

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Gloria Lin, et al.
U.S. Patent No.: 10,076,257 Attorney Docket No. 50095-0157IP1
Issue Date: August 11, 2020
Appl. Serial No.: 14/136,658
Filing Date: December 20, 2013
Title: SEAMLESSLY EMBEDDED HEART RATE MONITOR

DECLARATION OF DR. THOMAS W. KENNY

I currently hold the opinions set expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare 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 the Title 18 of the United States Code.

Dated: April 10, 2024

By: 
Thomas W. Kenny, Ph.D.

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I. QUALIFICATIONS AND BACKGROUND INFORMATION

1. My education and experience are described more fully in my *curriculum vitae*, previously submitted as Exhibit 2002 in this proceeding. For ease of reference, I have highlighted certain information below.

2. My academic and professional background is in Physics, Mechanical Engineering, Sensing, and Robotics, with a research specialization focused on microfabricated physical sensors, and I have been working in those fields since the completion of my Ph.D. more than 30 years ago. The details of my background and education and a listing of all publications I have authored in the past 35 years are provided in my curriculum vitae, attached as Appendix A. Below I provide a short summary of my education and experience which I believe to be most pertinent to the opinions that I express here.

3. I received a B.S. in Physics from University of Minnesota, Minneapolis in 1983, and a Ph.D. in Physics from University of California at Berkeley in 1989. I was educated as a Physicist specializing in sensors and measurement. My Physics Ph.D. thesis involved measurements of the heat capacity of monolayers of atoms on surfaces, and relied on precision measurements of temperature and power using time-varying electrical signals, and also on the design and construction of miniature sensor components and associated electrical circuits for conditioning and conversion to digital format.

4. After completion of my Ph.D. in Physics at U.C. Berkeley in 1989, I joined the Jet Propulsion Laboratory (JPL) in Pasadena, CA, as a staff scientist, and began working on miniature sensors and instruments for small spacecraft. This work involved the use of silicon microfabrication technologies for miniaturization of the sensors, and served as my introduction to the field of micro-electromechanical systems (MEMS), or the study of very small mechanical sensors powered by electricity and used for detection of physical and chemical signals.

5. While at JPL, we developed accelerometers, uncooled infrared sensors, magnetometers, seismometers, force and displacement sensors, soil chemistry sensors, miniature structures for trapping interstellar dust, and many other miniature devices. Some of these projects led to devices that were launched with spacecraft headed for Mars and for other interplanetary missions. Much of this work involved the use of physical sensors and measurement of small electrostatic signals for detection of small forces and displacements using micromechanical sensors.

6. I am presently the Richard Weiland Professor at the Department of Mechanical Engineering at Stanford University, where I have taught for the past 30 years. I am also currently the Senior Associate Dean of Engineering for Education and Student Affairs at Stanford.

7. For almost all of these 30 years, I have taught courses on Sensors and Mechatronics at Stanford University. The “Introduction to Sensors” course is a broad overview of all sensing technologies, from thermometers, to inertial sensors, ultrasound devices, flow sensors, optical and IR sensors, chemical sensors, pressure sensors, and many others, and has included sensors based on changes in capacitance, resistance, piezoelectricity. This course specifically included different mechanisms for sensing heart rate, blood pressure, blood chemistry, cardiovascular blood flow and pressure drops, intraocular pressure and other physiological measurements, as well as activity monitoring (step counting, stair-counting, etc). I first taught this course at Stanford in the Spring of 1994, and I offered this course at least annually until 2016, when my duties as Senior Associate Dean made this impractical, yet have continued to offer this course periodically since, including these last two years.

8. The “Introduction to Mechatronics” course is a review of the mechanical, electrical and computing technologies necessary to build systems with these contents, which include everything from cars and robots to cellphones and other consumer electronics devices. In this class, we routinely use IR, LEDs, and photosensors as a way of detecting proximity to objects in the space around miniature robots. We also use inertial sensors to detect movement, and a number of sensors, such as encoders to measure changes in position and trajectory. I was

one of the instructors for the first offering of this course in 1995, and this course has been offered at least once each year ever since, except for the pandemic year of 2021. The 2023 offering was highly-successful with 80 undergraduate and graduate students from many engineering and science disciplines.

9. I am co-author of a textbook titled “Introduction to Mechatronic Design,” which broadly covers the topic of integration of mechanical, electronic and computer systems design into “smart products.” This textbook includes chapters on Microprocessors, Programming Languages, Software Design, Electronics, Sensors, Signal Conditioning, and Motors, as well as topics such as Project Management, Troubleshooting, and Synthesis.

10. My research group at Stanford has focused on the area of microsensors and microfabrication—a domain in which we design and build micromechanical sensors using silicon microfabrication technologies. The various applications for these technologies are numerous. Generally, modern MEMS devices rely on capacitive transduction mechanisms to detect small forces. These capacitive transducers generally consist of a fixed electrode and an electrode that can undergo slight movements in response to external forces (acceleration, rotation, pressure, etc). In the research that has been carried out in my group and in the community, we utilize sensitive amplifiers to covert small changes in current or voltage into meaningful signals reflecting the phenomena of interest.

11. I have advised 75 Ph.D. students that have completed Ph.D. degrees and many more M.S. and B.S. students in Engineering during my time at Stanford.

12. I have published over 250 technical papers in refereed journals and conferences in the field of sensors, MEMS, and measurements. I have further presented numerous conference abstracts, posters, and talks in my field. I am a named inventor on 50 patents in my areas of work.

13. From 2020 to 2022 I served as CEO of Applaud Medical, a startup that I co-founded in 2015. Applaud is developing improved methods for treatment of kidney stones, and during my time as CEO, we initiated a FDA-regulated pivotal clinical trial on our first product, concluded an Australian clinical study on our second product, and positioned the company for on-boarding of an experienced CEO with resources to guide the company through all remaining trials and to a successful outcome.

14. I received the Office of the Secretary of Defense Award for Exceptional Public Service in 2010, the IEEE Sensors Council Technical Achievement Award in 2011, and was named Fellow of the ASME in 2014. I was awarded the 2018 IEEE Daniel Noble Award for Emerging Technologies. In 2022, I was elected to the National Academy of Engineering.

15. I have previously served as an expert on patent infringement cases related to the design and use of inertial sensors, sensors of physiological

parameters, optical proximity sensors, and other sensor-based technologies and applications, as well as other topics. My CV, Appendix A, includes a full listing of all cases in which I have testified at deposition or trial in the preceding several years.

16. I have been retained on behalf of Apple Inc. to offer technical opinions relating to U.S. Patent No. 10,076,257 (“the ’257 Patent”) and prior art references relating to its subject matter. I have reviewed the ’257 Patent, and relevant excerpts of the prosecution history of the ’257 Patent. Based on my experience and education, and the acceptance of my publications and professional recognition by societies in my field, I believe that I am qualified to offer opinions as to the knowledge and level of skill of one of ordinary skill in the art at the time of the invention of the ’257 patent (which I further describe below).

17. In addition to any materials cited in the present declaration, I have also reviewed the following references:

- EX1001 U.S. Patent No. 10,076,257 B2
- EX1002 Prosecution History of U.S. Patent No. 10,076,257 B2
- EX1003 Declaration of Dr. Ronald D. Berger (“Berger Declaration”)
- EX 1004 Curriculum vitae of Dr. Ronald Berger
- EX 1005 Markel U.S. Patent Appl. No. 11/492,278
- EX 1006 Nissilä U.S. Patent No. 6,775,566

- EX 1007 Righter U.S. Patent No. 5,191,891
- Ex. 1008 Farrington U.S. Patent No. 7,502,643
- EX 1009 Cardiology Explained EUAN A. ASHLEY & JOSEF NIEBAUER, CARDIOLOGY EXPLAINED (2004)
- EX 1010 Cudahy U.S. Patent No. 5,184,620
- EX 1011 Sujdak U.S. Patent No. 6,847,836
- EX 1012 Geddes U.S. Patent No. 4,606,352
- EX 1013 Ceballos U.S. Patent No. 6,522,915
- EX 1014 Gilles U.S. Patent No. 4,635,646
- EX 1015 Weiss U.S. Patent No. 5,623,926
- EX 1016 Apple's Complaint Complaint, Apple Inc. v. AliveCor, Inc., Case No. 4:22-cv-07608-HSG, Dkt. No. 1 (N.D. Cal., Dec. 12, 2022)
- EX 1017 Hobson U.S. Patent No. 7,876,274.

I have also reviewed various supporting references and other documentation as further noted in my opinions below.

18. Counsel has informed me that I should consider these materials through the lens of one of ordinary skill in the art related to the '257 Patent at the time of the earliest possible priority date of the '257 Patent, and I have done so during my review of these materials. The '257 Patent claims the benefit of priority to a provisional application filed November 5, 2008 ("the Critical Date"). Counsel

has informed me that the Critical Date represents the earliest possible priority date to which the challenged claims of '257 Patent are entitled, and I have therefore used that Critical Date in my analysis below.

19. I have no financial interest in the parties or in the outcome of this proceeding. I am being compensated for my work as an expert on an hourly basis. My compensation is not dependent on the outcome of these proceedings or the content of my opinions.

20. In writing this declaration, I have considered the following: my own knowledge and experience, including my work experience in the fields of mechanical engineering, computer science, biomedical engineering, and electrical engineering; my experience in teaching those subjects; and my experience in working with others involved in those fields. In addition, I have analyzed various publications and materials, in addition to other materials I cite in my declaration.

21. My opinions, as explained below, are based on my education, experience, and expertise in the fields relating to the '257 Patent. Unless otherwise stated, my testimony below refers to the knowledge of one of ordinary skill in the art as of the Critical Date, or before. Any figures that appear within this document have been prepared with the assistance of Counsel and reflect my understanding of the '257 Patent and the prior art discussed below.

II. OVERVIEW OF CONCLUSIONS FORMED

22. This declaration explains the conclusions that I have formed based on my analysis. To summarize those conclusions, based upon my knowledge and experience and my review of the prior art publications listed above, I believe that:

- Markel does not anticipate or render obvious claims 1-22 of the '257 Patent
- Markel in view of Nissilä does not render obvious claims 1-22 of the '257 Patent
- Markel in view of Righter does not render obvious claims 12-13 and 19 of the '257 Patent
- Markel in view of Nissilä and Righter does not render obvious claims 12-13 and 19 of the '257 Patent

III. LEVEL OF ORDINARY SKILL IN THE ART

23. In my opinion, a person of ordinary skill in the art as of the Critical Date of the '257 Patent (hereinafter a "POSITA") would have had at least a bachelor's degree in electrical engineering, mechanical engineering, biomedical engineering, computer engineering, physics, or a related field, and would have had at least two years of relevant work experience with capture and processing of data or information, including but not limited to physiological information, or

equivalents thereof. Less work experience may be compensated by a higher level of education and vice versa.

24. Based on my knowledge, skill and experiences, I have a good understanding of the capabilities of one of ordinary skill. Indeed, I have taught, participated in organizations, and worked closely with many such persons over the course of my career. For example, from my industry experience, I am familiar with what an engineer would have known and found predictable in the art. From teaching and supervising my post-graduate students, I also have an understanding of the knowledge that a person with this academic experience possesses. Furthermore, I possess those capabilities myself.

IV. CLAIM CONSTRUCTION

25. I understand the Patent Trial and Appeal Board (“Board”) construes claim terms as having their ordinary and customary meaning to a POSITA at the time of invention (i.e., the same standard used in district court). I have applied this standard in rendering my opinions on claim construction. In addition, I have been asked to assume that the claims are not indefinite.

26. I have noted that AliveCor has proposed constructions for several terms in the Petition. In my opinion, AliveCor’s constructions of terms relevant to this proceeding below are improperly broad. For this reason, I have presented constructions having a proper scope for these terms.

27. **“embedded in”** (claims 1, 15) – In my opinion, the term “embedded in” should be given its plain and ordinary meaning, which does not require an explicit construction. A POSITA would have known what it means for a first material, structure, or component to be “embedded in” a second material, structure, or component based on both the plain and ordinary meaning of this term and the way in which this term is used in the ’257 patent specification, which conforms with the plain and ordinary meaning. However, should it be necessary to define the parameters of the plain and ordinary meaning for this term, an express construction of the term “embedded in” that a POSITA would have recognized as consistent with the plain and ordinary meaning of this term is “at least partially set in or partially surrounded by a material.” This construction is both consistent with the plain and ordinary meaning of the term “embedded in” and supported by the use of the term “embedded in” in the specification and claims of the ’257 patent.

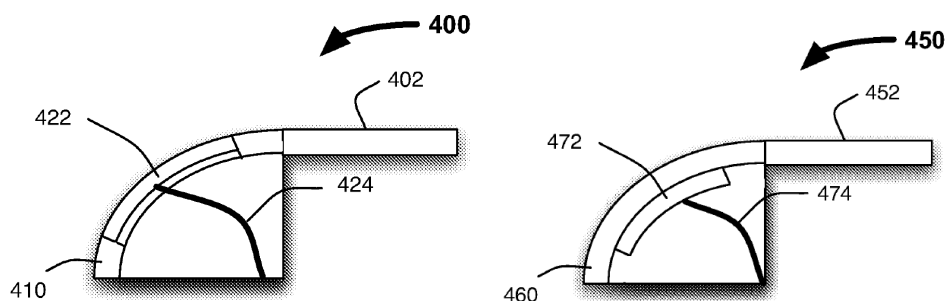
28. The ’257 patent uses the term “embedded” throughout, including in the title. The various uses of the term “embedded” also indicate that the claim term “embedded in” has a narrower meaning than the term “embedded” on its own as used in the specification. This is demonstrated by several examples from the ’257 patent specification in which the term “embedded in” is used in contrast to other terms such as “embedded adjacent to” or “embedded along.” In a first example, in a section toward the end of the detailed description of the ’257 patent

that describes the invention in general, the '257 patent states that in embodiments where the device includes “a housing forming the exterior surface” that “one or more leads can be embedded in or adjacent to the housing.”¹ EX1001, 10:24-29. A POSITA would have recognized that this section clearly distinguishes between a lead that is “embedded in” the housing and a lead that is merely positioned “adjacent to” the housing (such as by being positioned underneath a portion of the housing). Based on this example in the '257 patent, a POSITA would have recognized that for the lead to be “embedded in” the housing requires more than the lead and a portion of the housing to be positioned such that the lead is merely in contact with a flat interior surface or otherwise simply adjacent to a portion of the housing. Rather, this example from the specification of the '257 patent would guide a POSITA to understand that for a first object to be “embedded in” another object at least a portion of the first object, such as an embedded lead or pad, must be at least partially set in or partially surrounded by a second material or component (e.g., a portion of the enclosure). Therefore, a POSITA would distinguish a first material or component that is “embedded in” another material or component from a first material or component that is merely “embedded adjacent

¹ All emphasis added unless otherwise noted.

to” another material or component, or in contact with a flat surface of another component.

29. The '257 patent gives another example that makes this distinction clear with respect to Figure 4B, which is described as “...a cross-sectional view of another illustrative electronic device having a bezel with an embedded heart sensor lead...” EX1001, 3:33-35. Specifically, the '257 patent specification describes two alternative arrangements for the lead 472 with respect to Figure 4B.



Left: '257 Patent, FIG. 4A; Right: '257 Patent, FIG. 4B

30. In a first arrangement described with respect to Figure 4B, the '257 patent describes that “lead 472 of the heart sensor can be *positioned against* the back surface of bezel 460.” EX1001, 9:44-45. As shown in the figure, the lead 472 and the back surface of bezel 460 are both curved, with the lead 472 embedded in the bezel 460 because of the position of the lead 472 on the inside curved surface of the bezel 460. This is consistent with the understanding of a POSITA as discussed above, which would distinguish a first material or component that is “embedded in” another material or component from a first material or component

that is merely “embedded adjacent to” another material or component, or in contact with a flat surface of another component. The lead 472 is embedded in the bezel 460 because it is positioned on the inside curved surface of the bezel.

31. The specification then describes an alternative arrangement for the lead 472 with respect to the bezel, stating “[a]lternatively, lead 472 can be *placed within the thickness of bezel* 460 (e.g., in a pocket within the bezel wall), but underneath the outer surface of the bezel.” *Id.*, 9:45-48. This passage once again demonstrates the clear distinction between a lead that is embedded in a portion of the enclosure in contrast to a lead that is merely “positioned against” or in parallel contact with a portion of the enclosure. It is not sufficient that the lead/pad be in parallel contact with the first portion of the enclosure to be “embedded in,” the lead/pad needs to be at least partially surrounded by or at least partially set in the first portion of the enclosure. Specifically, the proposed construction requires that the lead be at least partially set in or partially surrounded by a material.

32. Other portions of the ’257 patent further support an interpretation of “at least partially set in or partially surrounded by a material” for the term “embedded in,” consistent with the plain and ordinary meaning of this term. For example, the ’257 patent describes an embodiment in which a lead is included in the touch screen. In describing this embodiment, the ’257 patent refers to an “additional lead 326 *embedded in or behind* display 302.” EX1001, 8:40-41. This

section offers another example of the term “embedded in” having a narrower meaning than the term “embedded” by distinguishing between a lead that is “embedded in” a portion of the enclosure verses a lead that is merely “behind” the portion of the enclosure. EX1001, 8:40-41. To be clear, a lead/pad can be both “embedded in” and “embedded behind” a portion of an enclosure, and indeed claim 1 requires this configuration. However, this example demonstrates that something more than merely being positioned behind the first portion of the enclosure is required for the lead/pad to be “embedded in” the first portion of the enclosure. Specifically, the proposed construction requires that the lead be at least partially set in or partially surrounded by a material.

33. I also note that the claims of the '257 use the term “embedded in” while also using the word “embedded” in other context, which once again indicates that the term “embedded in” has a different scope from the broader term “embedded. For example, claim 1 recites “a first lead comprising a first pad that is embedded *in* a first portion of the enclosure” while claim 9 recites “a third lead embedded *with* the display.” As would have been apparent to a POSITA, the term “embedded in” has a different scope than the term “embedded with.” A POSITA would have recognized that in the context of the '257 patent, the term “embedded in” has a narrower scope than “embedded with.” Specifically, a lead that is “embedded in” a first portion of the enclosure would be at least partially set in or

partially surrounded by the first portion of the enclosure rather than merely being “embedded with” or adjacent/parallel to the first portion of the enclosure.

34. Dictionary definitions of the terms “embedded” and “embed” similarly support the above conclusion that the plain and ordinary meaning for the term “embedded in” as it is used in the ’257 patent is “at least partially set in or partially surrounded by a material.” For example, a POSITA would have been aware that in the context of computing devices and computing technology, the term “embedded” means “[t]hat which has been *incorporated into a surrounding mass or enclosure*.” APPLE-2005, 3. This definition taken from the Wiley Electrical and Electronics Engineering Dictionary indicates to a POSITA that the term “embedded in” requires more than two materials or substrates that are merely positioned adjacent to, parallel, or against each other. *Id.*

35. For the above reasons, both the descriptions contained within the ’257 patent and the various other materials of which a POSITA would have been aware indicate that the proper scope of the term “embedded in” is “at least partially set in or partially surrounded by a material” which is consistent with the plain and ordinary meaning for this term.

36. **“a first pad that is embedded in a first portion of the enclosure, wherein an exterior surface of the enclosure comprises an exterior surface of the first portion, wherein the first pad is positioned underneath the exterior**

surface of the first portion” (claim 1) – “a first pad that is embedded in a first portion of the enclosure, wherein an exterior surface of the enclosure comprises an exterior surface of the first portion, wherein the first pad is positioned underneath the exterior surface of the first portion” (claim 1) – In my opinion, these elements of claim 1 should be given their plain and ordinary meaning. I also believe that these claim require precisely what they state: the first pad and the first portion of the enclosure are distinct components and the first pad is both “embedded in [the] first portion of the enclosure” and “positioned underneath the exterior surface of the first portion” of the enclosure.

37. In contrast, in his declaration, Dr. Berger alleges that Apple has asserted an interpretation for this claim element in which a “surface of an exposed electrode pad that is configured to detect a cardiac signal via direct contact with the user’s skin” can somehow satisfy both the claimed first pad and the claimed first portion of the enclosure, in which the first pad is both “embedded in” and “positioned underneath.” EX1003, ¶¶127-128. This overly broad interpretation by AliveCor’s expert is incorrect. The plain language of the claim requires a “first pad” that is distinct from “the first portion of the enclosure” and also specifies a physical relationship between the two components, reciting that the first pad is both “embedded in [the] first portion of the enclosure” and “positioned underneath the exterior surface of the first portion” of the enclosure. Dr. Berger admits that the

alleged “Apple’s interpretation” of this claim element is “incorrect.” EX1003, ¶128. Dr. Berger later goes on to describe a “correct interpretation” for claim element [1.c.iii] that requires that “the first pad is positioned underneath the exterior surface of the first portion.” *Id.*, ¶134.

38. “**bezel**” (claims 12, 13, 19) – The term “bezel” means “[a] rim that secures a transparent covering for an indicating device such as a meter, oscilloscope, or watch.” APPLE-2008; *see also* APPLE-2009 (“a rim that holds a transparent covering (as on a watch, clock, or headlight)”); APPLE-2010 (“A grooved rim used to hold a transparent glass or plastic window or lens for a meter, tuning dial, or some other indicating device”).

V. THE ’257 PATENT

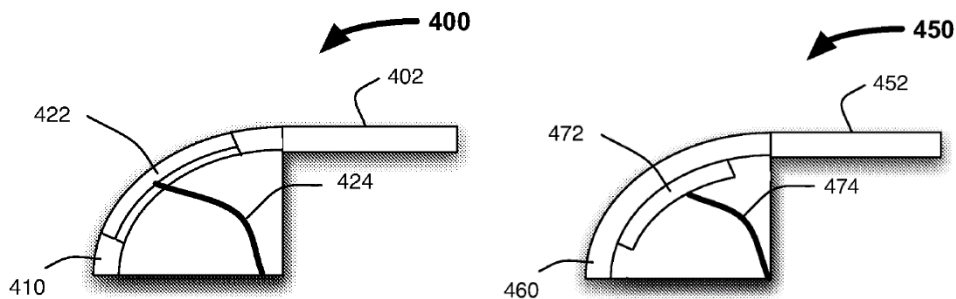
A. Overview

39. The ’257 Patent is directed to an electronic device that includes a sensor for detecting a user’s cardiac signal. EX1001, 2:1-2. The sensor can be used to unlock the device in response to “authenticat[ing] a user based on the attributes of the user’s heartbeat.” *Id.*, 1:49-2:3.

40. A “heart sensor 112 can include one or more leads connected to the exterior of the electronic device.” EX1001, 6:3-8. “The cardiac signals detected by the heart sensor leads can be coupled to a processor incorporated in heart sensor 112, or instead provided to processor 102.” *Id.*, 6:10-16. “The processor may then

analyze the received signals and generate, from the received signals, one or more characteristic quantities of the user's heartbeat or heart rate for authentication.” *Id.*

41. The '257 Patent provides several example configurations for its disclosed electronic device. For example, “FIG. 4A is a cross-sectional view of an illustrative electronic device having a bezel with an embedded heart sensor lead,” where “lead 422 is exposed to the user.” *Id.*, 9:18-26. “FIG. 4B is a cross-sectional view of another illustrative electronic device having a bezel with an embedded heart sensor lead,” where lead 472 is placed “underneath the outer surface of the bezel.” *Id.* 9:45-49. Each of lead 422 in Figure 4A and lead 472 in Figure 4B is coupled to a respective connector (424 and 474) that “transmit[s] the signals to a processor” of the device. *Id.*, 9: 24-26, 9:51-52.



Left: '257 Patent, FIG. 4A; Right: '257 Patent, FIG. 4B

42. The '257 Patent also discloses embodiments where a lead is “embedded in or behind display 302” or “embedded in or adjacent to the housing.” EX1001, 8:40-52, 10:25-29. The '257 patent provides examples of how a lead can detect the cardiac signal without needing to be a metal structure positioned on the

outer surface of the device. *Id.*, 6:17-6:33. The '257 describes express benefits of an electrode that is embedded within the structure, and not forming an outer surface. *Id.*, 1:58-2:3. This includes avoiding having to perform additional authentication functions.

B. Overview of the Prosecution History

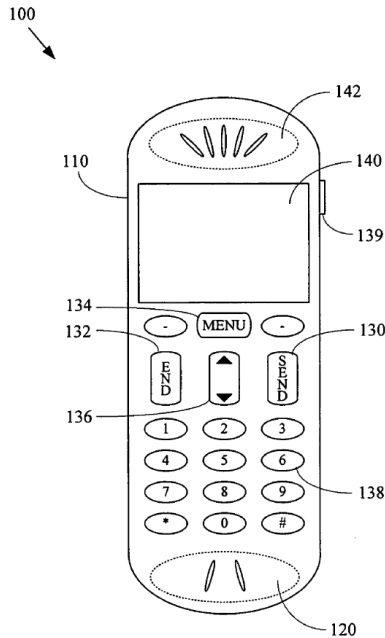
43. The application leading to the '257 Patent was filed on December 20, 2013, claiming priority to provisional application number 61/111,498 filed on November 5, 2008 through a chain of continuation. The '257 Patent went through an examination that involved three substantive office actions including prior art rejections based on Ceballos (US 6,522,915), Gilles (US 4,635,646), and Weiss (US 5,632,926). Subsequently, the '257 Patent was allowed on May 22, 2018, and issued on September 18, 2018.

VI. OVERVIEW OF PETITIONER'S APPLIED ART

44. Petitioner has applied Markel, Nissilä, and Righter as references in its grounds of the Petition. Below are brief descriptions of these references.

A. Overview of Markel

45. Markel describes a “mobile communication device [(MCD)] 100” that includes electrodes “adapted to detect cardiac activity of a user of the [mobile communication device, (MCD)] 100.” EX1005, [0033], [0035].



EX1005, FIG. 1

46. Markel discloses that the electrodes “generally comprise conductive material.” *Id.*, [0037]. Markel then continues with providing examples of such conductive material by explaining that:

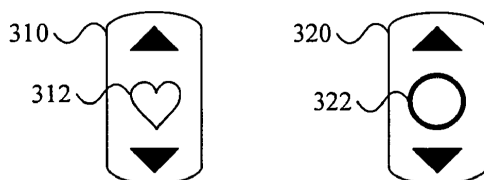
For example, an electrode may comprise a metallic surface exposed for user contact. Also for example, an electrode may be formed from conductive plastic (or another material) that may be integrated into various molded components of the mobile communication device. For example, various conductive plastics (e.g., graphite-impregnated plastic or the like) may provide sufficient conductivity for an electrode to perform adequately.

Id.

47. Markel also notes that “[e]lectrodes (or other sensors) may be shaped, positioned or formed with various physical features.” *Id.*, [0038]. For example,

“[e]lectrodes may[] be identified for the user in any of a variety of manners or may be generally concealed from the user.” *Id.*, [0039].

48. To clarify what it means by an identifiable (i.e., unconcealed) versus a concealed electrode, Markel provides several examples of identifiable “electrode[s] that] comprise a visible or tactile indicium to indicate the location of the electrode[s] to a user,” versus concealed electrodes that “comprise molded conductive plastic with *little or no visible indication of the electrode presence*” when “a user need not be aware of the presence of the electrode.” EX1005, [0039-40]. Figure 3 depicts examples of identifiable electrodes. In Figure 3, “[f]or example, the first pushbutton 310 comprises a heart-shaped indium 312 (or other visible characteristic) to notify a user of the location of the electrode and also the function of the electrode.” *Id.* “Also for example, the second pushbutton 320 comprises a circular projection (or other tactile characteristic) to notify a user of the location of the electrode.” *Id.*



EX1005, FIG. 3

49. “In general, one or more electrodes (or other sensors) may be positioned such that the one or more electrodes *contact* a user during normal (or

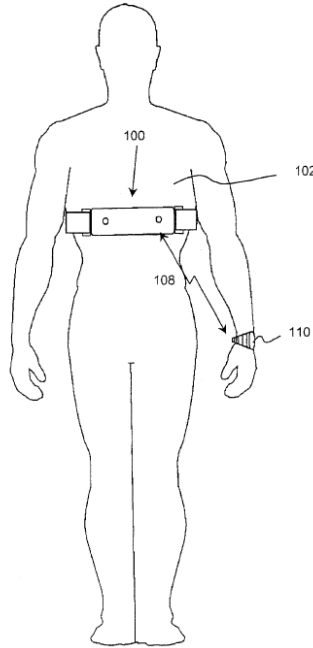
typical) use of the MCD 100.” *Id.*, [0041]. In FIGs. 2-6, Markel promotes placement of the electrodes **on** different parts of a “cellular or portable telephone” as the MCD. Such placement of the electrodes facilitates user engagement with the electrode during the use of the telephone. *See e.g., id.*, [0045]. For example, Markel includes several express disclosures of the electrodes being placed on exterior surfaces of the device (with no corresponding description of additional electrodes or pads positioned underneath the exterior of the device), such as when Markel describes, “FIG. 4 provides a non-limiting example of [the] electrode placement,” where “first and second electrodes may be **disposed on** a main body portion 110 of the MCD 100,” as presented in “FIG. 4.” *Id.* In another example, Markel describes, “FIG. 5 provides a non-limiting example of [the] electrode placement,” where the electrodes are “**disposed on** a main body portion 110 of the MCD 100 and a pushbutton.” *Id.*, [0046]. In yet another example, Markel describes: “FIG. 2 provides non-limiting examples of [electrode] placement,” where the “electrodes may be **disposed on** a same pushbutton of the mobile communication device 100.” *Id.*, [0047]. “FIG. 6 provides a non-limiting illustration of [electrode] placement,” where “a first electrode may be **disposed on** a handheld portion of the MCD 100, and a second electrode may be **disposed on** (or proximate) an earpiece of the MCD100.” “Such electrode placement may, for

example, provide for *user contact with both electrodes* during the process of listening to the MCD 100.” *Id.*, [0050].

B. Overview of Nissilä

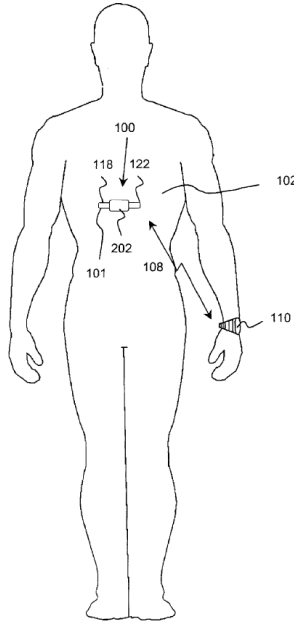
50. Nissila “relates to an electrode structure and a heart rate measuring arrangement for measuring an ECG signal on the skin of a person’s chest,” so that the arrangement can be “used in connection with exercise and sports.” EX1006, Abstract, 1:6-9. The Nissila patent appears to be an English translation of the original Finnish patent to which it claims priority (FI 20002304) (APPLE-2006).

51. Nissila recognizes that problems with the conventional “belt-like” electrode structures were that such electrodes were “poorly suited for long-term, continuous use” because (i) “they chafe the skin easily,” (ii) “[t]he belt-like structure of the electrode belt[] limits its optimal positioning substantially at the heart with persons having large quantities of muscular or other tissue in the chest area,” and (iii) “slim adults and children have troubles in wearing the rigid electrode belt, because it does not bend sufficiently to follow the contours of a human body with a narrow chest.” *Id.*, 1:37-39 and 1:57-2:14.



EX1006, FIG. 1 (depicting a conventional “belt-like” electrode structure)

52. Nissila’s solution is a “band-like” electrode structure “having an inner surface to be placed against the skin of the person’s chest.” *Id.*, 2:16-32. “[T]he inner surface of the electrode structure is an adhesive surface for attaching the electrode structure to the skin of the person’s chest.” *Id.* The “band-like component of the electrode structure is of flexible, soft material that fits the skin closely, and as a consequence it is comfortable and inconspicuous to wear and does not chafe the skin.” *Id.*, 2:62-67. FIG. 2 of Nissila depicts Nissila’s “band-like” “electrode structure 100 placed on the chest 102.” *Id.*, 4:64-65, 5:3-4. “At a first end of the electrode structure 100 there is a first electrode 118 and at a second end of the electrode structure 100 there is a second electrode 122.” *Id.*, 5:6-9.



EX1006, FIG. 2 (illustrating Nissila's proposed "band-like" electrode structure)

53. The "band 101 [has] an inner surface 116 against the skin of the person's chest and an outer surface 120 opposite thereto." *Id.*, 5:5-6. "The inner surface 116 of the electrode structure is an adhesive surface, by which the electrode structure 100 is attached to the skin 102 of the person's chest." *Id.*, 5:18-20.

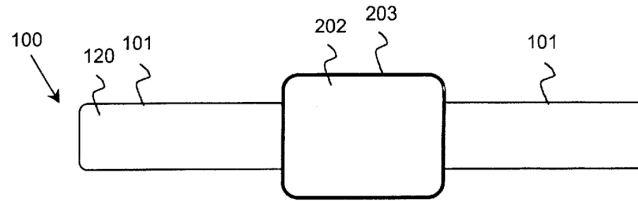


FIG.3

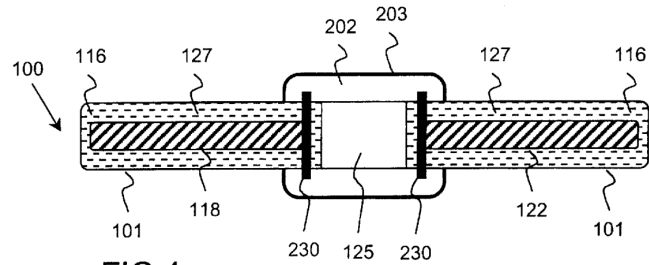


FIG.4

EX1006, FIG. 3 (top), and FIG. 4 (bottom)

54. Nissilä describes two different implementations for the electrodes that contact the user's skin, one in which the electrodes are formed of a conductive adhesive affixed to the band on each side and one in which the electrodes are a flexible, conductive membrane. In describing the first embodiment, Nissilä states "the electrodes located at the ends of the band-like component of the electrode structure are made of electrically conductive adhesive." EX1006, 3:18-23; 5:25-31. Figure 7 shows this embodiment in which the electrodes are made of electrically conductive adhesive:

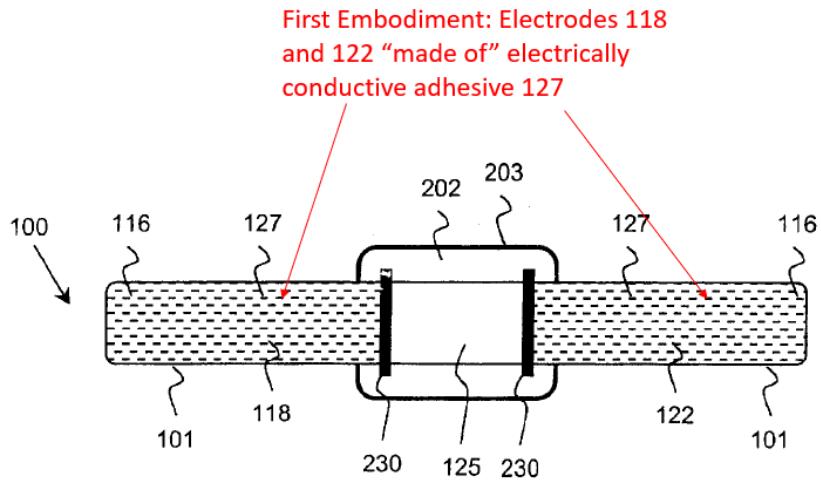
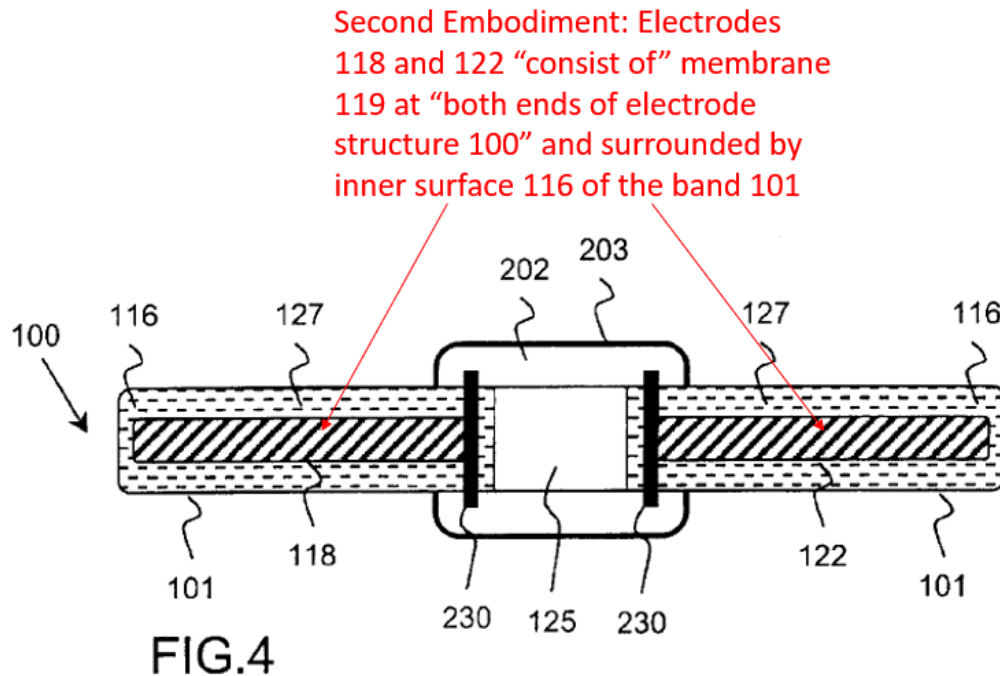


FIG. 7

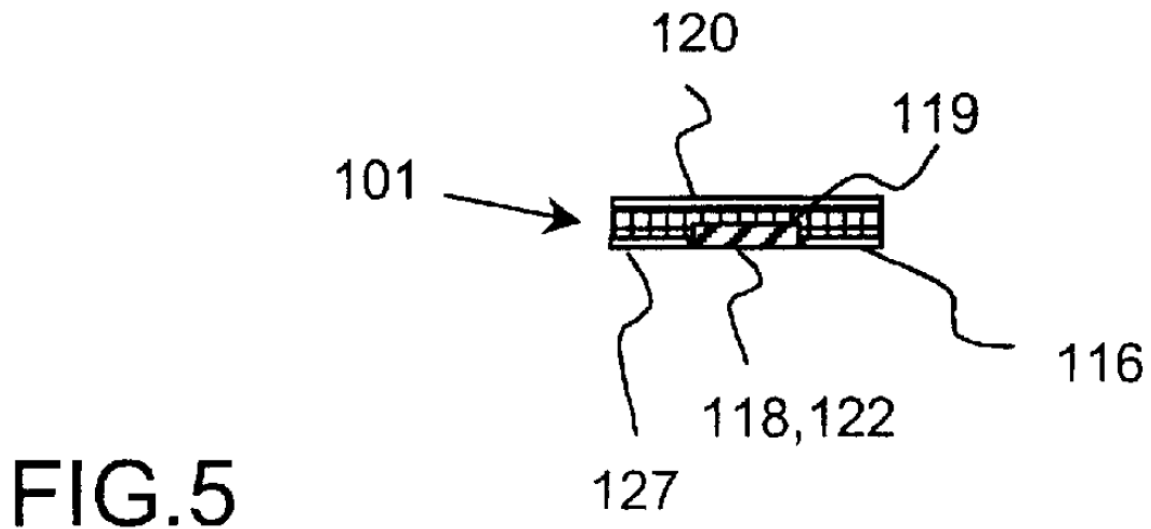
EX1006, FIG. 7 (annotated).

55. Nissilä goes on to describe that in the “second embodiment, as in FIGS. 3 to 6, the electrodes 118, 122 of electrode structure 100 *consist of* a membrane 119 that is located at both ends of the electrode structure 100, at the electrode 118, 122, and is made of metal, electrically conductive plastic or a similar conductive material.” EX1006, 5:33-38.



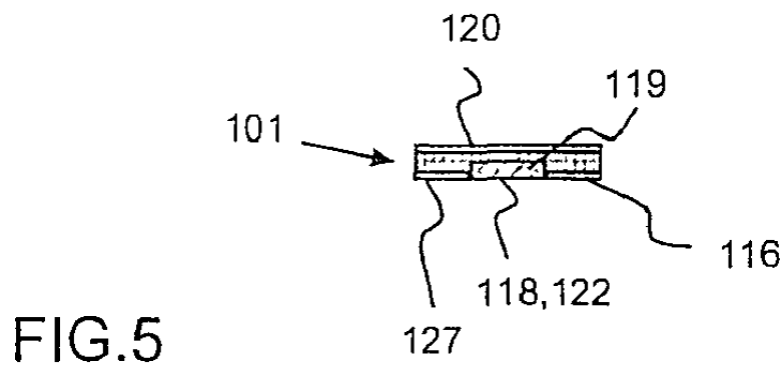
EX1006, FIG. 4 (annotated)

56. A cross-section of the membrane implementation of the electrodes is shown in FIG. 5, which shows reference numeral 119 pointing to the electrode 118, 122, indicating that the electrodes on each band of the device are formed as a membrane 119:



EX1006, FIG. 5; 4:35-41

57. The Finnish patent that serves as the source material for Nissilä shows even more clearly that the reference numeral 119 is pointing to the electrodes.



APPLE-2006, FIG. 5.

58. As can be seen in the Figure 5 cross-section from both the U.S. patent version of Nissilä and the original Finnish patent, the electrodes 118, 122 are positioned on the exterior of the device without an additional portion of the enclosure positioned between the electrodes 118, 122 and the user's skin. Nissilä

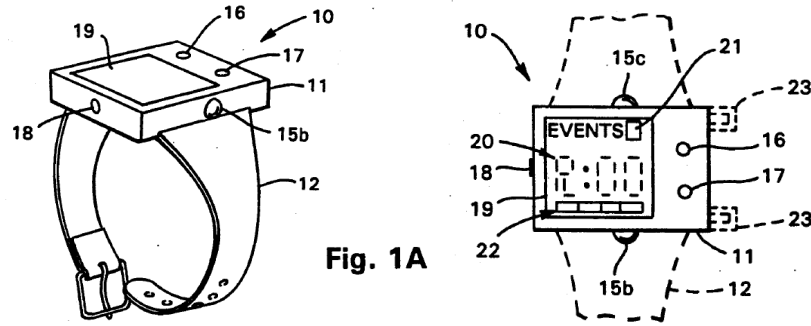
therefore describes two possible configurations for the electrodes, one in which the electrodes are formed using conductive adhesive and one in which the electrodes are formed as a flexible membrane from a material such as a metal or electrically conductive plastic. EX1006, 5:25-49.

C. Overview of Righter

59. AliveCor relies on Righter's disclosure of a "watch" that is "convenient and comfortable *for a user to wear*," to assert the obviousness of combining Righter with the devices disclosed in Markel. Pet., 86-87. Righter's watch includes a "pair of conductive electrodes 15b, 15c provided on opposing side surfaces of the casing 11, where they can be easily *contacted by the thumb and forefinger*, respectively, *of the user's right hand* (assuming the unit is being worn on the left wrist)." EX1007, 1:65-67, 2:65-3:2. Righter emphasizes the importance of the electrode-skin contact feature, and notes that:

[The] electrodes are made of a suitable conducting material, preferably silver or silver chloride, and to reduce undesirable *electrode-skin* artifact "noise" signals arising from contact variations, at least the side electrodes 15b, 15c ... are small enough in size *to be covered completely by the user's finger and/or thumb*, and have a curved, as opposed to flat, surface geometry.

EX1007, 5:7-15.



EX1007, FIGs. 1A (left) and 1B (right)

VII. GROUND 1 AND GROUND 2 EACH FAIL TO DEMONSTRATE THAT ALL ELEMENTS OF CLAIM 1 ARE DISCLOSED BY THE CITED REFERENCES

60. None of the prior art references, whether viewed alone or in the combinations proposed by AliveCor and Dr. Berger, disclose all elements of claim 1 of the '257 patent. Specifically,

- None of the references discloses a device in which a first pad “is embedded in a first portion of the enclosure” and “positioned *underneath* the exterior surface of the first portion [of the enclosure]” as required by claim 1.
- There is also no teaching or suggestion in any of the references that would have compelled a POSITA to modify the references to position the electrodes underneath an exterior surface of the enclosures of the devices of Markel and Nissilä.

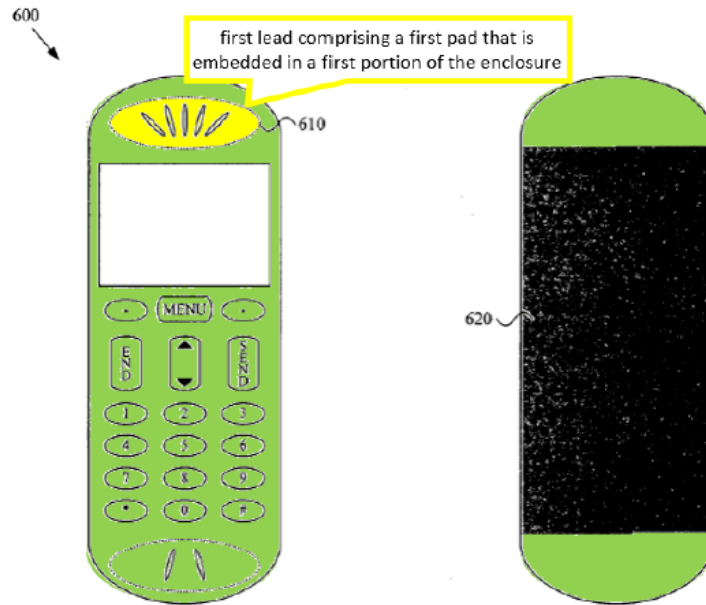
- There is also no teaching or suggestion in either Markel or Nissilä to position a second, interior electrode or pad under an exterior electrode.

I will begin my analysis of claim 1 by discussing how Markel fails to disclose or render obvious element [1.c.iii] followed by a discussion of how the proposed combination of Markel with Nissilä also fails to demonstrate that a POSITA would have located an electrode pad under an exterior surface of a heart monitoring device. I note that AliveCor and Dr. Berger do not make any arguments relevant to claim 1 based on Righter and therefore I do not address Righter in this section.

**A. Markel does not disclose or render obvious element [1.c.iii]
 (“wherein the first pad is positioned underneath the exterior
 surface of the first portion...”)**

61. Claim 1 recites that the heart sensor includes “a first pad” that is both “embedded in a first portion of the enclosure” and “positioned underneath the exterior surface of the first portion [of the enclosure].” In his declaration, Dr. Berger equates several different electrodes of various embodiments of Markel to the claimed “first pad.” For example, Dr. Berger identifies an electrode 610 of Figure 6 of Markel as an example of a “first pad.”

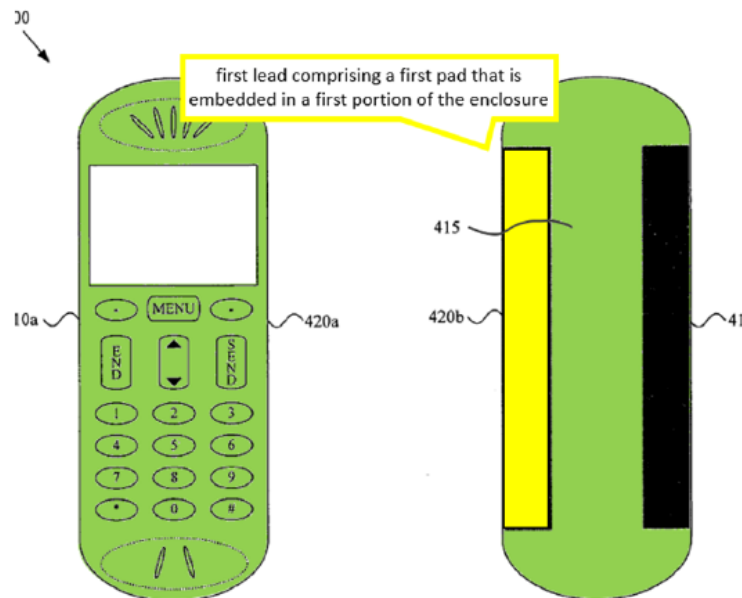
Ex-1005, Fig. 6 (annotated)



EX1003, ¶115 (annotating EX1005, FIG. 6).

62. Dr. Berger goes on to identify an electrode 420b of the embodiment of Figure 4 of Markel as allegedly disclosing another example of a “first pad” in Markel:

Ex-1005, Fig. 4 (annotated)



EX1003, ¶120 (annotating EX1005, FIG. 4).

63. However, each of these examples in Markel disclose electrodes that are placed on the exterior of the device, to “provide for user contact with both electrodes during the process of listening to the MCD 100.” EX1005, [0050]. For example, Markel describes the electrode of Figure 6 as “*disposed on* the audio output portion 610 (e.g., molded into the audio output portion 610 or positioned on the audio output portion 610).” *Id.* Markel similar describes the electrode at 420b as “*placed on* the right side portion 420 (e.g., placed on or molded into region 420 b).” *Id.*, [0045]. There is no disclosure of any additional electrodes or pads placed underneath these exterior electrodes of Markel’s device. In fact, Markel never describes an elements as “disposed in”, “disposed within”, “disposed

under”, “placed in”, “placed within” or “placed under”. Markel exclusively describes exterior features of the embodiment, and the appearance of those features is a key aspect of the invention of Markel – that these exterior electrodes may be concealed from the user by making them from conductive plastic materials that do not attract attention or appear to be electrodes.

64. In fact, every discussion in Markel regarding placement of the electrodes reveals that they are located on the external surface of the device to “provide for electrode contact with a user’s hand during use of the MCD 100,” “provide for electrode contact with an ear or cheek of a use,” or otherwise provide direct contact with the skin of the user. EX1005, [0043]-[0044]. In addition to the descriptions of Figures 4 and 6 which describe the electrodes as being positioned on the exterior surface of the device, Markel describes that “FIG. 2 provides non-limiting examples of [electrode] placement,” where the “electrodes may be *disposed on* a same pushbutton of the mobile communication device 100.” *Id.*, [0047]. In yet another example, Markel describes, “FIG. 5 provides a non-limiting example of [the] electrode placement,” where the electrodes are “*disposed on* a main body portion 110 of the MCD 100 and a pushbutton.” *Id.*, [0046].

65. Yet, contrary to this clear disclosure of Markel, Dr. Berger asserts that “a person of ordinary skill in the art would have been motivated to position the first pad of the ‘second electrode’ underneath the exterior surface of the electronic

device's 'audio output portion'" with no actual disclosure or suggestion in Markel to support such an assertion. EX1003, ¶138. To support this argument, Dr. Berger relies on language in Markel describing placement of electrodes on a main body portion, "...A first electrode may, for example, be placed on the left side 25 portion **410** (e.g., placed on or molded into region **410b**), and a second electrode may, for example, be placed on the right side portion **420** (e.g., placed on or molded into region **420b**).” In this description from Markel, Dr. Berger seizes on the “molded into” phrase to assert that the electrode is completely covered over by another outer layer, which could be insulating material or conductive plastic. To make this assertion, Dr. Berger asserts that a POSITA would understand that an ECG lead would include an upper layer that is insulating material or conductive plastic, and further that “molded into” necessarily means completely covered over. Neither of these assertions of this 2-step argument is supported by the language of Markel or any disclosure within the ‘257.

66. As discussed above, the requirement that any electrode or lead includes these additional layers and other details that are recited as limitations to the “first lead” term in the claims of the ‘257 patent reads out all of the limitations within the claims that add requirements for the position of the lead underneath an exterior surface of the first portion of the enclosure, and where the detection of the cardiac signal is via the user’s contact with the exterior surface of the first portion

of the enclosure. In reading out these limitations, AliveCor and Dr. Berger are substantially and incorrectly broadening the scope of these claims.

67. When addressing element [1.c.iii], Dr. Berger proposes to address this limitation based on two different claim constructions, one that he identifies as “incorrect” and one that he identifies as “the correct interpretation.” EX1003, ¶¶128, 134.

68. For all these reasons, Dr. Berger’s analysis fails under either interpretation.

1. Under Their First Interpretation, Dr. Berger and AliveCor Fail to Provide a Proper Mapping of Element [1.c.iii]

69. Under his first (admittedly incorrect) interpretation of element [1.c.iii], Dr. Berger asserts that a “surface of an exposed electrode pad [] is configured to detect the user’s cardiac signal via direct contact with the user’s skin” meets the claim language of this element. EX1003, ¶127; Pet., 16. Dr. Berger argues that “Markel discloses that its ‘second electrode’ may include an exposed electrode pad that is configured to detect the user’s cardiac signal via direct contact with the user’s skin,” and thus meets the claim limitation of element [1.c.iii] under the first interpretation of this element advanced by AliveCor and Dr. Berger. EX1003, ¶¶132-133; Pet., 17-19.

70. However, these assertions by AliveCor and its expert are premised on an admittedly incorrect claim interpretation and therefore irrelevant. As I discussed in Section IV, above, under the correct interpretation of elements [1.c.i]-[1.c.iii], the claim language should be given its plain and ordinary meaning and therefore requires that the first pad and the first portion of the enclosure are distinct components and the first pad is both “embedded in [the] first portion of the enclosure” and “positioned underneath the exterior surface of the first portion” of the enclosure. These claim elements cannot be satisfied by a single, external electrode that does not include another electrode or pad that is both positioned underneath and embedded in the external electrode or another external portion of the enclosure. Dr. Berger appears to agree because he identifies the alleged “Apple’s interpretation” of element [1.c.iii] as “incorrect.” EX1003, ¶128. Dr. Berger later identifies what he believes to be a “correct interpretation” for claim element [1.c.iii] that requires that “the first pad is positioned underneath the exterior surface of the first portion.” *Id.*, ¶134. Therefore, the fact that the arguments based on what Dr. Berger alleges is “Apple’s interpretation” are based on an incorrect claim construction render these arguments insufficient to demonstrate that Markel discloses element [1.c.iii].

71. Nevertheless, under this “incorrect” interpretation, Dr. Berger presents two mappings under this incorrect claim interpretation in an attempt to find “an exposed electrode pad” in Markel’s electrodes, through two mappings.

72. In a first mapping, Dr. Berger states that “Markel teaches that the ‘*second electrode* may be...*positioned on the audio output portion 610*’ of the electronic device” and that “[s]uch electrode placement may, for example, provide for *user contact*’ with the second electrode ‘during the process of listening’ to the electronic device.” EX1003, ¶129 (emphasis in original); Pet., 17.

73. In a second mapping, Dr. Berger states that “with respect to Markel’s Figure 4 configuration, the ‘*second electrode* may be...*placed on the right side portion 420*’ of the electronic device” and “[s]uch electrode placement allows the electrode to ‘*contact a user* during normal (or typical) use of the [electronic device].’” EX1003, ¶129 (emphasis in original); Pet., 18.

74. For each mapping, Dr. Berger argues that because “*Markel’s* electrodes also ‘may comprise a metallic surface exposed for user contact,’” Markel thus “discloses that its ‘second electrode’ may include an exposed electrode pad that is configured to detect the user’s cardiac signal via direct contact with the user’s skin.” EX1003, ¶132; Pet., 16, 19.

75. In both of its mappings, AliveCor and its expert improperly map two distinct features of claim 1—i.e., “first pad” and “exterior surface of the first

portion”—to the same component in Markel—i.e., to an “audio output portion 610” in the first mapping, or “the right side portion 420” in Markel in the second mapping. Pet., 17-19. By contrast, as I discussed above, the correct interpretation of claim 1 of the ’257 patent not only requires that the “first pad” and the “first portion of the enclosure” are two distinct components of the device but that they have a specific physical configuration with respect to each other such that the first pad is both “embedded in [the] first portion of the enclosure” and “positioned underneath the exterior surface of the first portion” of the enclosure. EX1001, 12:21-49. I was informed that mapping a single component in a prior art reference to two distinct components of a challenged claim is improper.

76. As such, for at least this reason, AliveCor and Dr. Berger fail to provide a proper mapping for the two distinct claimed features of the “enclosure” and the “first lead comprising a first pad” under the “incorrect” interpretation they have offered for element [1.c.iii]. Reassuringly, even Dr. Berger agrees that this mapping fails to meet the limitations of the claimed “enclosure” and “first pad”. On this point, it seems that we all agree.

2. Under Their Second Interpretation, Dr. Berger and AliveCor Fail to Demonstrate that Markel Discloses or Suggests “wherein [a] first pad is positioned underneath [an] exterior surface of [a] first portion” of the enclosure as Required by Element [1.c.iii].

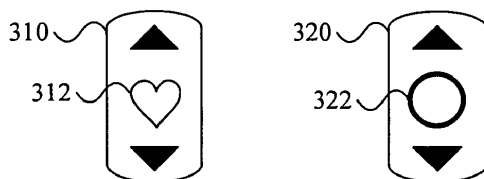
77. After presenting his analysis under the “incorrect” interpretation of element [1.c.iii], Dr. Berger presents different arguments under what he identifies as “the correct interpretation of claim element [1.c.iii]”. EX1003, ¶134. Under this second, correct interpretation, Dr. Berger describes that the claim limitation of element [1.c.iii] requires that the “the first pad is positioned underneath the exterior surface of the first portion, and the first pad is configured to detect a first electrical signal of the user’s cardiac signal via the user’s skin’s contact with the exterior surface of the first portion of the enclosure” *Id.*; Pet., 21. As Dr. Berger is quoting from the claim language here, this is correct.

78. Under this second, literal interpretation of claim element [1.c.iii], AliveCor and its expert, Dr. Berger, claim that based on Markel’s teachings, “[a] POSITA would thus have been motivated to place the pad of the ‘second electrode’ *underneath* the conductive plastic of the ‘audio output portion’” because “[t]his would have ‘substantially concealed (or hidden)’ the electrode pad from the user[.]” Pet., 20; EX1003, ¶135. AliveCor and Dr. Berger are simply wrong in asserting that the Markel discloses or suggests placing an electrode pad *underneath* an enclosure of a device for multiple reasons, as explained below.

79. To be clear, Markel neither discloses placing an electrode underneath a conductive plastic layer, nor suggests hiding an electrode *underneath* the conductive plastic. Instead, Markel *consistently and exclusively* discloses the use of such conductive plastic to make/form its electrodes, yielding conductive plastic electrode structures that are said by Markel to visually conceal the electrodes contained within them when the “user need not be aware of the presence of the electrode.” Ex. 1005, [0040]. In effect, Markel is disguising the electrode by making it appear to be a part of the plastic enclosure, and uses conductive plastic in this structure to provide the function of an electrode while maintaining the appearance of an ordinary part of the housing. Simply, Markel is hiding the electrode in plain sight.

80. In more detail, Markel discloses two scenarios: one where the electrodes are identifiable by the user, and the other where the electrodes are “concealed from the user.” EX1005, [0039]. Markel provides examples to show what it means by identifiable versus concealed electrodes. For identifiable electrodes, “an electrode may comprise *a visible or tactile indicium* to indicate the location of the electrode to a user.” *Id.* That is, Markel discloses that electrodes positioned on the exterior of the device are made more identifiable by adding visual or tactile indicium to the electrodes such that they stand out from the rest of the enclosure. Figure 3 (reproduced below) demonstrates one such example in

which “the first pushbutton 310 comprises a heart-shaped indium 312 (or other visible characteristic)” and “the second pushbutton 320 comprises a circular projection (or other tactile characteristic) to notify a user of “the location of the electrode.” *Id.*



EX1005, FIG. 3.

81. Markel then goes on to explain that for *concealed* electrodes, “an electrode (or all electrodes) or other sensor may be substantially concealed (or hidden) from a user” by having the electrode made of “*molded conductive plastic with little or no visible indication of the electrode presence.*” *Id.*, [0040]. In other words, Markel uses a “molded conductive plastic” to *make or form* its electrode in order to “conceal (or hide)” it from being identifiable from the rest of the device enclosure. Markel is specific in describing the intent to provide an electrode “...with little or no *visible* indication of the electrode presence.” EX1005, [0040]. Throughout Markel, concealing or hiding an electrode is accomplished through disguise – by use of conductive plastic as an electrode material which provides little or no visual indication of the electrode presence. Nowhere does Markel suggest positioning of an intermediate layer that would interrupt visual observation

of the electrode. Nor does Markel disclose or suggest positioning a second electrode or pad underneath the exterior, conductive plastic electrode. Instead, Markel proposes a surface electrode that doesn't look like an electrode. Again, Markel teaches hiding the electrode in plain sight, not hiding it out of view under other material layers.

82. Throughout its disclosure, Markel reaffirms this disclosure indicating that the conductive plastic is used to form electrodes *on the exterior* of the device without any discussion of positioning a second electrode or pad underneath the exterior surface. For example, Markel discloses forming an electrode from “conductive plastic,” and molding the conductive plastic into the corresponding portion of the device throughout. *See, e.g.*, EX1005, [0037] (“an electrode may be formed from a conductive plastic”); *id.*, [0045] (disclosing that first and second electrodes are placed on, e.g., molded into, regions 410b and 420b of the main body, where those regions, too, are made of conductive plastic and are separated by an insulating region 415); *id.*, [0047] (disclosing multiple exemplary pushbuttons that can be made of conductive plastic to form an electrode). In other words, the concealed electrode in Markel *is*—i.e., “*made of*” or “*formed from*”—the conductive plastic, not underneath a conductive plastic layer.

83. Indeed, there is no disclosure in Markel to suggest any other form of concealing the electrode beyond making the electrode from conductive plastics so

that there is little or no visible indication of the electrode; and certainly, nothing in Markel describes positioning the electrode underneath another layer to hide the electrode. A POSITA reading the disclosure of Markel in full context, would have understood that the concealment is achieved by the use of electrodes made from “molded conductive plastic with little or no visible indication.” EX1005, [0040]. A POSITA would have found nothing in cited portions of Markel to inform or encourage placement of an electrode underneath an exterior layer of a device. Simply, the electrodes in Markel are hidden in plain sight.

84. Dr. Berger does not provide any clear reason as to why a POSITA would have found Markel’s method of concealment to be deficient in making the electrodes unidentifiable, nor why a POSITA would be further motivated to hide the electrodes underneath the exterior portion of the device. Instead, AliveCor improperly modifies Markel’s device and then relies on Dr. Berger’s unsupported declaration to conclude in hindsight that hiding the electrode underneath a plastic conductive layer is a form of concealment taught by Markel. EX1003, ¶¶122, 135-139.

85. To be clear, as I discussed above, all three electrodes described by Markel that AliveCor and its expert identify as allegedly mapping to the claimed “first pad” are exterior electrodes that do not include a second electrode or pad positioned underneath. For example, Markel describes the electrode of Figure 6 as

“***disposed on*** the audio output portion 610 (e.g., molded into the audio output portion 610 or positioned on the audio output portion 610).” *Id.* Markel describes that this electrode is positioned to “provide for ***user contact with*** [the] electrodes during the process of listening to the MCD 100.” EX1005, [0050]. In a similar configuration, Markel states that “an electrode (or other sensor) may be placed on (or proximate to) an audio output portion 142 (e.g., a speaker) of the MCD 100. Such a placement may, for example, ***provide for electrode contact with an ear or cheek of a user*** of the MCD 100.” *Id.*, [0044].

86. Markel similarly describes the electrode at 420b as “***placed on*** the right side portion 420 (e.g., placed on or molded into region 420 *b*).” *Id.*, [0045]. This electrode is placed “***on*** a main body portion 110 of the MCD 100” to “provide for ***electrode contact with a user's hand*** during use of the MCD 100.” EX1005, [0043]-[0045].

87. The configuration disclosed by Figure 10 of Markel (also relied upon by AliveCor and its expert) similarly clearly demonstrates that the “second electrode 1022” is positioned on, and extending from, the exterior of the device:

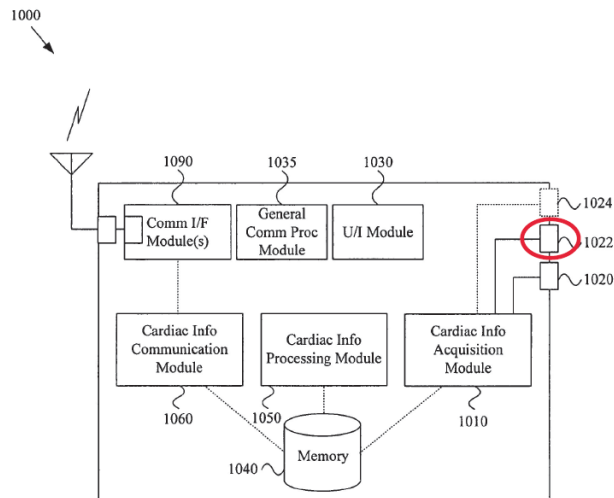


Figure 10

EX1006, FIG. 10 (annotated)

There is no disclosure of any additional electrodes or pads placed underneath these exterior electrodes shown in Figures 4, 6, and 10 of Markel’s device (or any other embodiment of Markel).

88. Nowhere does Markel disclose or suggest that its method of concealment involves placing an electrode pad *underneath* an enclosure of a device, as alleged by AliveCor (Pet., 20) because Markel’s invention is instead directed to *exposing* its electrodes to *provide for the user contact with the electrodes*. In fact, every discussion in Markel regarding placement of the electrodes reveals that they are located on the external surface of the device to “provide for electrode contact with a user's hand during use of the MCD 100,” “provide for electrode contact with an ear or cheek of a use,” or otherwise provide direct contact with the skin of the user. EX1005, [0043]-[0044]. In addition to the

descriptions of Figures 4, 6, and 10 which describe the electrodes as being positioned on the exterior surface of the device, Markel describes that “FIG. 2 provides non-limiting examples of [electrode] placement,” where the “electrodes may be ***disposed on*** a same pushbutton of the mobile communication device 100.” *Id.*, [0047]. In yet another example, Markel describes, “FIG. 5 provides a non-limiting example of [the] electrode placement,” where the electrodes are “***disposed on*** a main body portion 110 of the MCD 100 and a pushbutton.” *Id.*, [0046].

89. I note that during his deposition, Dr. Berger did not identify actual disclosures of Markel that describe positioning an electrode under the surface of the enclosure, but rather based his assessment of the capabilities of Markel’s device on an unsupported assertion that a conductive plastic electrode alone would be insufficient for the purposes of detecting the cardiac signal of a patient. APPLE-2013, 33:4-9, 30:18-22, 34:21-35:7, 35:15-18; 101:11-22, 108:21-109:3, 111:22-112:7. This assertion is both incorrect and not supported by any evidence that Dr. Berger has put forward. Additionally, even if this assertion were true, it would not inherently be the case that this would require a pad positioned that is both embedded in a first portion of the enclosure ***and*** positioned underneath the exterior surface of the first portion of the enclosure as required by claim 1.

90. More specifically, Dr. Berger stated that his belief that a POSITA would have configured Markel’s device to include a second electrode/pad

positioned underneath each exterior electrode of Markel's device is not rooted in the disclosures of Markel but rather based on his unsupported belief that in Markel's embodiments in which the electrodes are "molded from conductive plastic...it would be necessary to have something more conductive that makes contact with that molded plastic." APPLE-2013, 18:10-18, 28:3-18 (insisting that "a conductive plastic surface alone, would be inadequate" without identifying support for this assertion in the record). Dr. Berger's repeated assertions Markel would require such a dual-layered electrode because "that plastic alone, without the user of more conductive material making contact with that plastic, would not serve adequately and would require more conductive materials to make that electrical integrity work" are simply untrue and not supported by the evidence present in this proceeding. APPLE-2013, 33:4-9, 30:18-22, 34:21-35:7, 35:15-18 (insisting that "a POSITA would understand that anything less conductive than metal is going to require combining a metal in the full form of the electrode" without identifying any support for this assertion in the record), 101:11-22, 108:21-109:3, 111:22-112:7. In fact, Markel itself, and other references cited by Dr. Berger, contradicts this assertion of Dr. Berger. Markel expressly states that "*various conductive plastics* (e.g., graphite-impregnated plastic or the like) may *provide sufficient conductivity for an electrode to perform adequately*" with no discussion of an additional metal layer positioned underneath the conductive

plastic being required. EX1005, [0037]. Markel therefore leaves no doubt that the electrodes can be formed entirely of conductive plastic and yet still “perform adequately.” Nissilä provides a similar disclosure that such conductive plastics would have been fully sufficient for the task of detecting heart signals, disclosing that an electrode formed of “electrically conductive plastic” alone is sufficient to detect a user’s heart signal. EX1006, 5:33-37.

91. In fact, AliveCor’s improper modification of Markel’s device (which is necessary to arrive at the claimed invention) by interjecting an intermediate layer between the electrodes and the exterior of the device is a concept that is never once mentioned in Markel’s entire disclosure. Indeed, nowhere in Markel is there a suggestion on an alternative embodiment where the electrode would be hidden ***underneath*** an exterior portion of the device. It would have been understood by a POSITA reading Markel’s disclosure, as a whole, that Markel does not teach a method of concealing an electrode by placing the electrode “underneath the exterior surface of” a first portion of the enclosure, as alleged by AliveCor. *See* Pet., 20; EX1003, ¶¶135-139.

92. Markel uses the same strategy for its electrode placement on the device’s exterior throughout its disclosure. Markel starts with providing an “exemplary mobile communication device 100 (‘MCD’).” EX1005, [0033]-

[0034]. The electrodes in MCD 100 are “***disposed on*** any, any combination of, or all of” the example external device components of MCD 100. *Id.*, [0042].

93. Even for devices that Markel discloses beyond MCD 100, Markel suggests disposing or placing the electrode ***on*** an exterior surface of the device. *See e.g., id.*, [0057] (“one or more cardiac sensors (e.g., electrodes) may be ***disposed on*** a steering wheel, shifting lever or other commonly contacted automobile component.”) *id.*, (“In such an exemplary configuration, each of the left and right hands may ***advantageously contact respective cardiac sensors*** for extended periods of time and also during stressful situations.”); *id.*, [0076] (disclosing that in FIG. 13, “keyboard 1300 may, for example, comprise one or more cardiac sensors 1310 (e.g. electrodes and/or acoustic sensors) ***on a main body portion.***”); *id.*, [0077] (disclosing that in FIG. 14, “an electrode 1410 ***on a central main*** body portion of the mouse 1400.”). From this, it is apparent that concealment is used by Markel to impact the perception of a surface-positioned electrode, which belies movement of electrodes into a position that is underneath of another structure, as claimed. Indeed, contrary to the assertions of both AliveCor and Dr. Berger, nothing in Markel suggests placing an electrode “underneath” another layer. The arguments made by AliveCor and Dr. Berger with respect to element [1.c.iii] under what they identify as the “correct interpretation” appear to be based on hindsight due to Markel’s lack of any

disclosure or suggestion to place an electrode underneath the enclosure of Markel's device.

94. For at least the reasons provided above, AliveCor fails to demonstrate that Markel renders obvious all of the limitations of claim 1.

3. *Dr. Berger and AliveCor Fail to Demonstrate that the First Pad would be Embedded In the First Portion of the Enclosure Under Their Proposed Modification to Markel.*

95. As I discussed in the claim construction section, above, the proper scope of the plain and ordinary meaning of the term “embedded in” is “at least partially set in or partially surrounded by a material.” As discussed above in the claim construction section, the specification of the '257 patent draws a clear distinction between leads that are “embedded in” a housing and leads that are embedded “adjacent to the housing.” EX1001, 10:24-29, 9:44-48 (differentiating between a lead that is “positioned against” an inside surface of the housing and a lead that is embedded “within the thickness of” the housing.) Furthermore, the claim 1 requires more than that the first pad be merely embedded in the device as a whole, but rather that the first pad is specifically “embedded in a ***first portion*** of the enclosure” and that “the first pad is configured to detect a first electrical signal of the user's cardiac signal ***via the user's skin's contact with the exterior surface of the first portion of the enclosure.***”

96. Neither AliveCor nor Dr. Berger makes any attempt to describe how their proposed additional electrode or pad positioned underneath a conductive plastic surface in their proposed modification to Markel satisfies all requirements for the “first pad” of claim 1 under the proper definition of “embedded in.” Specifically, AliveCor and Dr. Berger do not describe any configuration for the electrode positioned underneath the exterior surface of the enclosure in their proposed (and unsupported) modification to Markel. Therefore, neither the Petition nor Dr. Berger’s declaration demonstrates that the electrode positioned underneath the exterior of the enclosure is “embedded in” a first portion of the enclosure rather than having a different relationship with respect to the first portion of the enclosure. Because AliveCor has proposed no configuration of the inner and outer electrodes in its proposed (and entirely unsupported) two-electrode configuration for Markel, the Petition fails to demonstrate that the first pad is “embedded in” a first portion of the enclosure which the user contacts to detect the user’s cardiac signal, rather than the two portions of the two-electrode configuration being merely in parallel contact with no portion of the outer electrode at least partially surrounding the lower electrode.

97. Dr. Berger’s declaration and deposition testimony does not correct for this deficiency in the Petition. In his deposition testimony, he explains that a POSITA would understand that any electrode used for ECG that includes

conductive plastic would necessarily include an upper layer of insulating material or conductive plastic, and an additional layer of material with much higher electrical conductivity that captures the ECG signal. *See e.g.*, APPLE-33:4-9, 30:18-22, 34:21-35:7, 35:15-18, 101:11-22, 108:21-109:3. Further, Dr. Berger appears to assert that a POSITA would understand that an electrode consists of these two elements (an upper layer of insulating material or conductive plastic, and an additional layer of material with much higher electrical conductivity) for any ECG electrode, even for instances where the electrode is explicitly described as being “placed on a main body portion”, and where there is no explicit disclosure of an upper layer of insulating material or conductive plastic. *Id.*, 101:14-22, 35:15-18, 98:20-99:2

98. Further, Dr. Berger asserts that an “electrode” and a “lead” are the same in the context of the ‘257 and in the general context of ECG, and that a POSITA would understand that an ECG lead would necessarily include an upper layer of insulating material or conductive plastic, and an additional layer of material with much higher electrical conductivity that captures the ECG signal. APPLE-33:4-9, 30:18-22, 34:21-35:7, 35:15-18, 101:11-22, 108:21-109:3.

99. Nowhere does Dr. Berger describe the arrangement of the elements he imagines a POSITA would be inspired to construct, and therefore fails to directly map any such features to the required claim elements for the pad – that it be

positioned under an exterior surface of a first portion of the enclosure, or that the cardiac signals would be detected via the user's contact with the exterior surface of a first portion of the enclosure.

100. Furthermore, as discussed above, this assertion by Dr. Berger is problematic as this understanding of a "lead" improperly reads out all of the language in the claim that adds further limitations to the "first lead" term.

101. Therefore, for all these reasons, AliveCor fails to demonstrate that Markel renders obvious claim 1 and its respective dependent claims.

B. Markel in view of Nissilä does not disclose or render obvious element [1.c.iii] ("wherein the first pad is positioned underneath the exterior surface of the first portion...")

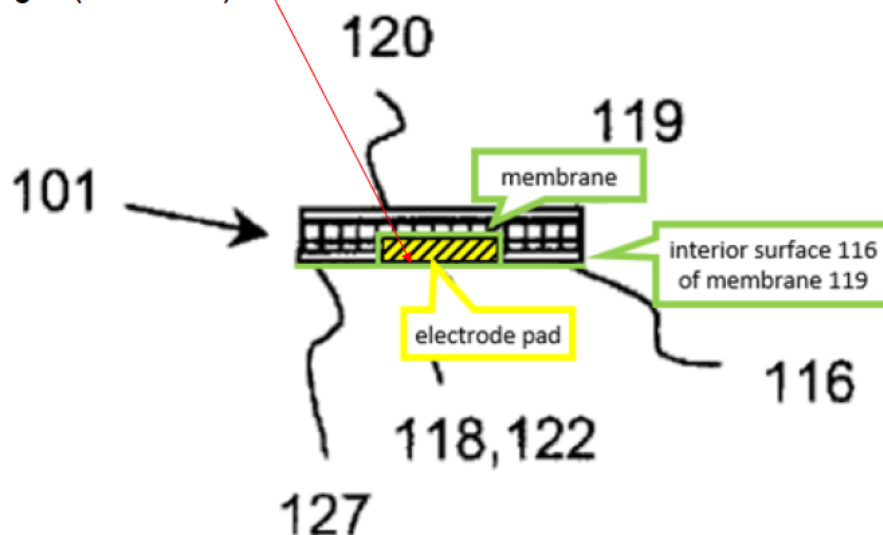
102. AliveCor fails to demonstrate that Markel in view of Nissilä renders obvious independent claim 1 of the '257 Patent and its respective independent claims. AliveCor's combination analysis is critically flawed because AliveCor's arguments are based on an incorrect reading of Nissilä that requires insertion of additional layers into the device of Nissilä that are simply not disclosed or depicted anywhere by Nissilä. Specifically, there is no disclosure anywhere in Nissilä of a pad or electrode positioned *underneath* the exterior surface of a first portion of the enclosure of Nissilä's device.

103. All of AliveCor and Dr. Berger's regarding the combination of Markel with Nissilä are based on an altered version of Figure 5 of Nissilä in which

Dr. Berger has drawn an additional green “membrane” layer that is positioned between the electrode of Nissilä’s device (identified as an “electrode pad” by Dr. Berger) and the exterior surface of Nissilä’s device that contacts the user’s skin. Dr. Berger’s added layer creates a new structure in place of a line in Nissila’s drawing that is simply representing the surface of the electrode, and not any additional structure.

No support in Nissilä for this additional green layer drawn by AliveCor between electrode 118, 122 and the wearer’s skin

Ex. 1006, Fig. 5 (annotated)



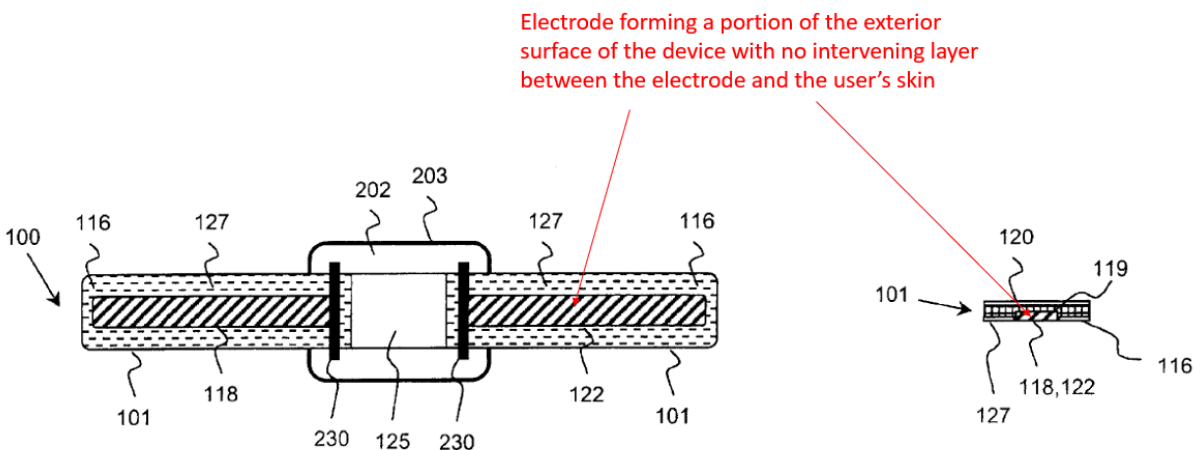
EX1003, ¶358 (Dr. Berger’s altered version of FIG. 5 of Nissilä in which Dr. Berger has drawn an extra layer)
(I have added additional annotation in Red)

104. Dr. Berger stated during his deposition that his opinions regarding this green “membrane” that he has added to Figure 5 were based on a belief that the term “membrane” must refer to a “material that covers something.” *Id.*, 145:13-18. However, this understanding is narrower than the plain and ordinary meaning of this term, which simply refers to “[a]ny thin sheet or layer.” APPLE-2014; APPLE-2015. As I previously discussed, and address in further detail below, there is no support in Nissilä that there is a separate membrane distinct from and encasing the electrodes 118 and 122.

105. Furthermore, this additional green layer is depicted nowhere in Nissilä and is also not supported by the specification. The earlier Finnish disclosure from which this specification and figures are drawn provides an even clearer figure indicating the absence of any intervening layer. This layer introduced by Dr. Berger is a pure fabrication. As I discussed in paragraphs 55-58 and 103, above, there is no teaching in Nissilä of an additional conductive “membrane” layer positioned between the electrode and the exterior surface of the device. Rather, what Nissilä **actually** discloses is that in the embodiment of Figure 5, the electrode pads are formed **from** a conductive membrane 119. EX1006, 33-49. Nissilä is clear that the electrodes 118, 122 **are** the membrane 119, the electrodes are never described as being “embedded in” or “enclosed by” a separate membrane as Dr.

Berger asserts. *Id.*; EX1003, ¶358. In fact, the words “embedded” and “enclosed” appear nowhere in Nissilä.

106. Rather, what is actually taught by Nissilä is that each of the electrodes 118 and 122 is positioned on the exterior of the device for contact with the user’s skin. This actual configuration of Nissilä’s device is clearly shown in the unaltered illustration below. Nissilä actually discloses “...the adhesive attaches the electrode structure on the skin of the person’s chest”, and “the inner surface of the electrode structure is an adhesive surface”, which clearly indicates that the adhesive is not a portion of an enclosure or a housing or any other structure that a POSITA would understand to be part of the external structure of the disclosed device.



EX1006, FIGs. 4-5 (annotated)

107. As I previously discussed, Nissilä describes two different implementations for the electrodes 118 and 122, one in which the electrodes are formed of a conductive adhesive affixed to the band on each side and one in which

the electrodes are a flexible, conductive membrane. Nissilä does not describe an intervening layer of the enclosure of the device between the electrodes and the user's skin in either implementation. In describing the first embodiment, Nissilä describes that “the electrodes located at the ends of the band-like component of the electrode structure are made of electrically conductive adhesive.” EX1006, 3:18-23; 5:25-31. Figure 7 shows this embodiment in which the electrodes are made of electrically conductive adhesive:

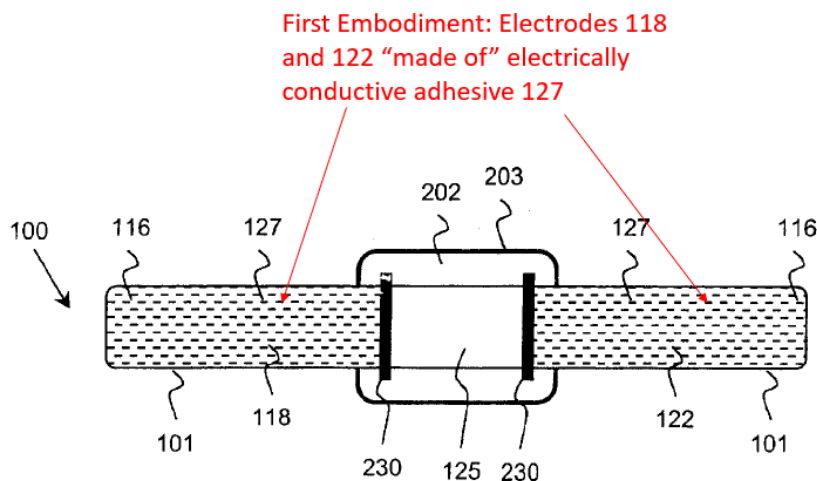
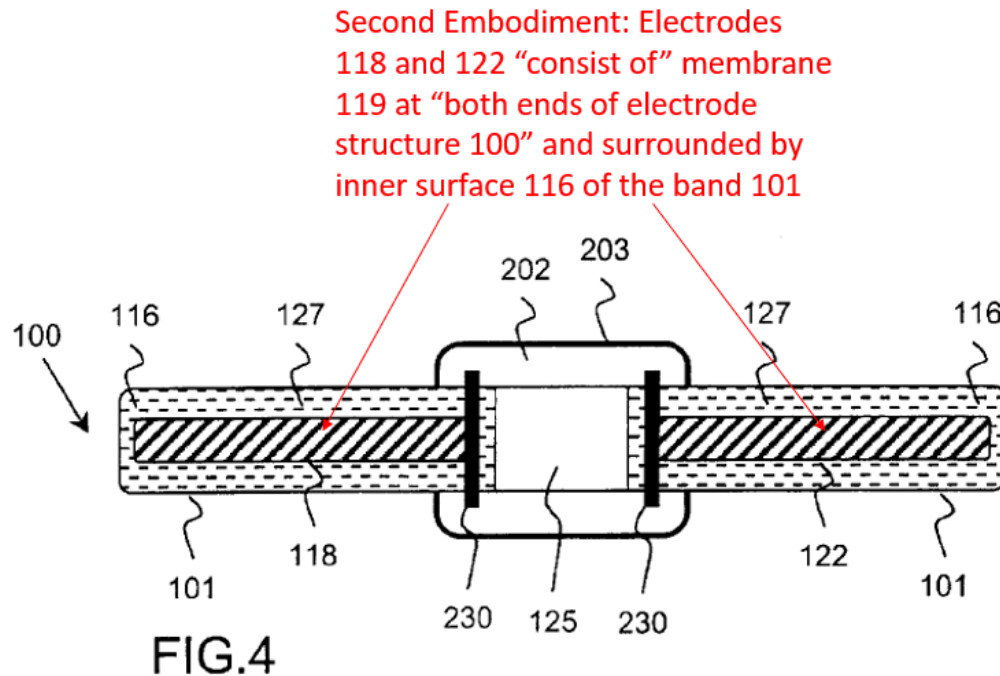


FIG.7

EX1006, FIG. 7 (annotated).

108. Nissilä goes on to describe that in the “second embodiment, as in FIGS. 3 to 6, the electrodes 118, 122 of electrode structure 100 *consist of* a membrane 119 that is located at both ends of the electrode structure 100, at the electrode 118, 122, and is made of metal, electrically conductive plastic or a similar conductive material.” EX1006, 5:33-38.



EX1006, FIG. 4 (annotated)

109. Nissilä provides additional details for this second embodiment, including two possible configurations for how the adhesive 127 is used to affix the device to the user’s skin. In one configuration, Nissilä describes that “on the inner surface 116 of the membrane 119 which is against the person’s skin there can be an electrically conductive adhesive 127. The adhesive 127 is preferably a conductive glue, such as conductive Solgel or a conductive silicone glue.” EX1006, 5:40-46. A POSITA would have recognized that in this configuration, the adhesive 127 is not a portion of the enclosure of the device but rather is an adhesive placed onto the surface of the membrane/electrode. In the second configuration, Nissilä describes that “[i]f the electrode 118, 122 is narrower than the band-like component 101, it is possible to use a non-conductive adhesive 127 on outer edges

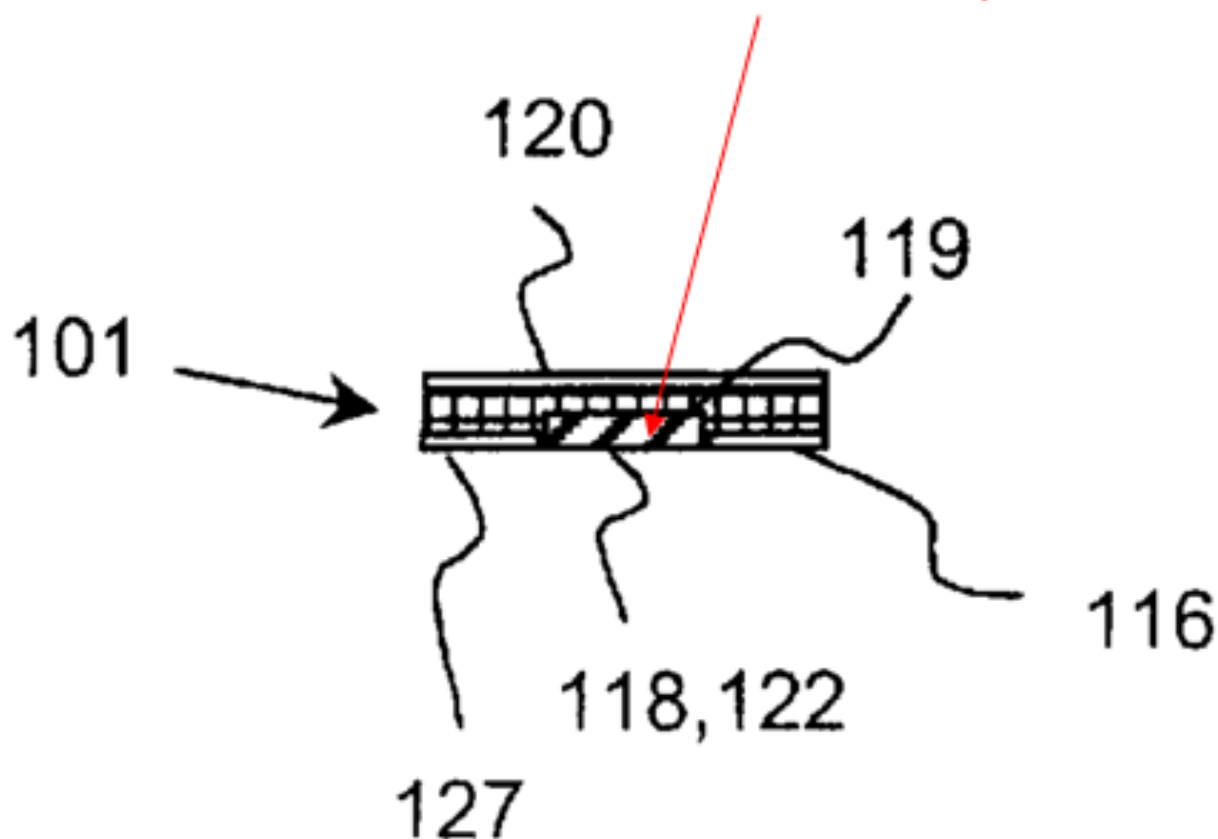
of the band 101, on the inner surfaces thereof, outside the electrodes 118, 122.” *Id.*, 5:46-49. Thus, in both configurations, there is no portion of the enclosure of the device positioned between the membrane/electrode and the user’s skin. I will now describe Nissilä’s disclosure’s in greater detail to demonstrate that there is no disclosure in Nissilä of positioning the electrodes underneath any portion of the exterior surface of the enclosure. Rather, Nissilä discloses electrodes positioned on the exterior of its respective device positioned to contact the wearer’s skin

1. Nissilä’s Electrodes 118 and 122 are Formed From the Membrane 119.

110. The arguments of AliveCor and Dr. Berger are based on a incorrect assertion, which is at least partially based on an altered illustration, that Nissilä “teaches a cross-sectional view of an “improved electrode structure” having a pad that is positioned underneath the exterior surface of an enclosure.” EX1003, ¶357. Dr. Berger goes on to assert (without any support from Nissilä) that the “electrode pad is embedded in and enclosed by ‘membrane 119.’ Thus, the electrode pad is *underneath* the ‘membrane 119,’ which includes an ‘exterior surface of the enclosure’ and ‘exterior surface of the first portion’ as recited in claim element [1.c.ii].” EX1003, ¶358. However, as I discussed above, Nissilä includes no such disclosure of a membrane 119 that is distinct from the electrodes 118, 122 that encloses the electrodes. Indeed, the unaltered cross-section of Figure 5 of Nissilä clearly shows that there is no “exterior surface” layer of the enclosure positioned

between the electrode 118, 122 and the exterior surface that contacts the user's skin:

Unaltered FIG. 5 of Nissilä (electrode 118, 122 on exterior of device with no intervening layer between the electrode and the user's skin)



EX1006, FIG. 5 (annotated)

111. The original illustration from the Finnish patent makes this even more clear (see above). In contrast to Dr. Berger's assertions that Nissilä discloses a membrane 119 that is distinct from and encloses the electrodes 118 and 122, what

Nissilä *actually* discloses is that, in the embodiment of Figures 3-6, the electrodes *are* a membrane 119 made from a flexible metal or conductive plastic. EX1006, 5:32-40.

112. Only two paragraphs in Nissilä's specification discuss a membrane. The first discussion of a "membrane" appears in a paragraph of the Summary section in column 3. EX1006, 3:24-40. The second and final discussion of a "membrane" appears in a paragraph of the Detailed Description in column 5. EX1006, 5:33-49. Both portions of Nissilä disclose that the membrane *is* the material that makes up the electrodes, not a separate material that encloses the electrodes.

113. Turning first to the discussion of column 3, Nissilä states that "*the first electrode and the second electrode* of the electrode structure *consist of an electrically conductive membrane.*" EX1006, 3:24-27; 3:32-37. Column 5 includes a similar disclosure while describing the embodiments of Figures 3-6, stating that "*the electrodes 118, 122* of the electrode structure 100 *consist of a membrane 119* that is located at both ends of the electrode structure 100, at the electrode 118, 122, and is made of metal, electrically conductive plastic or a similar conductive material." *Id.*, 5:32-38. A POSITA would have recognized that these disclosures in Nissilä mean exactly what they say, the electrodes 118, 122 positioned on either end of Nissilä device "*consist of*" or are made of an

electrically conductive membrane. There is no discussion in Nissilä that contradicts this clear disclosure of electrodes made from the electrically conductive membrane or otherwise describe the membrane as a separate component distinct from the electrodes themselves. Dr. Berger does not address this “consist of” language in Nissilä nor discuss how these limited disclosures of Nissilä, which clearly state that the electrodes 118 and 122 “consist of” the membrane 119 could somehow be interpreted such that the membrane is actually distinct from the electrodes 118 and 122. Instead of addressing the clear “consist of” language used in Nissilä’s specification, Dr. Berger uses terms such as “embedded in” and “enclosed by” that appear nowhere in Nissilä and are not supported by the actual disclosures of Nissilä. EX1003, ¶358. Furthermore, Dr. Berger admitted during his deposition that he was “not sure” of a difference between the terms “comprising” and “consisting of” and that “I think they’re very similar.” APPLE-2013, 54:9-21, 139:18-140:7. This further indicates that his understanding of Nissilä is based on a misunderstanding of its actual disclosure.

114. A POSITA would have recognized that the term “consist of” describes what a particular component or substance is “made of.” For example, a description that a particular adhesive “consists of” an epoxy resin would indicate that the adhesive *is* an epoxy resin. As another example, a description that a display screen “consists of” a touch screen display would indicate to the POSITA that the display

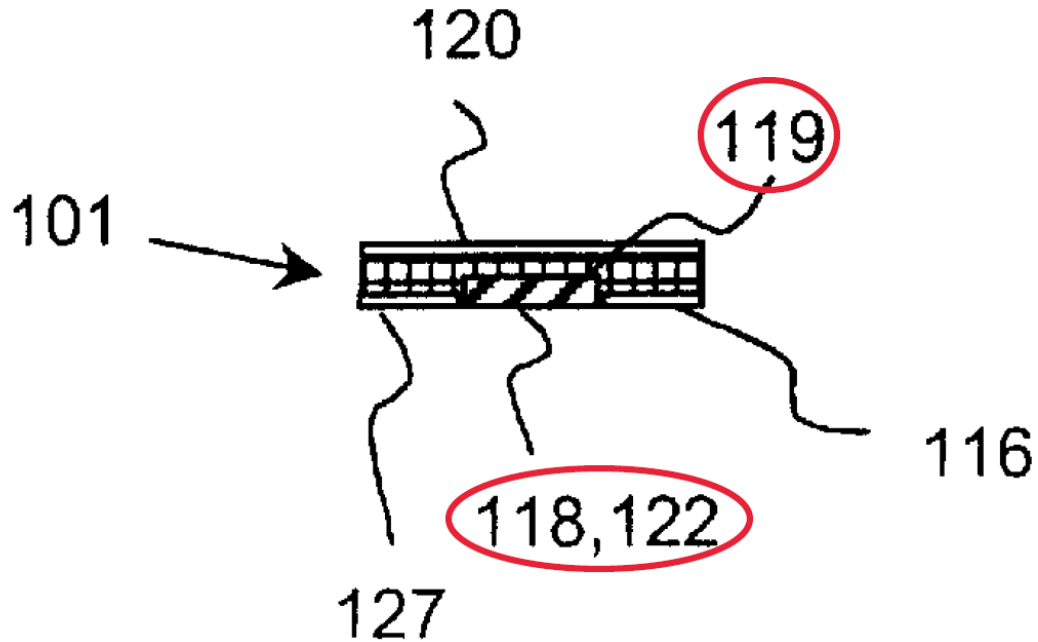
screen *is* a touch screen display. Similarly, here, Nissilä's description that "the electrodes 118, 122 of the electrode structure 100 consist of a membrane 119" clearly indicates to a POSITA that each of the electrodes 118 and 122 *is* a membrane 119.

115. This is made even more clear by the fact that the membrane 119 is the *only* material that Nissilä describes the electrodes 118 and 122 as "consist[ing] of" and then provides examples of specific materials that can be used for the membrane that the electrodes 118 and 122 are made from. EX1006, 5:33-49. Specifically, Nissilä describes that "the electrodes 118, 122 of the electrode structure 100 *consist of* a membrane 119" and that the membrane "is made of metal, electrically conductive plastic or a similar conductive material." The fact that Nissilä does not identify any other components or materials that the electrodes "consist of" other than the membrane 119 would have indicated to a POSITA that the electrodes 118 and 122 are each formed of a membrane 119.

116. This proper interpretation of Nissilä, that the electrodes 118 and 122 are *made of* a membrane 119 that can be "metal, electrically conductive plastic or a similar conductive material" is further indicated by the fact that Nissilä expressly identifies the materials used to form the other portions of Nissilä's device. EX1006, 5:3-49. For example, Nissilä expressly describes the materials used to make the band 101, stating that "the band 101 can be of plastic, textile fibre, a

combination thereof or the like.” EX1006, 5:20-25. Similarly, Nissilä expressly describes that “[t]he adhesive 127 is preferably a conductive glue, such as conductive Solgel or a conductive Silicone glue.” *Id.*, 5:44-45. In this context, a POSITA would have recognized that Nissilä’s discussion that “the electrodes 118, 122 of the electrode structure 100 ***consist of*** a membrane 119 that is located at both ends of the electrode structure 100, at the electrode 118, 122, and is ***made of metal, electrically conductive plastic or a similar conductive material***” is simply a description of the material used to manufacture the electrodes (metal or electrically conductive plastic), similar to Nissilä’s descriptions of the materials for the band 101 and adhesive 127. EX006, 5:33-38.

117. As I previously discussed, the Figures of Nissilä also support the correct interpretation that each of the electrodes 118 and 122 ***is*** a membrane 119. Figure 5 is the only figure in Nissilä that includes reference numeral 119, which Nissilä uses to identify the “membrane 119.” EX1006, 33-49. As shown in FIG. 5, the reference numerals 119, 118, and 122 are all pointing to the same structure, the electrode positioned on the user facing exterior surface of the band of Nissilä’s device..



EX1006, FIG. 5 (annotated)

118. Figure 5 clearly shows that reference numeral 119 is pointing to the electrodes 118, 122, indicating that, as described in the specification, the electrodes 118, 122 “consist of” the membrane 119. This is shown even more clearly in the Finnish patent on which Nissilä is based:

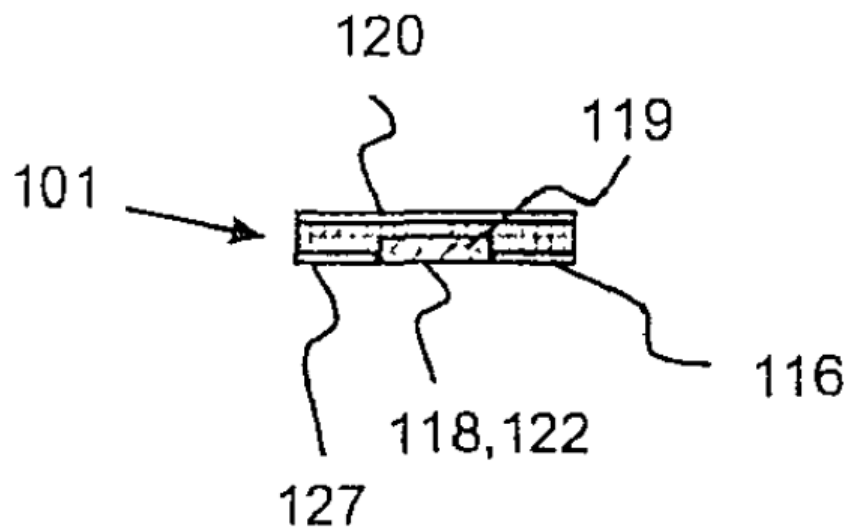


FIG.5

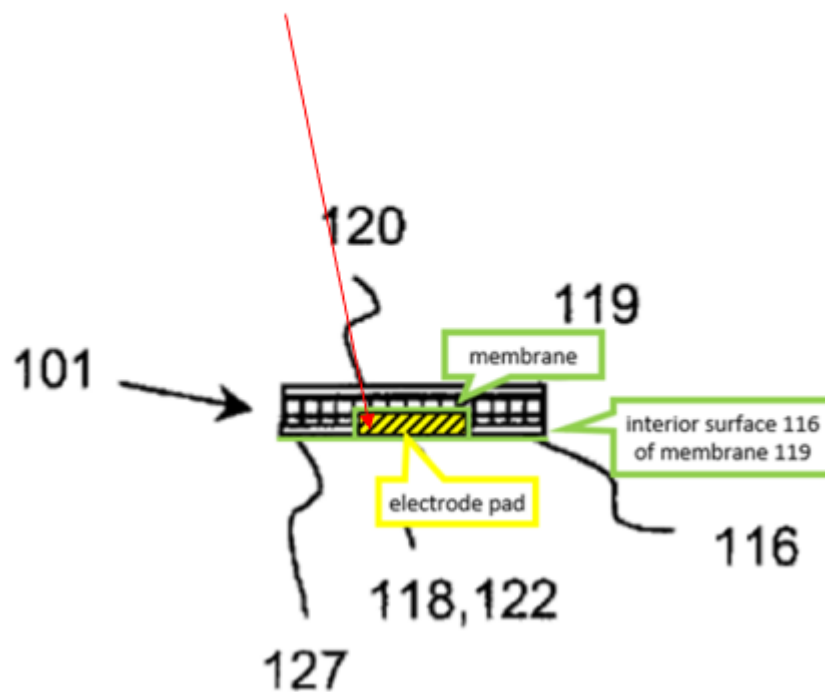
APPLE-2006, FIG. 5.

119. Once again, as with the specification, the Figures of Nissilä (and the Finnish patent application to which it claims priority) demonstrate that the electrodes 118 and 122 are made of or formed of an electrically conductive membrane, not enclosed by a separate membrane.

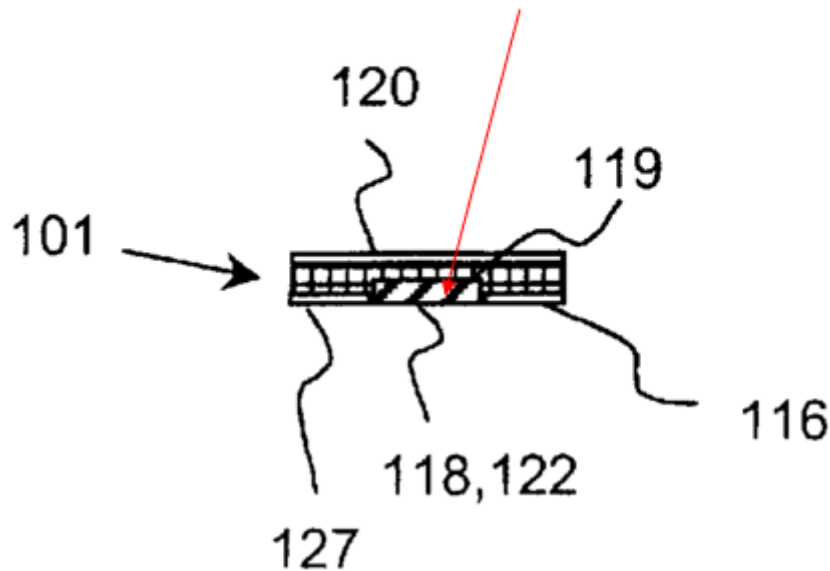
120. The English translation of the Finnish patent to which Nissilä claims priority (APPLE-2007) provides additional support for this correct interpretation of Nissilä, that the membrane 119 is the electrodes 118 and 122. The English translation of the original source document states “the first electrode and the second electrode of the electrode structure *are formed of* an electrically conductive film.” APPLE-2007, 7:4-8, 7:14-17. Similarly, in describing FIGs. 3-6, the original Finnish patent to states that “the electrodes 118, 122 of the electrode structure 100 *are formed of* an electrically conductive film 119 at the position of the electrodes 118, 122 at both ends of the electrode structure 100; for example, the film is metal, electrically conductive plastic, or a comparable electrically conductive material.” APPLE-2007, 11:9-15. A POSITA would have recognized that these disclosures of the original Finnish patent provide the same disclosure as Nissilä, the “membrane 119” in Nissilä (“film 119” in the original patent) is the material used to make the electrodes 118, 122 and not a description of a second structure that is distinct from the electrodes.

121. As I discussed above, the green line positioned between the electrode 118, 122 and the user's skin in the altered version of Figure 5 presented by both AliveCor and Dr. Berger is completely fabricated. There is no such intervening layer appearing in the actual FIG. 5 of Nissilä:

AliveCor's altered FIG. 5 (green layer completely fabricated by AliveCor)



Unaltered FIG. 5 of Nissilä (electrode 118, 122 on exterior of device with no intervening layer between the electrode and the user's skin)



122. Other disclosures of Nissilä confirm that the electrodes are positioned on the external, user facing surface of Nissilä's device without an intervening layer or portion of the enclosure between the electrodes and the user's skin. In one example, Nissilä describes that "[b]ecause the inner surface 116 of the electrode structure 100 is the portion which is against the person's skin, *the electrodes 118, 122 are preferably located on the inner surface 116 of the band 101.*" EX1006, 5:50-59. Nissilä goes on to describe that "the electrodes 118, 122 are located on the inner surface 116 of the band." *Id.* In the Summary section, Nissilä similarly describes that "the electrodes are preferably located *on the inner surface* of the band." *Id.*, 3:41-44.

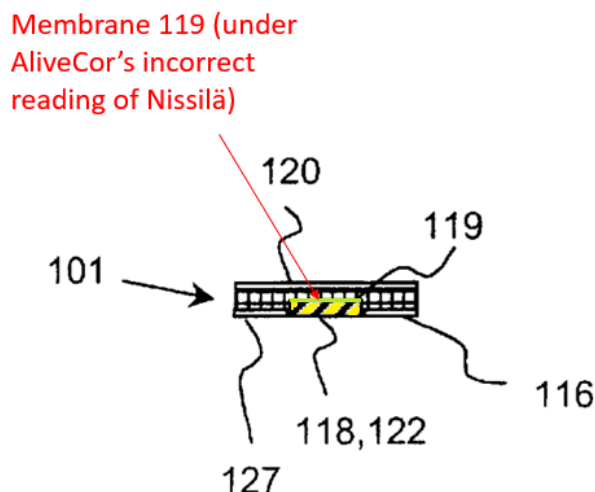
123. The insertion of an extra membrane layer in Nissilä's device positioned between the electrodes 118, 122 and the user's skin, where no such layer is disclosed or suggested by Nissilä itself, indicates that AliveCor and its expert were relying on the disclosure of the '257 patent itself and using hindsight to reconstruct the claimed features of claim 1. For at least this reason, the combination of Markel with Nissilä fails to provide all elements of claim 1.

2. Even Under AliveCor and Dr. Berger's Incorrect Interpretation of Nissilä, there is Still No Disclosure of a Membrane Being Positioned Between the Electrodes 118 and 122 and the User's Skin.

124. I will add that even if Nissilä were incorrectly interpreted in the manner that Dr. Berger and AliveCor assert, such that the membrane 119 is considered to be a separate structure that is distinct from the electrodes 118 and 122, even under this incorrect reading, there is still no disclosure of the membrane enclosing the electrodes or the electrodes otherwise being positioned between the electrodes 118 and 122 and the skin of the user.

125. As I discussed earlier, the only Figure in Nissilä that includes reference numeral 119 is Figure 5 and this figure shows the reference numeral 119 pointing to the top of the electrode 118, 122. Therefore, even if Dr. Berger's improper interpretation of Nissilä in which the membrane 119 is distinct from the electrodes 118, 122 is adopted, there is still no disclosure of the membrane 119 positioned between the electrodes 118, 122 and the user's skin. Even if there were

a separate layer 119 (which is not actually depicted in Figure 5 or described in the specification), the reference numeral 119 is pointing to an interior surface of the electrodes 118 and 122, not a layer positioned between the electrodes and the user's skin.



EX1006, FIG. 5 (annotated based on AliveCor's incorrect reading)

126. Nissilä further discloses that “[t]he membrane 119 can thus come into contact with the person’s skin surface 102 or on the inner surface 116 of the membrane 119 which is against the person’s skin there can be an electrically conductive adhesive 127.” EX1006, 5:40-44. This portion of Nissilä therefore describes that the “membrane 119” can contact the user’s skin “on the inner surface 116.” Figures 4 and 5 of Nissilä show that the “inner surface 116” surrounds the electrodes 118, 122:

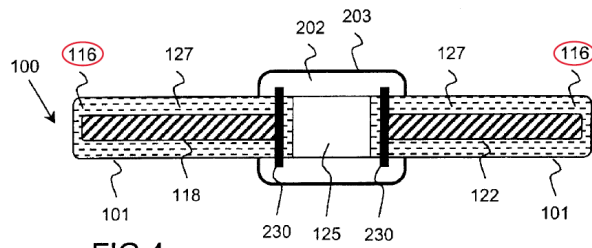
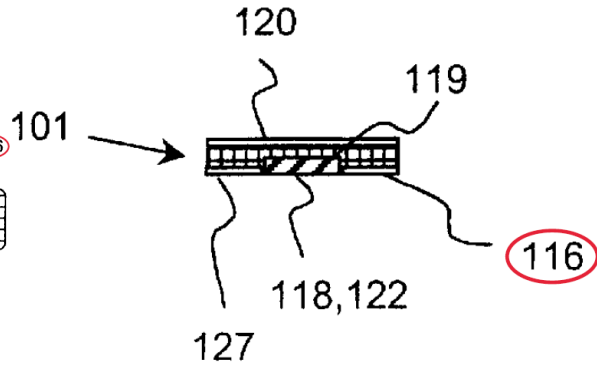


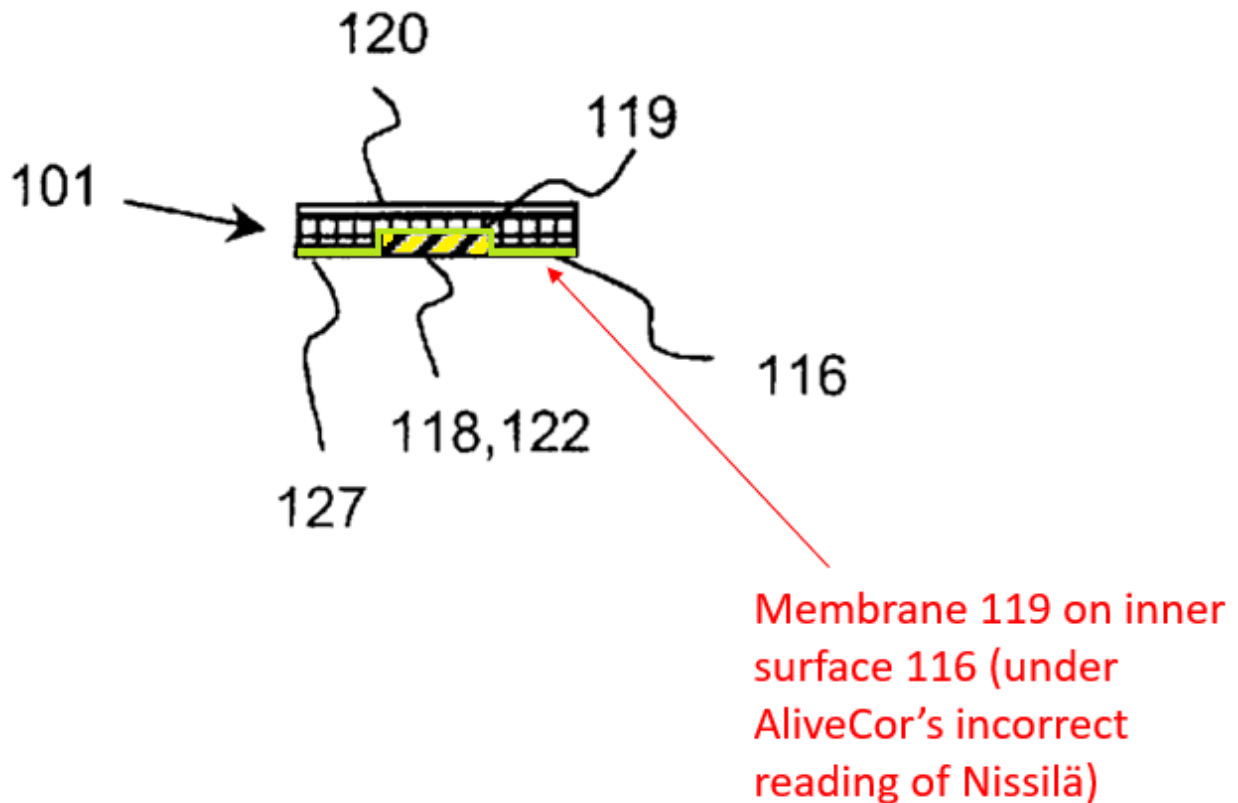
FIG. 4

EX1006, FIG. 4



EX1006, FIG. 5

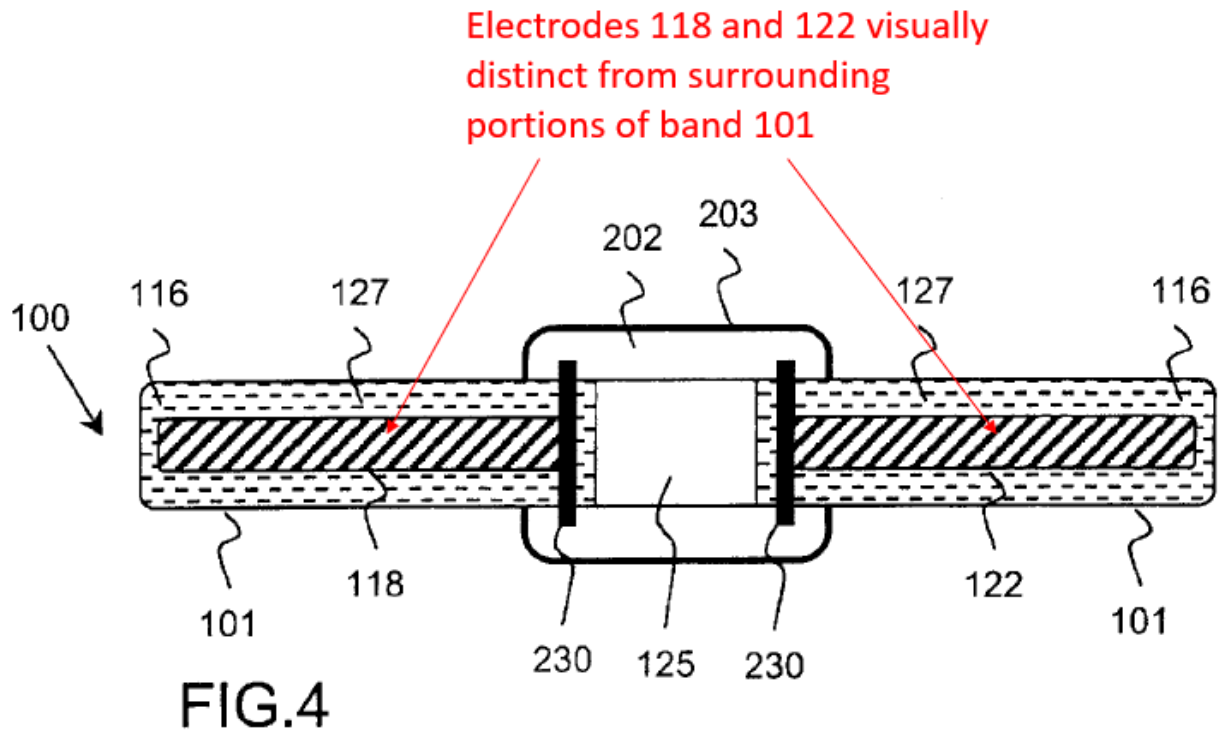
127. Therefore, even if Dr. Berger's incorrect reading of Nissilä in which the membrane 119 is distinct from the electrodes 118, 122 is adopted, at most Nissilä discloses the membrane 119 contacts the user's skin at the inner surface 116, not by being positioned between the electrodes 118, 122 and the user's skin. Under this incorrect hypothesis, such a configuration might look as follows:



128. As I discussed above, Nissilä provides clear disclosure that the electrodes 118, 122 are positioned on the exterior of Nissilä's device, stating that "the electrodes 118, 122 are preferably located on the inner surface 116 of the band 101." EX1006, 5:50-53. Once again, there is simply no disclosure in Nissilä of an intermediate layer of the enclosure of the device positioned between the electrodes 118, 122 and the skin of the wearer.

129. Figure 4 also demonstrates that the electrodes 118 and 122 form part of the outer surface of Nissilä's device and are not separated from the user by an intervening layer of the enclosure of the device. Specifically, Figure 4 "shows an inner surface of the electrode structure" and depicts that the electrodes 118 and 122

are not only visible on the “inner surface” of Nissilä’s device but are visually distinct from the surrounding portions of the band 101. EX1006, 4:38-39.

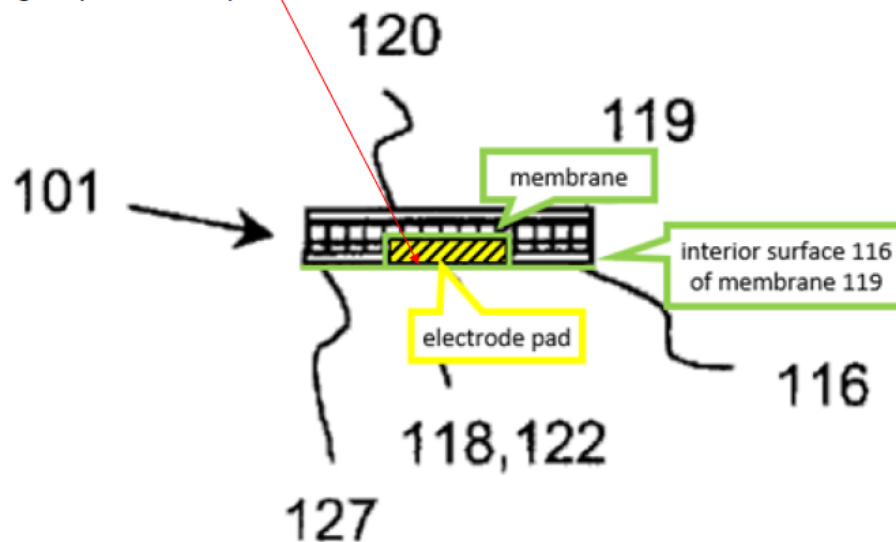


EX1006, FIG. 4 (annotated)

130. By contrast, AliveCor’s altered version of Nissilä’s FIG. 5, repeated throughout the Petition, incorrectly shows the membrane extending across the entire inner surface of Nissilä’s device:

AliveCor's incorrect
interpretation of Nissilä with
membrane extending across
entire surface of the device

Ex. 1006, Fig. 5 (annotated)



Pet. 72 (AliveCor's altered version of FIG. 5 of Nissilä in which AliveCor has drawn an extra layer) (additional annotation in red by Apple)

131. This interpretation of FIG. 5 cannot be accurate because if Nissilä really did include a membrane extending along the entire inner surface of the device, the inner surface of the device would have a uniform appearance across the surface. A POSITA would have recognized from Figure 4's depiction of the electrodes 118 and 122 being visually distinct from the surrounding portions of the band 101 (as shown above) clearly indicate that AliveCor's assertion of a membrane that extends across the entire inner surface of the band, including over the electrodes 118 and 122, is incorrect.

132. To reiterate, the correct interpretation of Nissilä is that Nissilä discloses that the electrodes 118 and 122 *are* the membrane 119. However, even under Dr. Berger’s improper reading of Nissilä, there is still no disclosure of a separate membrane 119 positioned between the electrodes 118 and 122 and the user’s skin.

C. AliveCor and Dr. Berger Fail to Establish that a POSITA Would Have Combined Markel with Nissilä in the Proposed Manner

133. As I described above, AliveCor’s purported reasoning for why a POSITA would have been motivated to look to Nissilä is based on an improper reading of Nissilä’s teachings. In addition to this flaw, AliveCor fails to provide a reason why a POSITA would have combined Markel and Nissila without relying on any hindsight. Further, AliveCor’s combination analysis is critically flawed because AliveCor repeatedly conflates or misconstrues the teachings of the prior art references, as I explain in more detail below.

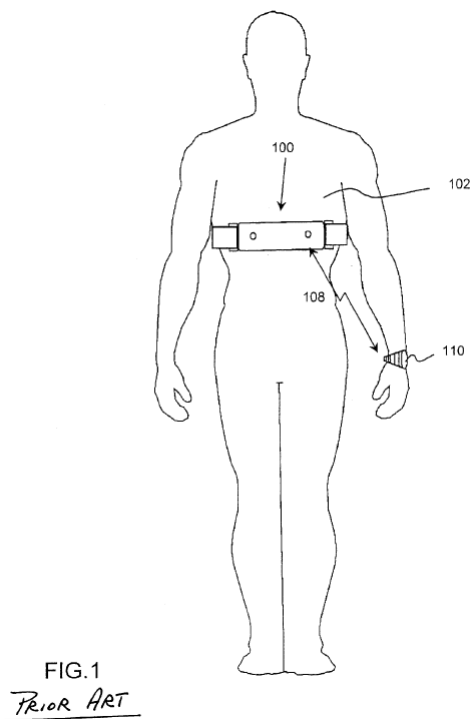
134. AliveCor and its expert, Dr. Berger, erroneously allege that a POSITA would have been motivated to combine Markel and Nissilä because “[they] share similar goals.” Pet., 70. To explain this motivation, AliveCor improperly conflates Markel’s usage of the term “concealed” with Nissilä’s usage of the term “inconspicuous,” to create an inaccurate perception that these two references have a common purpose. They do not. The context for using “concealment” in Markel is not even remotely relevant to the context for using “inconspicuous” in Nissilä.

Markel and Nissilä are not in pursuit of a common goal, and this becomes apparent from a comparison of Markel's description of visually concealing the presence of electrodes with respect to the rest of the device and Nissilä's differentiated reference to making its entire device "inconspicuous" to people other than the user wearing the device.

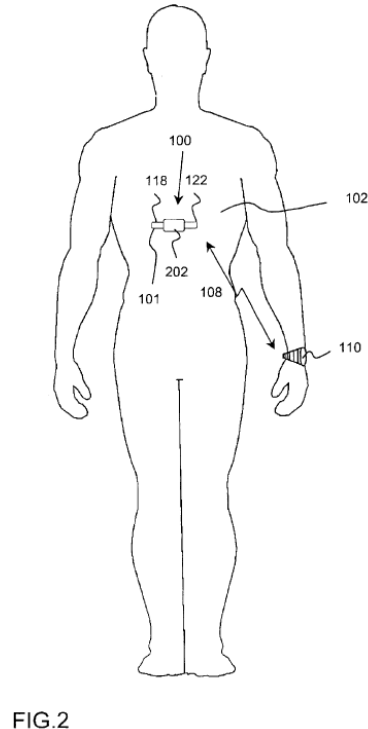
135. As I described above in Section VII.A, Markel describes "concealing" its surface electrodes from its own user in certain embodiments. In particular, Markel explains that a surface electrode can be "substantially concealed (or hidden) from a user" since the "user need not be aware of the presence of the electrode." EX1005, [0040]. For example, Markel's "electrode may comprise molded conductive plastic with little or no visible indication of the electrode presence." EX1005, [0040]. In this way, Markel visually conceals its surface electrodes by using electrodes made from a conductive plastic material in place of more commonly known metals, without applying indicia or labeling that would ordinarily be used for identifying the electrodes. Markel's goal is therefore to conceal the presence of an electrode with respect to the rest of the exterior of the device

136. In contrast to Markel, nothing in Nissilä teaches visually concealing the presence of an electrode with respect to the rest of the device from its own user. As I described above in Section VI.B, Nissila is directed to an electrode that

“measur[es] an ECG signal on the skin of a person’s chest” on a device structure that includes “a band-like component [] that is fitted against the skin [] of the person’s chest.” EX1006, Abstract; 2:16-32. Unlike Markel, the user of Nissilä’s device needs to be aware of the location of the electrodes because “[i]n the solution of the invention, *it is intended* that the electrode structure is placed on the skin of the user’s chest.” EX1006, 2:61-3:5. Furthermore, as compared to conventional “electrode belts” found in the prior art that are “relatively rigid” structure and may “not bend sufficiently to follow the contours of a human body,” Nissilä’s improved “electrode structure is of *flexible, soft material that fits the skin closely*, and as a consequence it is comfortable and *inconspicuous to wear*.” EX1006, 1:58-2:8, 2:61-3:5. And with this added context, it becomes clear that when Nissilä states that its “electrode structure is inconspicuous,” it is referring to the facts that (i) the electrode structure—i.e., the whole device—is inconspicuous to wear, and (ii) the electrode structure “fits the skin closely” explains that the structure would not be visible *to others* when the electrode is facing the user’s skin and the structure is placed *under a user’s clothing*. EX1006, 2:61-3:5. This is demonstrated by comparing the prior art device depicted in FIG. 1, which is large and bulky and would be apparent through the user’s clothing, with Nissilä’s much smaller, form fitting device in FIG. 2.



EX1006, FIG. 1
(prior art)



EX1006, FIG. 2
(Nissilä's device)

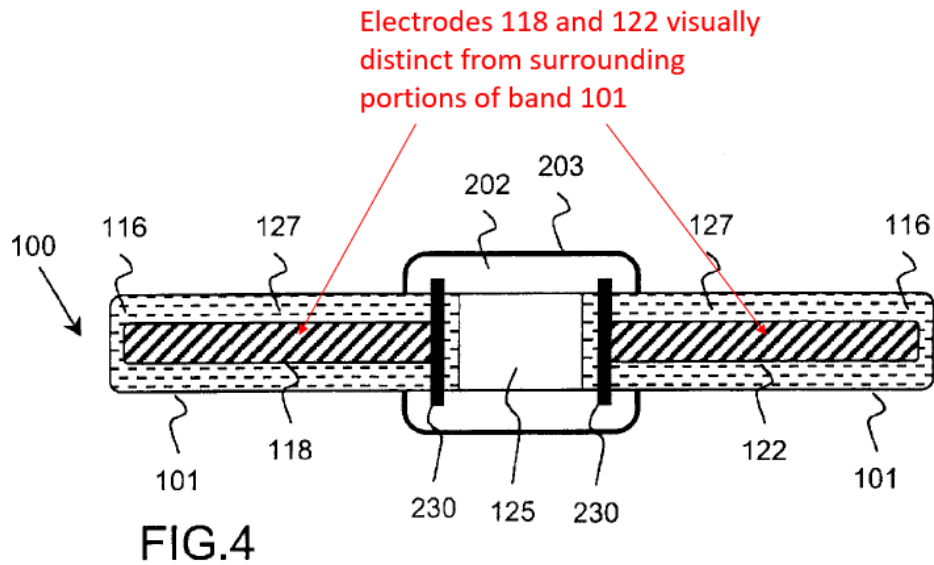
137. Thus, the goal of Nissilä is to make the presence of the entire device inconspicuous to people other than the user, not to visually conceal the location of electrodes with respect to the rest of the device.

138. It is clear that Nissilä's usage of "inconspicuous" has nothing to do with visual concealment of electrodes from a user through its placement *underneath an exterior surface of the housing*, as alleged by AliveCor. Instead, Nissilä's electrodes are "inconspicuous" to *others*—not the user himself or herself—due to its electrodes' flexibility and ability to conform when positioned facing the user's skin and underneath a user's shirt—not an exterior surface of the

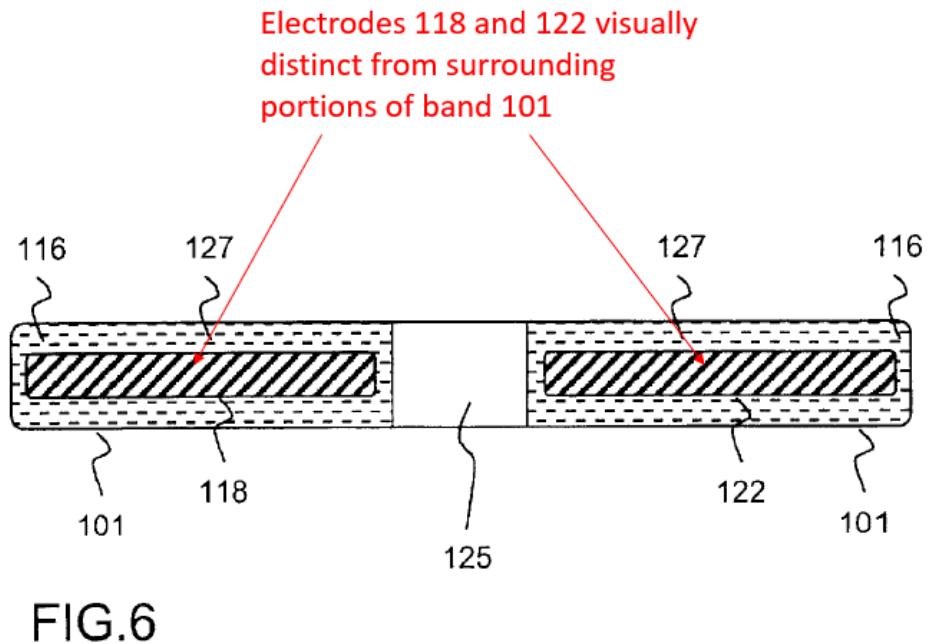
housing, as alleged by AliveCor. Nothing in Nissilä's disclosure describes using a visual concealment from the user of the electrode. Indeed, a POSITA would have understood that visual concealment of the electrode is simply unnecessary for Nissilä's electrodes because these electrodes are physically placed facing the user's skin and underneath the user's clothing.

139. There is therefore no support for the assertions of AliveCor and Dr. Berger that a POSITA would have been motivated to combine Markel and Nissilä due to the two references sharing similar goals. There is simply no disclosure in Nissilä of concealing the presence of electrodes with respect to the rest of the device. This becomes clear when looking at the Figures of Nissilä, which shows the electrodes of the embodiment of Figures 3-6 (the embodiment relied upon by AliveCor and Dr. Berger) as being clearly visually identifiable with respect to the rest of Nissilä's device. Therefore application of the teachings of Nissilä to Markel would have achieved the exact opposite of Markel's goal of achieving "little or no visible indication of electrode presence."

140. As shown in Figures 4 and 6 of Nissilä (which depict the embodiment relied on in the Petition), the electrodes 118 and 122 are visually distinct from the other portions of Nissilä's device:



EX1006, FIG. 4 (annotated)



EX1006, FIG. 6 (annotated)

141. Nissilä states that these figures are depicting “an *inner surface* of the electrode structure of FIG. 3” and distinguishes this depiction of the inner surface from other Figures that depict cross-sections of the device. EX1006, 4:38-50. A

POSITA would have recognized, based on Nissilä's disclosure that the electrodes are visually distinct from the surrounding portions of the device, that application of Nissilä to Markel would directly hinder Markel's goal of concealing the presence of electrodes. There is no disclosure in Nissilä of visually concealing the presence of the electrodes from the rest of the device with respect to the embodiments of Nissilä relied upon in the Petition and by Dr. Berger in his declaration. For this reason, a POSITA would not have been motivated to apply Nissilä to Markel in the proposed manner as such a modification would not have achieved the goal of "concealing the electrode from the user" which is the basis for AliveCor's motivation to combine argument. Pet., 70; EX1003, ¶355. Simply stated, Markel already achieves its stated goal of visually concealing the presence of electrodes with respect to the rest of the device. Because Nissilä would hinder that goal, a POSITA would not have been motivated to modify Markel based on Nissilä in the manner proposed by Dr. Berger.

142. Moreover, AliveCor fails to offer any reason (and there would be no reason) to justify incorporation of the features of Nissilä's flexible electrode in Markel's device because Markel's electrodes are part of a protective housing for an electronic device and are not designed for adherence or conformity to a user's body. Any such conformance or adherence would interfere with the use of the device and lead to user discomfort. Additionally, Markel's electrodes are not

placed under clothing such that they would necessitate or benefit from being made from a “flexible, soft material that fits the skin closely.” Thus, for at least these reasons and those discussed above, Markel and Nissilä do not share similar goals at all, as Dr. Berger purported in his declaration. Instead, the goals of these two references are distinct and unrelated and application of Nissilä to Markel’s device would hinder Markel’s goal of visually concealing the presence of electrodes with respect to the rest of the device. A POSITA would not have been motivated to combine Markel with Nissilä, let alone the particular manner that AliveCor and Dr. Berger allege to arrive at the claimed elements.

143. For at least these reasons, AliveCor fails to demonstrate that the combination of Markel and Nissilä renders obvious claims 1-22.

VIII. THE PETITION FAILS TO DEMONSTRATE OBVIOUSNESS OF ADDITIONAL RECITATIONS OF THE DEPENDENT CLAIMS

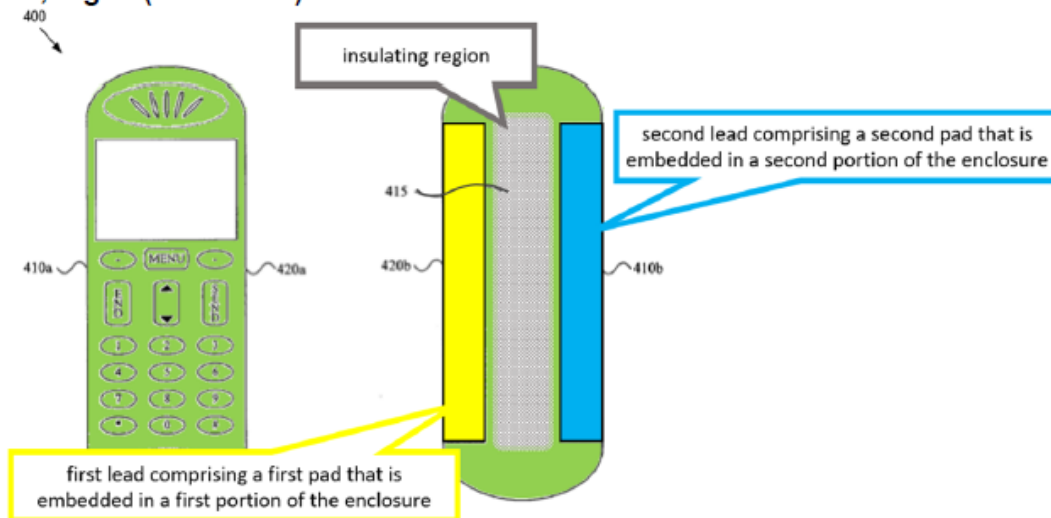
144. In addition to the above described deficiencies of Grounds 1 and 2 with respect to claim 1, AliveCor and Dr. Berger fail to demonstrate that any of the Grounds disclose all elements of several of the dependent claims that depend from claim 1 and independent claim 15. I address these claims and the deficiencies in the Petition and the analysis of Dr. Berger below.

A. Grounds 1 and 2 fail to provide all elements of claim 5

145. Claim 5 recites: “wherein: the material having the first conductivity comprises one of aluminum and steel; and the second pad is constructed from a silver based compound.” Claim 5 depends from claim 4 which recites “the first portion is separated from the second portion by a third portion of the enclosure; at least the third portion is constructed from a material having a first conductivity; and the first conductivity is insufficient to transmit the first electrical signal from the first pad to the second pad via the third portion.”

146. In his analysis of claim 4, Dr. Berger identifies an insulating region 415 of Markel as corresponding to the claimed “third portion of the enclosure” which “is constructed from a material having a first conductivity.” EX1003, ¶¶179-182.

Ex-1005, Fig. 4 (annotated)



EX1003, ¶179.

147. Markel only discusses the insulating region 415, with no disclosure of a material used for the insulating region 415. Specifically, Markel's single reference to insulating region 415 states "an insulating region 415 may separate regions 410b and 420b." EX1005, [0045]. Dr. Berger asserts that "person of ordinary skill in the art would have known that one of the simplest ways to implement an "insulating region" would be to use a material having relatively less conductivity" and that "[a] person of ordinary skill in the art would further have known that aluminum and steel were used in the construction of mobile devices and were examples of materials having relatively less conductivity." EX1003, ¶¶188-189. However, Dr. Berger does not support his assertions with any disclosures of Markel (or Nissilä or Righter) but rather adds in additional references to support this alleged knowledge. Dr. Berger presents no analysis as to why a POSITA would have selected aluminum or steel for the insulating region 415 and makes no effort to demonstrate that such an implementation of Markel would have been successful. I therefore find Dr. Berger's analysis insufficient to demonstrate that it would have been obvious to implement Markel's insulating region 415 using aluminum or silver, especially considering the lack of disclosure in Markel itself.

148. Similarly, Markel includes no disclosure of any of the electrodes being formed from a silver based compound. Dr. Berger once again turns to other references as allegedly disclosing use of silver or silver chloride for the electrodes. EX1003, ¶192. As with his analysis of the insulating region 415 of Markel, Dr. Berger presents no analysis as to why a POSITA would have selected silver or silver chloride for implementing the electrodes of Markel and makes no effort to demonstrate that such an implementation of Markel would have been successful. Dr. Berger's analysis with respect to element [5.b] is therefore similarly deficient.

149. AliveCor does not present any additional arguments based on Nissilä with respect to claim 5 in Ground 2.

B. Grounds 1 and 2 fail to provide all elements of claim 6

150. Claim 6 recites, in part, “the second pad is positioned from the exterior surface of the second portion by a thickness of the second portion; at least the thickness of the second portion is constructed from material having a second conductivity; and the second conductivity is defined such that the second electrical signal is not able to be transmitted through material having the second conductivity over a distance larger than the thickness of the second portion.” As discussed above, there is no disclosure in Markel of an electrode or pad positioned underneath the exterior surface of a device. Furthermore, in his proposed modification to Markel, Dr. Berger does not identify any teaching that would

dictate “a thickness of the second portion” separating the second pad from the exterior of the device or compare that thickness to the electrical transmission properties of the second portion. EX1003, ¶¶205-211.

151. Dr. Berger does not provide any analysis as to the conductivity of the insulating region 415 of Markel or the second portion of the enclosure based on any actual teachings of Markel. EX1003, ¶¶205-211. Dr. Berger merely identifies Markel’s disclosure that the electrodes “provide sufficient conductivity for an electrode to perform adequately.” EX1003, ¶209 (quoting EX1005, [0037]). The analysis of Dr. Berger and AliveCor with respect to elements [6.c]-[6.e] is purely conclusory and is not supported by any teachings of Markel. Rather, the analysis of Dr. Berger and AliveCor appears to rely entirely on hindsight reconstruction of the recitations of claim 6. Pet., 38-39; EX1003, ¶¶205-211. The analysis provided with respect to claim 6 in Ground 2 does not correct for these deficiencies in that Dr. Berger relies on Nissilä only for the (incorrect) premise that a second electrode can allegedly be positioned underneath the exterior of the device. EX1003, ¶¶368-373.

C. Grounds 1 and 2 fail to provide all elements of claim 7

152. Claim 7 recites that “the first pad and the second pad are positioned apart from one another at a distance larger than the thickness of the second portion by material having the second conductivity.” As I discussed above with respect to

claim 6, because Dr. Berger has included no discussion or indication of the thickness of Markel's electrodes, he has failed to demonstrate that Markel discloses "the first pad and the second pad are positioned apart from one another at a distance larger than the thickness of the second portion" as required by claim 7. EX1003, ¶¶214-217. Dr. Berger also makes no attempt to demonstrate that the alleged first and second pads of Markel are positioned apart a distance larger than the thickness of the second portion. EX1003, ¶¶214-217. AliveCor does not present any additional arguments based on Nissilä with respect to claim 7 in Ground 2 and therefore AliveCor has failed to meet its burden with respect to claim 7.

D. Grounds 1 and 2 fail to provide all elements of claim 8

153. Claim 8 recites "the enclosure further comprises at least one pocket underneath the exterior surface of the enclosure; and at least one of the first pad and the second pad is placed within the at least one pocket." As I have previously discussed, there is no disclosure in Markel of the internal configurations of Markel's MCD. There is therefore no disclosure or suggestion in Markel of a "pocket underneath the exterior surface of the enclosure" in which the first or second pad is placed. There is also no indication that Markel's device would "require a pocket underneath the exterior surface of the enclosure" as Dr. Berger asserts. EX1003, ¶223. Dr. Berger provides no reasoning as to why such a pocket

would be required in Markel's MCD. Therefore, Grounds 1 and 2 fail to demonstrate the Markel discloses claim 8 either alone or in view of Nissilä.

E. Grounds 1 and 2 fail to provide all elements of claim 9

154. Claim 9 recites, in part, "a display, wherein the enclosure supports the display, and wherein at least a portion of the exterior surface of the enclosure forms at least a portion of an exterior surface of the electronic device behind the display." Dr. Berger points to disclosures of Markel indicating that "display 140...may also function as a touch screen input feature" in addressing claim 9. EX1003, ¶¶227-228 (quoting EX1005, [0034]). However, Dr. Berger provides no analysis to identify where Markel discloses that "at least a portion of the exterior surface of the enclosure forms at least a portion of an exterior surface of the electronic device behind the display." Both AliveCor and Berger assert that this feature is present in Markel but do not identify any portion of Markel that actually discloses this claim feature. AliveCor does not present any additional arguments based on Nissilä with respect to claim 9 in Ground 2. As such, AliveCor has failed to demonstrate that Markel, either alone or in combination with Nissilä, provides all elements of claim 9.

F. Grounds 1 and 2 fail to provide all elements of claims 12, 13, and 19

155. Dr. Berger's arguments asserting that the electrodes at the locations 410b and 420b in the embodiment depicted in Figure 4 of Markel wrap around to

the front of the device based on an altered version of Markel in which Dr. Berger has drawn additional portions of the electrodes that are not actually present in the unaltered Figure 4. EX1003, ¶251. Before addressing Dr. Berger's altered version of Figure 4, I want to make clear that the original Figure 4 in Markel does not show any electrodes on the front or even the sides of the device:

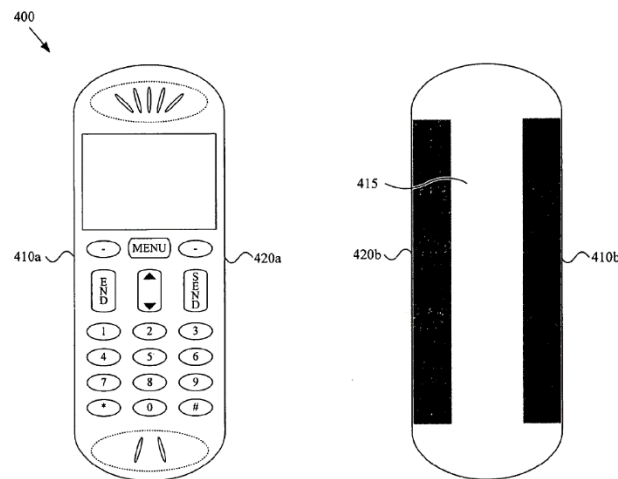
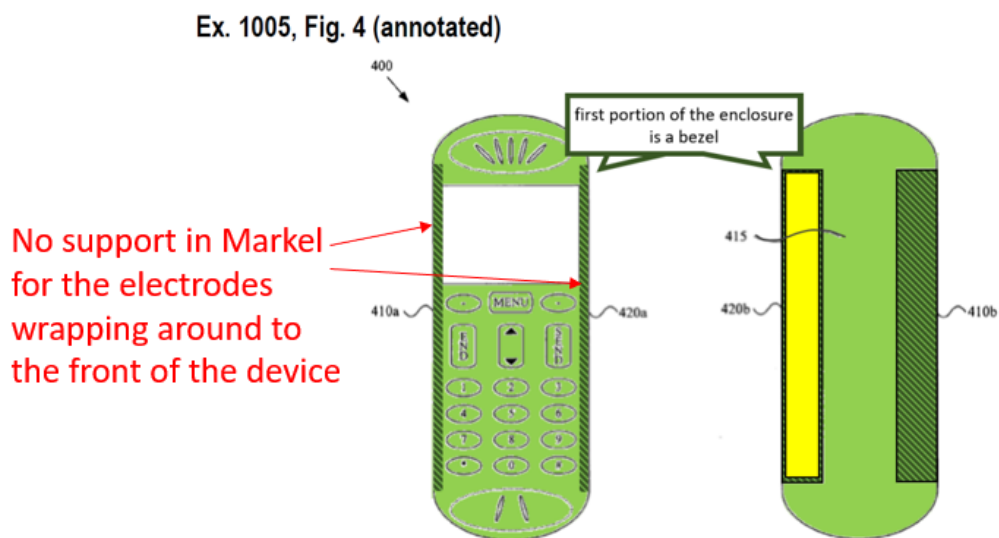


Figure 4

EX1005, FIG. 4.

156. There is no support in Markel for Dr. Berger's assertion that "the second electrode extends to the rim that encircles Markel's electronic device." EX1003, ¶251. In fact, Dr. Berger does not cite to any portion of Markel as allegedly providing support for this assertion. Rather than identifying a portion of Markel that provides support for such a configuration, Dr. Berger has provided altered versions of Figure 4 showing electrodes positioned on the front side

portions of the MCD that are not actually shown in Figure 4 or described in the specification of Markel.



EX1003, ¶251 (Dr. Berger's altered version of FIG. 4 of Markel in which AliveCor has drawn additional portions of the electrodes)
(additional annotation in red)

157. As I discussed above, the original Figure 4 of Markel does not include an indication of electrodes positioned on the front of the device and shows only electrodes positioned on the back side. In fact, Figure 4 shows that there is a narrow gap between the electrodes and the respective edges of the device.

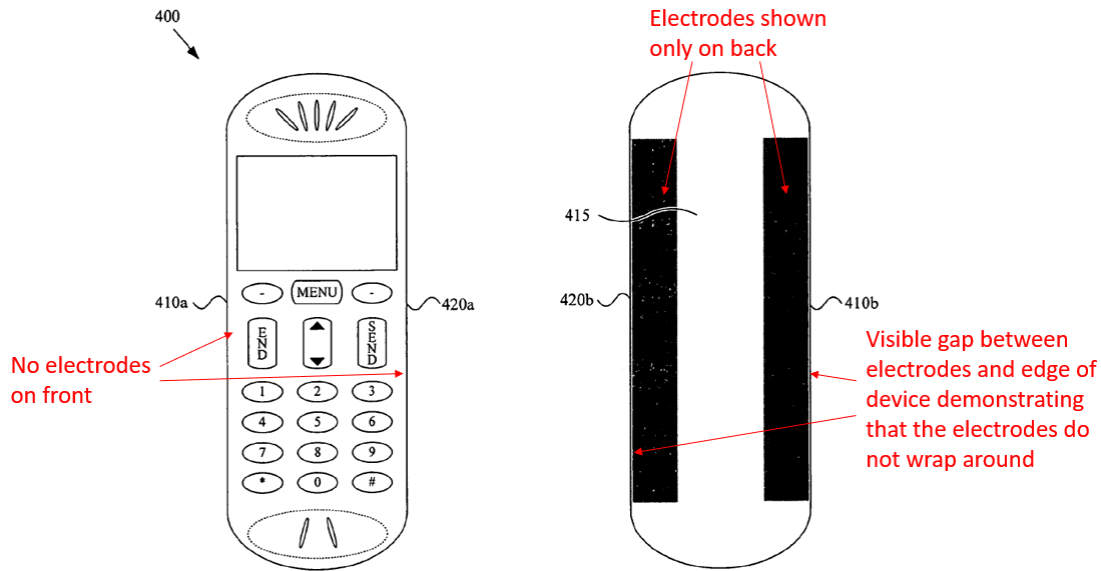


Figure 4

EX1005, FIG. 4 (annotated)

158. Dr. Berger goes on to assert that it “would have been a trivial modification well-within the general knowledge of a person of ordinary skill in the art” to modify Markel device such that the electrodes positioned at 420b and 410b were to wrap around to the front of the device. EX1003, ¶252. However, there is simply no teaching or suggestion in Markel that would lead a POSITA to make such a modification absent an outside teaching to do so. While it may have been possible to make such a modification, Markel does not provide a teaching to do so. Both the Petition and Dr. Berger’s declaration fail to demonstrate that the electrodes identified by AliveCor as corresponding to the claimed “first portion” and “second portion” of the enclosure are a bezel and therefore Ground 1 fails with respect to claims 12, 13, and 19.

159. The Petition and Dr. Berger’s declaration fail with respect to claim 19 for an additional reason. Claim 19 includes the additional recitation “the electronic device further comprises a non-conductive component *positioned between the bezel and the display screen* for electrically isolating the first lead from the second lead.” Dr. Berger argues that an “insulating region” between the two electrodes positioned on the back of the device in the embodiment of Figure 4 of Markel “electrically isolates ‘regions 410b and 420b.’” EX1003, ¶¶330-332. However, this configuration in Markel is irrelevant to Element [19.b] because it does not describe “a non-conductive component positioned between *the bezel* and the *display screen*” as required by claim 19. Pet., 66-67; EX1003, ¶¶330-333. The assertions of Dr. Berger and AliveCor with respect to element [19.b] are based on nothing but hindsight reconstruction of the claim language with no actual support from Markel. Even if AliveCor’s general assertion that “Markel further teaches that its electrodes would be electrically isolated” *and* its assertion that the electrode 420b would somehow form part of the bezel (Pet., 65-67) were both accepted as true, neither AliveCor nor Dr. Berger has demonstrated that Markel includes a teaching that would instruct a POSITA to isolate an electrode embedded in the display and an electrode embedded in the bezel in the precise manner recited by claim 19 (“ non-conductive component positioned between the bezel and the

display screen”), rather than electrically isolating the two electrodes in another manner.

160. For the above reasons, Ground 1 fails to provide the additional recitations of claims 12, 13, and 19. Neither the Petition nor Dr. Berger presents any additional arguments with respect to claims 12, 13, and 19 in Ground 2 and therefore Ground 2 also fails with respect to claims 12, 13, and 19.

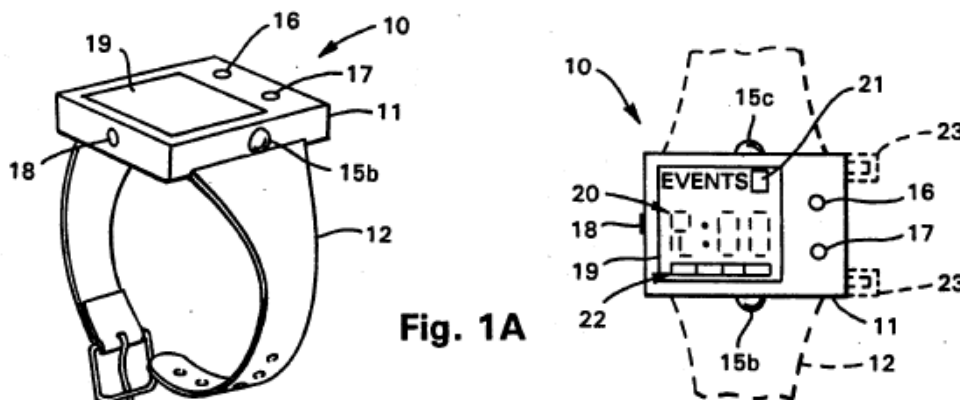
G. Ground 3 fails to provide all elements of claims 12, 13, and 19

161. The additional arguments included in Ground 3 based on applying the additional teachings of Righter to Markel also fail to disclose claims 12, 13, and 19. As I discussed in the claim construction section, above, the term “bezel” means “A rim that secures a transparent covering for an indicating device such as a meter, oscilloscope, or watch.” APPLE-2008. A POSITA would have found this construction to be the plain and ordinary meaning of the term in the context of devices such as those described in the ’257 patent. Under this proper construction, Ground 3 fails with respect to claims 12, 13, and 19 because Righter fails to disclose an electrode embedded in a bezel.

162. Dr. Berger asserts that Righter’s “pair of conductive electrodes 15b, 15c [] provided *on opposing side surfaces of the casing 11*” allegedly provide the configuration of an electrode embedded in a portion of the enclosure that is a bezel as required by the additional recitations of claims 12, 13 and 19 in light of their

respective parent claims. EX1003, ¶¶403-404 (quoting EX1007, 2:65-3:2).

However, Figures 1A and 1B show that the electrodes of Righter's device are not positioned in the bezel (e.g., a rim that secures the transparent covering/display) but rather are positioned on the sides of the device:



EX1007, FIGs. 1A-1B.

163. While a POSITA would have been aware that it is possible, in some device designs, for the sides of a device to act as a bezel, that is not the configuration disclosed by Righter. Rather, as shown in Figures 1A-1B, the “rim that secures” the LCD display screen 19 of Righter is positioned on the front of the watch and not the sides of the watch and therefore the electrodes 15b and 15c are not embedded in the bezel. Under such a broad interpretation of bezel as that implied by AliveCor and Dr. Berger, nearly any portion of the enclosure of the device would qualify as the bezel. A POSITA would have recognized that this is simply not true, the bezel is the rim that supports the display screen on the front of

Righter's device. The combination of Markel with Righter therefore fails because Righter does not disclose electrodes embedded in "a bezel" of the enclosure.

164. Dr. Berger has proposed a construction of "bezel" of "a rim that encircles an electronic device." EX1003, ¶405. Even under this definition provided by Dr. Berger, Righter still fails to disclose that the electrodes are embedded in a bezel. Dr. Berger has made no demonstration that the sides of Righter's device where the electrodes 15b and 15c are located form a rim that encircles an electronic device. I believe that a POSITA would have recognized that the sides and top face of Righter's watch appear to be made from one piece and not from a front face supported by a "rim" defined by the sides. I do not see any portion of the Petition or Dr. Berger's declaration that identify any portions of Righter disclose such a configuration in which the sides form a "rim" that supports the front of the watch and therefore Ground 3 fails even under the broader construction proposed by Dr. Berger.

165. Furthermore, as I discussed with respect to Ground 1, above, Dr. Berger does not appear to have even attempted to demonstrate that Righter provides "a non-conductive component positioned *between the bezel and the display screen* for electrically isolating the first lead from the second lead" as required by element [19.b]. EX1003, ¶¶412-416. Therefore, for the reasons I discussed in paragraphs 159-160, above, with respect to Ground 1, Ground 3 also

fails with respect to claim 19 because the Petition fails to demonstrate that the combination of Markel and Righter includes “a non-conductive component positioned between the bezel and the display screen for electrically isolating the first lead from the second lead.”

H. Ground 1 and 2 fail to provide all elements of claim 20

166. Grounds 1 and 2 fail to disclose all recitations of claim 20 for similar reasons as those I discussed with respect to claim 1. As I discussed with respect to claim 1, above, neither Markel alone nor Markel in view of Nissilä discloses or renders obvious a pad or electrode positioned under a portion of the enclosure. As previously discussed, each of Markel’s electrodes is positioned on the exterior of the device such that the “electrodes contact a user during normal (or typical) use of the MCD 100.” EX1005, 4:49-51.

167. As I previously discussed, every disclosure in Markel regarding electrodes discusses the electrodes being positioned on the exterior of the device to allow for direct contact with the skin of the user. For example, Markel includes several express disclosures of the electrodes being placed on exterior surfaces of the device (with no corresponding description of additional electrodes or pads positioned underneath the exterior of the device), such as when Markel describes, “FIG. 4 provides a non-limiting example of [the] electrode placement,” where “first and second electrodes may be *disposed on* a main body portion 110 of the

MCD 100,” as presented in “FIG. 4.” *Id.* In another example, Markel describes, “FIG. 5 provides a non-limiting example of [the] electrode placement,” where the electrodes are “***disposed on*** a main body portion 110 of the MCD 100 and a pushbutton.” *Id.*, [0046]. In yet another example, Markel describes: “FIG. 2 provides non-limiting examples of [electrode] placement,” where the “electrodes may be ***disposed on*** a same pushbutton of the mobile communication device 100.” *Id.*, [0047]. “FIG. 6 provides a non-limiting illustration of [electrode] placement,” where “a first electrode may be ***disposed on*** a handheld portion of the MCD 100, and a second electrode may be ***disposed on*** (or proximate) an earpiece of the MCD100.” “Such electrode placement may, for example, provide for ***user contact with both electrodes*** during the process of listening to the MCD 100.” *Id.*, [0050].

168. As I also previously discussed, Markel neither discloses placing an electrode underneath a conductive plastic layer, nor suggests hiding an electrode ***underneath*** the conductive plastic. Instead, Markel discloses the use of such conductive plastic to make/form its electrodes, yielding conductive plastic electrode structures that are said by Markel to conceal the electrodes contained within them when the “user need not be aware of the presence of the electrode.” Ex. 1005, [0040]. In effect, Markel is disguising the electrode by making it appear to be a part of the plastic enclosure, and uses conductive plastic in this structure to

provide the function of an electrode while maintaining the appearance of an ordinary part of the housing. Simply, Markel is hiding the electrode in plain sight.

169. Therefore, for the reasons discussed in Section VII.A, above, the electrodes in Markel's device detect the first electrical signal of the user's cardiac signal via direct contact between the electrode and the user's skin, **not** "via the user's contact with the first portion of the enclosure."

170. With respect to Ground 2, as I discussed in Section VI.B.1, above, Nissilä does not disclose a separate membrane positioned between the electrodes 118, 122 and the user's skin. Rather, what Nissilä **actually** discloses is that in the embodiment of Figure 5, the electrodes are formed **from** a conductive membrane 119. EX1006, 33-49. Specifically, Nissilä describes that in the "second embodiment, as in FIGS. 3 to 6, the electrodes 118, 122 of electrode structure 100 **consist of** a membrane 119 that is located at both ends of the electrode structure 100, at the electrode 118, 122, and is made of metal, electrically conductive plastic or a similar conductive material." EX1006, 5:33-38. Nissilä is express that "[b]ecause the inner surface 116 of the electrode structure 100 is the portion which is ***against the person's skin, the electrodes 118, 122 are preferably located on the inner surface 116 of the band 101.***" EX1006, 5:50-59. As with Markel, Nissilä discloses that the electrodes make direct contact with the user's skin, without an intervening "membrane" layer, to detect the first electrical signa of the

user's cardiac signal. Nissilä therefore also fails to disclose or suggest that the electrodes “detect the first electrical signal of the user's cardiac signal via the *user's contact with the first portion of the enclosure*” in which the first lead is embedded as required by claim 20 for the reasons discussed with respect to claim 1.

IX. LEGAL PRINCIPLES

A. Anticipation

171. I have been informed that a patent claim is invalid as anticipated under 35 U.S.C. § 102 if each and every element of a claim, as properly construed, is found either explicitly or inherently in a single prior art reference. Under the principles of inherency, if the prior art necessarily functions in accordance with, or includes the claimed limitations, it anticipates.

172. I have been informed that a claim is invalid under 35 U.S.C. § 102(a) if the claimed invention was known or used by others in the U.S., or was patented or published anywhere, before the applicant's invention. I further have been informed that a claim is invalid under 35 U.S.C. § 102(b) if the invention was patented or published anywhere, or was in public use, on sale, or offered for sale in this country, more than one year prior to the earliest effective filing date of the patent application (*i.e.*, the Critical Date). And a claim is invalid, as I have been informed, under 35 U.S.C. § 102(e), if an invention described by that claim was

described in a U.S. patent granted on an application for a patent by another that was filed in the U.S. before the date of invention for such a claim.

B. Obviousness

173. I have been informed that a patent claim is invalid as “obvious” under 35 U.S.C. § 103 in light of one or more prior art references if it would have been obvious to a POSITA, taking into account (1) the scope and content of the prior art, (2) the differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) any so called “secondary considerations” of non-obviousness, which include: (i) “long felt need” for the claimed invention, (ii) commercial success attributable to the claimed invention, (iii) unexpected results of the claimed invention, and (iv) “copying” of the claimed invention by others. For purposes of my analysis above and because I know of no indication to the contrary, I have applied the Critical Date as the date of invention in my above analyses, although in many cases the same analysis would hold true even at an earlier time than the Critical Date.

174. I have been informed that a claim can be obvious in light of a single prior art reference or multiple prior art references. To be obvious in light of a single prior art reference or multiple prior art references, there must be a reason to modify the single prior art reference, or combine two or more references, in order to achieve the claimed invention. This reason may come from a teaching,

suggestion, or motivation to combine, or may come from the reference or references themselves, the knowledge or “common sense” of one skilled in the art, or from the nature of the problem to be solved, and may be explicit or implicit from the prior art as a whole. I have been informed that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. I also understand it is improper to rely on hindsight in making the obviousness determination.

X. CONCLUSION

175. I reserve the right to supplement my opinions to address any information obtained, or positions taken, based on any new information introduced throughout this proceeding.

176. I declare under penalty of perjury that the foregoing is true and accurate to the best of my ability.