encapsulation processes,” suggests to one of ordinary skill in the art that the material is applied using a mold. <i>Id.</i> at ¶ 0049. Such an artisan would have understood that the use of a mold would have been a natural and typical way to apply the materials in <i>Anderson</i>. As shown in Fig. 2B below, this coating (<i>i.e.</i>, a first inner molding) covers substantially all of the intermediate primer coating 41 (<i>i.e.</i>, the covering): 
[1C] selectively forming a second inner molding that covers all or substantially all of the first inner molding; and	<i>Anderson</i> teaches a method for selectively forming a filler-material inner coating (<i>i.e.</i>, a second inner molding) that covers substantially all of the tamper-resistant coating (<i>i.e.</i>, the first inner molding). In particular, <i>Anderson</i> teaches forming the first of “at least two encapsulant layers” after the tamper-resistant coating is applied. Ex. 1004 at ¶ 0039. The first of these encapsulant layers is identified as “inner coating 44” and constitutes a second inner molding. <i>Id.</i> This second inner molding can

Claim Language	<i>Anderson and Downey</i>
	be a “low viscosity, low stress epoxy material” that flows easily and “wicks up to fill gaps or spaces.” <i>Id.</i> at ¶ 0041. It is selectively formed over the tamper-resistant coating (<i>i.e.</i>, the first inner molding) by “saturat[ing] and fill[ing] spaces around TRC 43.” <i>Id.</i> at ¶ 0039. A barrier or mold may be applied around the circuit and the coating material “applied to partially fill the area defined by the barrier 42 (FIGS. 7e–7h) and surrounding the TRC coated circuit.” <i>Id.</i> at ¶ 0040. <i>Anderson</i> teaches that this second inner molding may “be equally applied using molded encapsulation methods.” <i>Id.</i> at ¶ 0049. Figures 7g, 7h, and 6b below illustrate that the coating 44 covers substantially all of the tamper-resistant coating (<i>i.e.</i>, the first inner molding). Fig. 7g Fig. 7h

Claim Language	Anderson and Downey
	 Fig. 6b (SIDE VIEW)
[1D] selectively forming an outer molding of the wearable device, the outer molding covering all or substantially all of the second inner molding, the outer molding configured to be positioned in contact with the user.	<i>Anderson</i> teaches a method of selectively forming a shell outer coating (<i>i.e.</i>, an outer molding) that covers substantially all of the inner coating (<i>i.e.</i>, the second inner molding) to provide a moisture barrier and handling surface. In particular, <i>Anderson</i> teaches forming the second of “at least two encapsulant layers” after the inner coating 44 is applied. Ex. 1004 at ¶ 0039. This second encapsulant layer, “outer coating 45 (referred to as ‘shell coating’ 45),” may be an epoxy or other material with a higher viscosity than the inner coating 44 in order to “provid[e] a moisture barrier 42 and handling surfaces of the microelectronic device.” <i>Id.</i> at ¶ 0039. This outer coating, “when hardened, provides a smooth, rigid, moisture resistant and durable handling surface for the microelectronic device.” <i>Id.</i> at ¶ 0044. As with the other layers, <i>Anderson</i> teaches that this outer coating 45 can be “applied using molded encapsulation methods.” <i>Id.</i> at ¶ 0049. As I discussed

Claim Language	<i>Anderson and Downey</i>
	above, this suggests the use of a mold to apply the material, particularly in view of the materials being applied in <i>Anderson</i>. Moreover, the rectangular shape of the outer shell (<i>i.e.</i>, the outer molding) in Figure 7i could only be realized through the use of a mold. As shown in Figures 6B and 7i, the outer molding shell coating 45 covers substantially all of the second inner molding inner coating 44. The image contains two cross-sectional diagrams of a device. The left diagram shows a cross-section of a device with layers 10, 41, 45a, 40, 35, 43, and 44. The right diagram shows a cross-section of a device with layers 45a and 10. As discussed above, although <i>Anderson</i> does not expressly disclose a wearable device positioned to be in contact with a user, it is my opinion that one of ordinary skill in the art would have been motivated to apply the <i>Anderson</i> multi-layer manufacturing method to a wearable device positioned to be in contact with a user, such as the swim watch taught by <i>Downey</i>. <i>Anderson</i> teaches that the outer molding has “resilient handling characteristics” and “provides a smooth, rigid, moisture resistant and durable handling surface for the microelectronic device.” <i>Id.</i> at ¶ 0044. It is my opinion that

Claim Language	<i>Anderson and Downey</i>
	one of ordinary skill in the art would have recognized these properties of <i>Anderson</i> 's outer molding would be equally applicable to and beneficial for the outer housing of the exercise watch taught by <i>Downey</i> , which is positioned to be in contact with a user during active use. To a person of ordinary skill in the art, this would have been nothing more than the simple application of a well-known prior art method according to its established function that would have predictably improved the exercise watch taught by <i>Downey</i> .

2. Claim 6

70. As described below, the combination of *Anderson* and *Downey* teaches or suggests the features of claim 6:

Claim Language	<i>Anderson and Downey</i>
6. The method of claim 1, wherein the outer molding is configured to provide a waterproof seal over the plurality of elements.	Both <i>Anderson</i> and <i>Downey</i> teach an outer molding configured to provide a waterproof seal over the plurality of elements. In particular, <i>Anderson</i> teaches that “outer coating 45” (<i>i.e.</i> , the outer molding), “provid[es] a moisture barrier 42 and handling surfaces of the microelectronic device” (<i>i.e.</i> , provides a waterproof seal over the plurality of elements). Ex. 1004 at ¶¶ 0039 and 0044.

	<i>Downey</i> similarly teaches the outer housing of its exercise watch (<i>i.e.</i> , the outer molding) “may be made substantially waterproof or water-resistant to prevent the intrusion of liquids and other foreign objects within the housing” (<i>i.e.</i> , provides a waterproof seal over the plurality of elements). Ex. 1005 at ¶ 0022.
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3. Claim 15

71. As described below, the combination of *Anderson* and *Downey* teaches or suggests the features of claim 15:

Claim Language	<i>Anderson and Downey</i>
15. The method of claim 1, wherein the at least one covering comprises a curable coating.	<i>Anderson</i> teaches that the “intermediate layer (primer coating)” applied to the circuit elements and framework (<i>i.e.</i> , the at least one covering) is hardened using a “raised temperature curing process.” Ex. 1004 at ¶¶ 0031–0032. <i>Anderson</i> further teaches that each of its layers and coverings may be curable coatings. <i>See, e.g., Id.</i> at ¶¶ 0032, 0034, 0036, 0040, 0043, and 0045.

E. Ground 6: *Anderson* and *Downey* in View of *Huang* Teach or Suggest All the Features of Claims 2, 3, and 5

1. Claim 2

72. As described below, the combination of *Anderson* and *Downey* in view of *Huang* teaches or suggests the features of claim 2:

Claim Language	<i>Anderson and Downey</i>
2. The method of	As discussed above in connection with claim 22 in

claim 1, wherein the outer molding comprises an anti-bacterial material.	paragraph 66, the use of an anti-bacterial material as an outer molding on an electronic device was well known to those of ordinary skill in the art before the priority date of the '811 patent, and it would have been predictably beneficial to apply the use of such anti-bacterial material to the outer molding of a wearable device. Those teachings would have been equally applicable to the exercise/swim watch of <i>Anderson</i> and <i>Downey</i>. It is my opinion that one of ordinary skill in the art would have recognized the benefit of applying well known anti-bacterial materials, such as those taught in <i>Huang</i>, to the outer molding of the wearable exercise watch taught by <i>Downey</i>. To a person of ordinary skill in the art, this combination would have been a natural design choice and nothing more than the predictable application of a known solution to the problem of bacterial buildup on the swim/exercise watch taught by <i>Downey</i>—a watch that would have been in prolonged contact with a user's skin in moist environments where the presence of bacteria would have been a particular concern.
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2. Claim 3

73. As described below, the combination of *Anderson* and *Downey* in view of *Huang* teaches or suggests the features of claim 3:

Claim Language	<i>Anderson and Downey</i>
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3. The method of claim 1, wherein the outer molding comprises an oleophobic material.	As I discussed above in connection with claim 21 in paragraph 65, the use of an oleophobic material as an outer molding on an electronic device was well known to those of ordinary skill in the art before the priority date of the '811 patent and it would have been clearly beneficial to apply the use of such an oleophobic material to the outer molding of a wearable device. Those teachings would have been equally applicable to the exercise/swim watch of <i>Anderson</i> and <i>Downey</i>. It is my opinion that one of ordinary skill in the art would have recognized the benefit of applying well-known oleophobic materials, such as those taught in <i>Huang</i>, to the outer molding of the wearable exercise watch taught by <i>Downey</i>. To a person of ordinary skill in the art, this combination would have been a natural design choice and nothing more than the application of a known prior art element, according to its established function, to predictably improve the exercise watch of <i>Downey</i>, given that it would have been in prolonged contact with a user's skin during exercise. One skilled in the art would have been well aware of the benefits of applying an oleophobic outer coating to protect against sweat and/or grease from the user's skin as taught in <i>Huang</i>.
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3. Claim 5

74. As described below, the combination of *Anderson* and *Downey* in view of *Huang* teaches or suggests the features of claim 5:

Claim Language	<i>Anderson and Downey in view of Huang</i>
5. The method of claim 1, wherein the outer molding comprises a hydrophobic material.	As I discussed above in connection with claim 20 in paragraph 64, the use of a hydrophobic material as an outer molding on an electronic device was well known to those of ordinary skill in the art before the priority date of the '811 patent and it would have been clearly beneficial to apply the use of such a hydrophobic material to the outer molding of a wearable device. Those teachings would have been equally applicable to the exercise/swim watch of <i>Anderson</i> and <i>Downey</i>. It is my opinion that a person of ordinary skill in the art would have recognized the benefit of applying well-known hydrophobic materials, such as those taught in <i>Huang</i>, to the outer molding of the wearable exercise watch taught by <i>Downey</i>. To a person of ordinary skill in the art, this would have been a natural design choice and nothing more than the application of a known prior art element, according to its established function, to predictably improve the exercise/swim watch of <i>Downey</i>, given that it would be worn during exercise in and around water.

F. Ground 7: Anderson and Downey in View of the Handbook of Thermoplastic Elastomers Teach or Suggest All the Features of Claims 4 and 7

1. Claim 4

75. As described below, the combination of *Anderson* and *Downey* in view of the *Handbook of Thermoplastic Elastomers* teaches or suggests all the features of claim 4:

Claim Language	<i>Anderson and Downey in view of the Handbook of Thermoplastic Elastomers</i>
4. The method of claim 1, wherein the outer molding is configured to protect against ultraviolet radiation.	Techniques for configuring an outer molding to protect against ultraviolet radiation were well understood by those skilled in the art long before the '811 patent's priority date. An industry reference handbook, the <i>Handbook of Thermoplastic Elastomers</i>, teaches that it was desirable for outer moldings to be configured to protect against ultraviolet radiation because "polymers deteriorate in the presence of sunlight" and more specifically, "as a result [of] exposure to ultraviolet light at wavelengths 290–400 nm." See Ex. 1006 at 13–14 (§§ 3.2–3.2.2). The handbook identifies a number of well-known additives for configuring moldings to protect against ultraviolet radiation. <i>Id.</i> (discussing "[t]he most widely used UV absorbers" and "quenchers"). As the handbook teaches, it was an established practice in the industry by the priority date of the '811 patent to configure exposed, exterior

	coatings (<i>i.e.</i>, an outer molding) to protect against ultraviolet radiation. <i>Id.</i> It is my opinion that it would have been natural to one of ordinary skill in the art to apply such well understood techniques to the outer molding of a wearable device, such as the exercise watch of <i>Anderson</i> and <i>Downey</i>. Such a device would have been worn outside and would have been exposed to ultraviolet radiation. It would have been a beneficial design choice to configure the outer coating to protect against degradation from such radiation. To one of ordinary skill in the art, using an outer coating to protect against degradation from such radiation would have been a natural design choice that simply applied a well-known prior art method, according to its established function, to predictably improve the device of <i>Anderson</i> and <i>Downey</i>.
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2. Claim 7

76. As described below, the combination of *Anderson* and *Downey* in view of the *Handbook of Thermoplastic Elastomers* teaches or suggests all the features of claim 7:

Claim Language	<i>Anderson</i> and <i>Downey</i> in view of the <i>Handbook of Thermoplastic Elastomers</i>
7. The method of claim 1, wherein a pattern is formed on	A variety of methods to form a pattern on an outer molding of a device were well known long before the '811 patent's priority date and opting to do so in the combination of

Claim Language	<i>Anderson and Downey in view of the Handbook of Thermoplastic Elastomers</i>
the outer molding.	<i>Anderson and Downey</i> would have been a natural design choice well within the knowledge of a person of ordinary skill in the art. For example, an industry reference handbook, <i>Handbook of Thermoplastic Elastomers</i>, taught numerous methods for forming patterns on thermoplastic molding surfaces that were known to skilled artisans, including “in-mold decorating” and the use of “appliqués,” “metallization,” “laser printing,” “fill and wipe,” “screen printing,” “diffusion,” “pad transfer,” “electrolytic plating,” “flame and arc spraying,” “molding,” and/or “flocking” as well as other disclosed methods. See Ex. 1006 at 148–150 (§ 4.12.5). The handbook further teaches that patterned outer moldings were widely used throughout the industry to provide a number of well-understood benefits in addition to aesthetics, including: “provid[ing] enhanced performance properties such as improved chemical, abrasion or weathering resistance, and electrical conductivity” and coverage of “surface imperfections” that often result from plastic molding manufacturing processes. <i>Id.</i> at 148 and 150 (§§ 4.12.5.2 and 4.12.5.6).

Claim Language	<i>Anderson and Downey in view of the Handbook of Thermoplastic Elastomers</i>
	It is my opinion that it would have been a beneficial design choice, based on the state of the art in existence at the time of '811 patent's priority date, to form a pattern on the outer molding of the exercise/swim watch of <i>Anderson</i> and <i>Downey</i> with methods taught in the <i>Handbook of Thermoplastic Elastomers</i>. In addition to the clear benefits of aesthetic design and the display of a manufacturer's logo or other branding, it was known that such patterns could improve resistance to abrasion and weathering in a device intended for active use and repeated impacts like the exercise/swim watch taught in <i>Downey</i>. To a person of ordinary skill in the art, forming a pattern on the outer molding using methods such as those taught in the <i>Handbook of Thermoplastic Elastomers</i> would have been a natural design choice—one that simply applied a well-known prior art technique according to its established function to predictably improve the exercise/swim watch of <i>Anderson</i> and <i>Downey</i>.

G. Ground 8: *Anderson* and *Downey* in View of *Toyoda* Teach or Suggest All the Features of Claims 8 and 9

1. Claim 8

77. As described below, the combination of *Anderson* and *Downey* in view of *Toyoda* teaches or suggests the features of claim 8:

Claim Language	<i>Anderson and Downey in view of Toyoda</i>
8. The method of claim 1, further comprising performing an inspection of the outer molding to determine if the outer molding is defective.	As I discussed above in connection with claim 25 in paragraph 68, performing an inspection of a molding for defects, as taught by <i>Toyoda</i>, was a fundamental manufacturing technique that was known long before the '811 patent's priority date. As discussed in connection with claim 25, to a person of ordinary skill in the art, it would have been clearly beneficial to incorporate this step taught by <i>Toyoda</i> in the manufacturing process of a wearable device, particularly for a visible outer molding. Those teachings would have been equally applicable to the combination of <i>Anderson</i> and <i>Downey</i>. It is my opinion that it would have been natural to a person having ordinary skill in the art to combine the inspection step taught by <i>Toyoda</i> with the process for forming the outer molding layer taught by <i>Anderson</i>. Such an inspection was well known in the art by the '811 patent's priority date and from an economic perspective, such an inspection would have been beneficial as it would have stopped defective products from being sold to consumers. This would have been understood by persons of ordinary skill in the art to be particularly important for devices like the swim watch taught by <i>Downey</i>, where the outer molding was not only the most visible surface to a consumer but also provided protection for sensitive internal

	circuitry from moisture. In this context, an undetected defect could have resulted in damage to the essential components and rendered the device inoperable. To one of ordinary skill in the art, incorporating the manufacturing inspection steps of <i>Toyoda</i> into the manufacturing process taught by <i>Anderson</i> would have been a natural design choice—one that simply applied a well-known prior art technique according to its established function to predictably improve the exercise/swim watch taught by <i>Downey</i>.
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2. Claim 9

78. As described below, the combination of *Anderson* and *Downey* in view of *Toyoda* teaches or suggests the features of claim 9:

Claim Language	<i>Anderson and Downey in view of Toyoda</i>
9. [9A] The method of claim 8, further comprising: removing the outer molding after determining the outer molding is defective; and	As I discussed above in connection with claim 25 in paragraph 68, removing a molding that is determined to be defective and re-forming the molding, as taught by <i>Toyoda</i>, was a well understood and fundamental manufacturing technique long before the '811 patent's priority date. As discussed in connection with claim 25, to a person of ordinary skill in the art, it would have been clearly beneficial to incorporate the steps taught by <i>Toyoda</i> in the manufacturing of a wearable device, particularly for a visible outer molding. <i>Id.</i> Those teachings would have been equally applicable to the combination of <i>Anderson</i> and

	<i>Downey</i>. In my opinion, one of ordinary skill in the art would have been motivated to combine the fundamental inspection, removal, and re-forming steps taught by <i>Toyoda</i> with the process for forming an outer molding taught by <i>Anderson</i>. It was well understood that a defective molding left a designer with two primary options: (1) discard the entire device, or (2) remove and re-form the molding. It was also well understood that the choice between these options was generally dictated by the cost of the device's constituent components. In the case of the microelectronic components protected by the outer molding in <i>Downey</i> (e.g., GPS circuitry, various sensors and processors), it would have been a beneficial design choice to remove and re-form a defective outer molding rather than to scrap the entire device. Given the costly components in <i>Downey</i> (e.g., GPS circuitry, various sensors and processors), a person of ordinary skill in the art would have applied such known techniques to improve the reliability of the molding process taught by <i>Anderson</i> in the same way as taught by <i>Toyoda</i>, as it was a known solution to the problem of otherwise having to scrap the entire device.
[9B] re-forming the outer molding.	As I explained above in connection with element 9A, <i>Toyoda</i> teaches re-forming the outer molding after a defective layer is identified and removed.

H. Ground 9: *Anderson* and *Downey* in View of *Azuma* Teach or Suggest All the Features of Claims 10–12

1. Claim 10

79. As described below, the combination of *Anderson* and *Downey* in view of *Azuma* teaches or suggests the features of claim 10:

Claim Language	<i>Anderson</i> and <i>Downey</i> in view of <i>Azuma</i>
10. The method of claim 1, wherein the framework is comprised of a synthetic fiber.	<i>Anderson</i> and <i>Downey</i> teach frameworks that include “printed circuit boards” (described in <i>Anderson</i> as “an interconnecting laminate substrate”). <i>See, e.g.</i>, Ex. 1004 at ¶ 0026; Ex. 1005 at ¶ 0026. Although not expressly stated in <i>Anderson</i> and <i>Downey</i>, by the ’811 patent’s priority date, one of ordinary skill in the art would have expected that such circuit boards would have included a synthetic fiber layer. Printed circuit boards have long been known in the art to be made of a series of laminar layers, including layers of synthetic fibers (often woven) embedded in a composite to maintain dimensional reinforcement and stability of the board. <i>See, e.g.</i>, Ex. 1012 at 1:64–67 (“FR-4 laminates, perhaps the most widely used material in the PCB industry, include multiple plies of epoxy resin-impregnated woven glass cloth.”). The most widely used circuit board material, FR-4, includes reinforcement layers of woven fiberglass fibers. <i>Id.</i>

Azuma, a patent that issued fifteen years before the '811 patent's priority date, teaches a number of established techniques used in manufacturing printed circuit boards in its background section. Ex. 1009 at 1:32–38. These include forming a laminar layer containing synthetic fiber “by permeating a thermosetting resin . . . in a fabric or nonwoven fabric of a glass fiber, an aramid fiber, a polyester fiber, a carbon fiber, or paper, and drying the resultant structure.” *Id.*

It is my opinion that it would have been natural for one of ordinary skill in the art to use the circuit boards containing synthetic fibers described in *Azuma* in the combination of *Anderson* and *Downey*. Any printed circuit board selected, such as those described in *Azuma*, would have been expected to include synthetic fibers as part of its basic design.

In addition to printed circuit boards, embedding synthetic fibers in composite materials was a well-known and commonly used way to enhance the structural integrity of a component support, such as the framework of a molded device. See Ex. 1006 at 22 (§ 3.10.1.3) (discussing the benefits of glass fiber and carbon fiber reinforced plastics). It would have been clear to one of ordinary skill in the art that the framework and structural members of an exercise

	watch could have been fabricated with synthetic fiber. Using synthetic fiber reinforced composites was well understood and a mere design choice. Given the intended active use of the <i>Downey</i> exercise watch and consequent impact and shocks, one of ordinary skill in the art would have recognized that using synthetic fibers in the watch’s structural framework would have been a natural and beneficial design choice that simply applied well-known prior art, according to its established function, to predictably improve the exercise/swim watch taught by <i>Downey</i> in combination with <i>Anderson</i>.
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2. Claim 11

80. As described below, the combination of *Anderson* and *Downey* in view of *Azuma* teaches or suggests the features of claim 11:

Claim Language	<i>Anderson</i> and <i>Downey</i> in view of <i>Azuma</i>
11. The method of claim 1, wherein the framework is formed using carbon fiber.	<i>Anderson</i> and <i>Downey</i> teach frameworks that include “printed circuit boards” (described in <i>Anderson</i> as “an interconnecting laminate substrate”). <i>See, e.g.</i>, Ex. 1004 at ¶ 0026, Ex. 1005 at ¶ 0026. By the ’811 patent’s priority date, it would have been natural for one of ordinary skill in the art to include carbon fiber in these frameworks. Printed circuit boards have long been known to be made of a series of laminar layers, including layers of synthetic fibers (often woven) embedded in a composite to maintain

Claim Language	<i>Anderson and Downey in view of Azuma</i>
	dimensional reinforcement and stability of the board. <i>See, e.g.</i>, Ex. 1012 at 1:64–67 (“FR-4 laminates, perhaps the most widely used material in the PCB industry, include multiple plies of epoxy resin-impregnated woven glass cloth.”). <i>Azuma</i>, a patent that issued fifteen years before the ’811 patent’s priority date, teaches a number of established techniques used in manufacturing printed circuit boards in its background. These include forming a laminar layer “by permeating a thermosetting resin . . . in a fabric or nonwoven fabric . . . a carbon fiber . . . and drying the resultant structure.” Ex. 1009 at 1:32–38 (emphasis added). It is my opinion that it would have been natural for one skilled in the art at the time of the invention to use the circuit boards containing carbon fiber taught in <i>Azuma</i> in the combination of <i>Anderson</i> and <i>Downey</i>. The use of carbon fiber in printed circuit boards was well understood in the art long before the ’811 patent’s priority date and it would have been a predictably beneficial design choice to include it for enhanced structural integrity and reduced weight in the exercise watch of <i>Anderson</i> and <i>Downey</i>.

Claim Language	<i>Anderson and Downey in view of Azuma</i>
	In addition to printed circuit boards, embedding carbon fiber in composite materials was a well-known and commonly used way to enhance the structural integrity of a component support, such as the framework of a molded device. An industry reference handbook, <i>Handbook of Thermoplastic Elastomers</i>, explains “carbon fibers . . . have exceptional reinforcing properties” making them common in “specialized applications, such as aerospace, marine . . . and medical applications.” See Ex. 1006 at 22 (§ 3.10.1.3). It is my opinion that it would have been natural for a person of ordinary skill in the art to fabricate the framework and structural members of an exercise watch with carbon fiber. Using carbon fiber reinforced composites was well understood and would have been a mere design choice. Given the intended active use of the exercise watch taught by <i>Downey</i> and consequent impact and shocks, one of ordinary skill in the art would have been aware of the particular benefits that using of carbon fiber in the watch’s structural framework could offer. One of ordinary skill in the art would have been aware that utilizing carbon fiber according to its established function would have predictably benefited the watch of <i>Anderson</i> and <i>Downey</i> and would have been nothing more than a simple substitution of known materials to yield predictable

Claim Language	<i>Anderson and Downey in view of Azuma</i>
	results, <i>i.e.</i> , enhanced structural integrity and reduced weight.

3. Claim 12

81. As described below, the combination of *Anderson* and *Downey* in view of *Azuma* teaches or suggests the features of claim 12:

Claim Language	<i>Anderson and Downey in view of Azuma</i>
12. The method of claim 1, wherein the framework is comprised of one or more filaments.	Synthetic fibers, such as those discussed above in connection with claims 10 and 11 in paragraphs 79–80 and taught in <i>Azuma</i> , are formed by combining one or more filaments into a fiber or strand. <i>See</i> Ex. 1006 at 22 (§ 3.10.1.3) (“Glass fiber reinforcements are strands of filaments The number of filaments per strand, configuration of the strand, and the fiber length-to-weight ratio can be varied, depending on the desired properties.”). Because the synthetic fibers described in <i>Azuma</i> are composed of filaments, the use of a framework comprised of a synthetic fiber such as that discussed in connection with claim 11, would have also resulted in the use of a framework comprised of one or more filaments.

I. Ground 10: *Anderson* and *Downey* in View of *Brennan* Teach or Suggest All the Features of Claims 13 and 14

1. Claim 13

82. As described below, the combination of *Anderson* and *Downey* in view of *Brennan* teaches or suggests the features of claim 13:

Claim Language	<i>Anderson</i> and <i>Downey</i> in view of <i>Brennan</i>
13. The method of claim 1, wherein the framework is formed using a thermoplastic elastomer.	As I discussed in connection with claims 10 and 11 in paragraphs 79–80, <i>Anderson</i> and <i>Downey</i> teach frameworks that include printed circuit boards. <i>Brennan</i> teaches that it was well understood at the time of the invention that “[a] wide range of polymeric materials are used as substrate or laminate elements in electronics applications, and a great deal of information regarding their properties is known.” Ex. 1010 at 1:29–33. Those of ordinary skill in the art would have understood that thermoplastic elastomers could have been used as polymeric materials in a printed circuit board. <i>Id.</i> at 12:14–15 (“One of the simplest applications of such a laminate structure is as a printed circuit board.”). For example, <i>Brennan</i> teaches “patterned laminated structures having at least one thermoplastic elastomeric layer . . . such as antennas or printed circuit boards.” <i>Id.</i> at 1:8–13. <i>Brennan</i> teaches that the embodiments using thermoplastic elastomers “exhibit[] many desired

Claim Language	<i>Anderson and Downey in view of Brennan</i>
	properties, such as flexibility, conformability and weatherability.” <i>Id.</i> at Abstract. <i>Brennan</i> further teaches that “thermoplastic elastomer material is particularly well suited for use outdoors, as it is weatherable and its electrical properties, such as dielectric constant and loss tangent, experience little change over a wide temperature range.” <i>Id.</i> at 15:20–24. In view of the teachings of <i>Brennan</i>, it is my opinion that it would have been natural for one skilled in the art to use a thermoplastic elastomer framework for the swim/exercise watch of <i>Anderson and Downey</i>. Indeed, the <i>Downey</i> swim/exercise watch was intended to be used outdoors, an environment in which <i>Brennan</i> teaches thermoplastic elastomers are “particularly well suited.” <i>Id.</i> Understanding this, one skilled in the art would have recognized that utilizing a thermoplastic elastomer would have been a simple substitution of known materials to yield the predictably beneficial result of added protection against repeated impacts from active use, <i>i.e.</i>, enhanced flexibility, conformability, and weatherability, as taught in <i>Brennan</i>.

2. Claim 14

83. As described below, the combination of *Anderson and Downey* in view of *Brennan* teaches or suggests the features of claim 14:

Claim Language	<i>Anderson and Downey in view of Brennan</i>
14. The method of claim 13, wherein the thermoplastic elastomer comprises polypropylene.	As I explained in connection with claim 13 in paragraph 82, one of ordinary skill in the art would have understood that thermoplastic elastomers could have been used as polymeric materials in a printed circuit board. <i>Brennan</i> teaches that it is “particularly preferred” to use polypropylene in the thermoplastic elastomer component of its printed circuit boards. Ex. 1010 at 6:42–46. For the same reasons as I explained in connection with claim 13, and in view of the teachings of <i>Brennan</i> that polypropylene would have been “particularly preferred,” it is my opinion that it would have been natural for one skilled in the art to use polypropylene in the thermoplastic elastomer framework for the swim/exercise watch of <i>Anderson and Downey</i>.

X. CONCLUSION

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

Dated: February 10, 2016

By:

A handwritten signature in black ink, appearing to read 'D Cairns', written over a horizontal line.

Darran Cairns