

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ALIVECOR, INC.,
Petitioner

v.

APPLE INC.,
Patent Owner

Case No. IPR2023-00950
U.S. Patent No. 10,076,257 B2

**SECOND DECLARATION OF
RONALD D. BERGER, M.D., Ph.D., F.H.R.S.**

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AliveCor Exhibit 1021

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I, Ronald D. Berger, M.D., Ph.D., F.H.R.S., declare as follows:

I. INTRODUCTION

1. I have been retained by AliveCor, Inc. (“Petitioner”) as an independent expert consultant in this proceeding before the United States Patent and Trademark Office (“PTO”) against Apple, Inc. (“Apple” or “Patent Owner”) regarding U.S. Patent No. 10,076,257 B2 (“the ’257 patent”) (Ex-1001).¹ I have been asked to submit this Second Declaration on behalf of Petitioner.

2. I understand that Apple moves to amend certain claims of the ’257 patent in the event that the Board finds that any of original claims 16-22 is unpatentable.

3. I have been asked to analyze whether certain references disclose or render obvious the features recited in Apple’s proposed substitute claims 23-29 (“the substitute claims”) of the ’257 patent, which are set forth in Appendix A to this Declaration. My opinions are set forth below. Based on my experience and expertise, it is my opinion that the prior art renders obvious all limitations of the substitute claims, as I discuss in detail below.

4. I have been asked to look at whether the substitute claims are invalid as

¹ Where appropriate, I refer to exhibits that I understand are to be attached to the petition for *Inter Partes* Review of the ’257 patent.

indefinite. Based on my experience and expertise, it is my opinion that proposed substitute claims 25, 28, and 29 are indefinite.

5. I am being compensated at a rate of \$800 per hour for my work in this proceeding. My compensation is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other interest in this proceeding.

6. All of my opinions stated in this Second Declaration are based on my own personal knowledge and professional judgment. I am over 18 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth in this Second Declaration.

II. BACKGROUND AND QUALIFICATIONS

7. I incorporate my background and qualifications set forth in my earlier Declaration, Ex-1003.

III. MATERIALS REVIEWED

8. The opinions contained in this Second Declaration are based on the documents I reviewed, my professional judgment, as well as my education, experience, and knowledge.

9. In forming my opinions expressed in this Second Declaration, I also reviewed the following materials and information:

Exhibit	Description
Ex-1001	U.S. Patent No. 10,076,257 B2 (“the ’257 patent”)
Ex-1002	Prosecution History of U.S. Patent No. 10,076,257 B2
Ex-1005	U.S. Patent Appl. No. 11/492,278 (“ <i>Markel</i> ”)
Ex-1006	U.S. Patent No. 6,775,566 (“Nissilä”)
Ex-1007	U.S. Patent No. 5,191,891 (“ <i>Richter</i> ”)
Ex-1008	U.S. Patent No. 7,502,643 (“ <i>Farrington</i> ”)
Ex-1009	EUAN A. ASHLEY & JOSEF NIEBAUER, CARDIOLOGY EXPLAINED (2004) (“ <i>Cardiology Explained</i> ”)
Ex-1010	U.S. Patent No. 5,184,620 (“ <i>Cudahy</i> ”)
Ex-1011	U.S. Patent No. 6,847,836 (“ <i>Sujdak</i> ”)
Ex-1012	U.S. Patent No. 4,606,352 (“ <i>Geddes</i> ”)
Ex-1013	U.S. Patent No. 6,522,915 (“ <i>Ceballos</i> ”)
Ex-1014	U.S. Patent No. 4,635,646 (“ <i>Gilles</i> ”)
Ex-1015	U.S. Patent No. 5,623,926 (“ <i>Weiss</i> ”)
Ex-1016	Complaint, <i>Apple Inc. v. AliveCor, Inc.</i> , Case No. 4:22-cv-07608-HSG, Dkt. No. 1 (N.D. Cal. , Dec. 12, 2022)
Ex-1017	U.S. Patent No. 7,876,274 (“ <i>Hobson</i> ”)
Ex-1020	U.S. Patent Application Publication No. 2008/0113650 (“ <i>Engstrom</i> ”)

10. I also reviewed any other materials I refer to in this Second Declaration in support of my opinions.

11. My opinions contained in this Second Declaration are based on the documents I reviewed and my knowledge and professional judgment. My opinions have also been guided by my appreciation of how a person of ordinary skill in the art would have understood the state of the art, the prior art, and the proposed

substitute claims and the specification of the '257 patent at the time of the alleged invention.

IV. LEGAL STANDARDS

12. AliveCor's attorneys have explained to me the legal standards that apply in this case. My understanding of those standards is described below. I am not an attorney, and I do not have formal training in the law regarding patents. I have used my understanding of the following legal principles set forth in this section in reaching my opinions.

13. I understand that, in this proceeding, AliveCor has the burden of proving that the challenged claims are invalid by a preponderance of the evidence.

A. Anticipation

14. I have been informed that a claim is invalid as anticipated under 35 U.S.C. § 102 (pre-AIA) if a prior art reference discloses, either expressly or inherently, all limitations of a claim as those limitations are arranged in the claim.

15. I have been informed that a limitation is disclosed inherently in a reference if it is necessarily present in the process or product described in the prior art reference. I understand that probabilities or possibilities are insufficient to show that a prior art reference inherently discloses something beyond what it discloses explicitly.

B. Obviousness

16. I have been informed that a claim is invalid as obvious under 35 U.S.C.

AliveCor Exhibit 1021

AliveCor, Inc. v. Apple Inc.

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§ 103 (pre-AIA) if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time of the invention to a person of ordinary skill in the art. I have been informed that the following matters are relevant to determining whether the claimed invention would have been obvious: (1) the scope and content of the prior art, (2) the difference or differences between the patent claim and the prior art, (3) the level of ordinary skill in the art at the time the invention of the patent, and (4) any secondary considerations or objective indicia of non-obviousness.

17. 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. When a claim simply arranges prior art elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, then such a combination is obvious. When a patent claims a structure already known in the prior art altered by the mere substitution of one element for another known in the field, the combination is likely to be obvious unless the combination yields an unpredictable result.

18. I have been informed that when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill in the art can implement a predictable variation, such a variation is likely unpatentable. For the

same reason, if a technique has been used to improve one device, and one of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. One question to consider is whether the improvement is more than predictably using prior art elements according to their established functions.

19. I have been informed that it may often be necessary, in a validity analysis, to consider whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. This can be accomplished by looking to interrelated teachings of multiple patents or other publications or pieces of prior art; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by one of ordinary skill in the art.

20. I have been informed that a validity analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim; it is appropriate to take account of the inferences and creative steps that a person of ordinary skill in the art would employ. I have been informed that a person of ordinary skill in the art is a person of ordinary creativity, not an automaton.

21. I have been informed that a claim composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art. I have been informed that it can be important to identify a

reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does. I have been informed that one way that subject matter can be proved obvious is by noting there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims. I have been informed that any need or problem known in the field of endeavor at the time of the claimed invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

22. I have been informed that one should not assume that a person of ordinary skill in the art attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem. Instead, I have been informed that since familiar items may have obvious uses beyond their primary purposes, in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple prior art references together like pieces of a puzzle.

23. I have been informed that, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, persons of ordinary skill in the art have good reason to pursue the known options within their technical grasp. If this leads to the anticipated success, the product was likely not accomplished by innovation but by using ordinary skill and common sense. I have been informed that, in such an instance, the fact that the

combination was obvious to try may show that the combination was obvious.

24. I have been informed that, when determining whether a claimed combination would have been obvious, the correct analysis is not whether a person of ordinary skill in the art, writing on a blank slate, would have chosen the particular combination of elements described in the claim. Instead, I have been informed that the correct analysis considers whether one of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to selecting the combination claimed.

25. I have been informed that, when determining whether a claimed invention is obvious, any “secondary considerations” of non-obviousness identified by the patentee should also be considered. These secondary considerations can include:

- commercial success of the invention, causally related to the invention itself rather than to companion factors, such as advertising or attractive packaging;
- the invention taught away from the technical direction followed by those skilled in the art;
- a long-felt but unsatisfied need for the invention while the needed implementing arts and elements had long been available;
- the invention achieves results unexpected to those skilled in the art;

- copying of the invention by competitors as distinguished from their independent development
- unsuccessful attempts by those skilled in the art to make the invention;
- acquiescence by the industry to the patent's validity by honoring the patent through taking licenses or not infringing the patent, or both; and
- skepticism, disbelief in or incredulity by those skilled in the art that the patentee's approach worked.

26. I have been informed that, for the above information to impact the obviousness of a patent claim, there must be a nexus between the alleged secondary considerations and the claims. In addition, I have been informed that the burden of introducing evidence of secondary considerations generally is on the Patent Owner. If the Patent Owner or its expert should assert secondary considerations of non-obviousness, I reserve the right to provide a Declaration addressing assertions of non-obviousness due to secondary considerations.

C. Claim Construction

27. I have been informed that claim terms are typically given their plain and ordinary meanings, as would have been understood by a person of ordinary skill in the art at the time of the earliest alleged priority date. I have further been informed that when considering the meaning of any terms in the challenged claims of the '257

patent, I should apply the plain and ordinary meaning of those terms. I have further been informed that in considering the meaning of the claims, one must consider the language of the claims, the specification, and the prosecution history of record.

28. I have been informed that in general, a preamble limits the invention if it recites essential structure or steps, or if it is necessary to give life, meaning, and vitality to the claim. I have further been informed that a preamble is not limiting where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention. I have further been informed that dependence on a particular disputed preamble phrase for antecedent basis may limit claim scope because it indicates a reliance on both the preamble and claim body to define the claimed invention. I have further been informed that clear reliance on the preamble during prosecution to distinguish the claimed invention from the prior art transforms the preamble into a claim limitation because such reliance indicates use of the preamble to define, in part, the claimed invention.

D. Indefiniteness

29. I have been informed that a claim is invalid as indefinite under 35 U.S.C. § 112 (pre-AIA) if the claim, viewed in light of the specification and prosecution history, fails to inform those skilled in the art about the scope of the invention with reasonable certainty.

30. I have been informed that a term of degree is indefinite when guidance as to the scope of the claims is lacking, and the written description is the key to determining whether a term of degree is indefinite. I have been informed that examples in the written description may provide sufficient detail to render claim scope reasonably certain.

V. PERSON OF ORDINARY SKILL IN THE ART AND THE TIME OF THE ALLEGED INVENTION

31. I have been asked to assume that the '257 patent is entitled to its earliest alleged priority date of November 5, 2008 (*see* Ex-1001, 1 (“Cross-Reference to Related Application” section)). Based on my knowledge and experience, I was a person of ordinary skill in the art (“POSITA”) as of November 5, 2008 and can provide opinions regarding the knowledge of a person of ordinary skill in the art as of that time. My opinions herein are, where appropriate, based on my understandings as to a person of ordinary skill in the art at that time.

32. In my analysis, the level of skill of a POSITA remains the same as in my earlier Declaration, Ex-1003. A POSITA at the time of the alleged invention of the '257 patent would have been a person with a working knowledge of physiological monitoring technologies. That person would have had a Bachelor of Science degree in an academic discipline emphasizing the design of electrical, computer, or software technologies, in combination with training or at least one to two years of related work experience with capture and processing of data or

information, including but not limited to physiological monitoring technologies. Alternatively, that person could have also had a Master of Science degree in a relevant academic discipline with less than a year of related work experience in the same discipline. More education can supplement practical experience and *vice versa*. I myself had these capabilities at the time of the alleged invention of the '257 patent.

VI. TECHNICAL BACKGROUND

33. I incorporate by reference Section VI (“Technical Background”) in my earlier Declaration, Ex-1003.

VII. SUMMARY OF THE '257 PATENT

A. The '257 Patent's Specification

34. I incorporate by reference Section VII.A (“The '257 Patent's Specification”) in my earlier Declaration, Ex-1003.

B. The '257 Patent's Prosecution History

35. I incorporate by reference Section VII.B (“The '257 Patent's Prosecution History”) in my earlier Declaration, Ex-1003.

36. Furthermore, *Engstrom* (Ex-1020) was identified in Applicant's information disclosure statement and considered by the Examiner during prosecution (Ex-1002 at 106, 183).

VIII. SUMMARY OF ADDITIONAL KNOWN PRIOR ART

A. *Engstrom* (Ex-1020)

37. United States Patent Application Publication No. 2008/0113650 (“*Engstrom*,” Ex-1020) is titled “Wireless Mobile Phone with Authenticated Mode of Operation Including Heart Beat Profile Based Authentication.”

38. *Engstrom* was published on May 15, 2008 (Ex-1020, Cover). Consequently, I have been informed that I should assume *Engstrom* is prior art under at least 35 U.S.C. §§ 102(a) (pre-AIA).

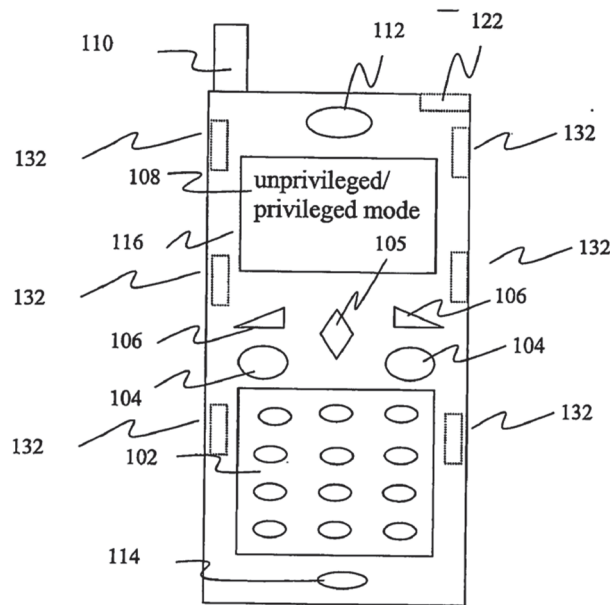
39. *Engstrom* was identified in Applicant’s information disclosure statement and considered by the Examiner during prosecution (Ex-1002 at 106, 183). Therefore, along with the prior art discussed in my earlier Declaration, Ex-1003, *Engstrom* is prior art known to Apple.

40. *Engstrom* discloses “a wireless mobile phone [that] is equipped to operate in an unauthenticated and an authenticated mode of operation” (Ex-1020, Abstract). “More specifically, the present invention is related to a wireless mobile phone having an authenticated mode of operation available only to an authenticated user, in particular, a user authenticated via a heart beat profile of the user” (Ex-1020, [0004]).

41. According to *Engstrom*, “authentication is performed by comparing the real time captured heart beat profile against a reference heart beat profile.” (Ex-1020, Abstract).

42. *Engstrom*’s device “includes a number of sensors to enable a user’s heart beat profile to be captured and be used for authentication” (Ex-1020, Abstract). Specifically, the phone in *Engstrom* is “advantageously equipped with sensors 132 to facilitate real time capturing of heart beat profile of the user” (Ex-1020, [0026]). *Engstrom* discloses an array of sensors “disposed along and underneath the side surfaces of phone 100” (Ex-1020, [0029]). *Engstrom*’s phone is depicted in Figure 1, below:

Ex-1020, Fig. 1



IX. KNOWN PRIOR ART RENDERS OBVIOUS SUBSTITUTE CLAIMS 23-29

43. Apple's proposed substitute claims depend from original claims 1 and 12 (*see* Appendix A). In my earlier declaration, Ex-1003, I explained how original claims 1 and 12 are unpatentable as obvious based on the following Grounds: (1) *Markel* (Ex-1005), (2) *Markel* in view of *Nissilä* (Ex-1006), or (3) *Markel* in view of *Nissilä* and/or *Righter* (Ex-1007) (Ex-1003, Sections IX.A, IX.B, IX.C). In this Declaration, therefore, I only address the additional limitations of the proposed substitute claims.

44. It is my opinion that the proposed substitute claims would also have been obvious over *Markel* alone and/or in view of *Nissilä* (Grounds 1 and 2). In addition, substitute claims 24-25 and 27-29 would have been obvious over *Markel* in view of *Nissilä* and/or *Engstrom*.

A. Motivation to Combine *Markel* with *Nissilä* and/or *Engstrom*

45. *First*, a POSITA would have been motivated to combine *Markel*'s electronic device with *Nissilä*'s electrode structure for the reasons explained in my earlier Declaration (*see* Ex-1003, ¶¶ 351-55).

46. *Second*, a POSITA would have been motivated to combine *Markel*'s electronic device with *Engstrom*'s electrode placement. To begin with, *Markel* and *Engstrom* are directed to the same technical field of personal heart sensors. *Markel* is directed to "mobile communication dcevice[s] . . . with cardiovascular monitoring

capability” (Ex-1005, [0004]). *Engstrom* is directed to a phone that “includes a number of sensors to enable a user’s heart beat profile to be captured” (Ex-1020, Abstract).

47. Moreover, a POSITA would have been motivated to combine the electrode placement of *Engstrom* with the mobile device of *Markel* to accomplish *Markel*’s goal of best positioning the electrodes to “contact a user during normal (or typical) use” of the device (Ex-1005, [0041]). Specifically, *Engstrom*’s device is “advantageously equipped with sensors 132 to facilitate real time capturing of heart beat profile of the user” (Ex-1020, [0026]). Indeed, *Engstrom* provides for sensors that can be used by left or right hand and includes the ability to dynamically discern between the appropriate sensors to obtain measurement (Ex. 1020, [0029]).

48. Furthermore, both *Markel* and *Engstrom* contemplate user authentication based on cardiac information. *Markel* discloses that the “cardiac information acquisition module 1710 may also, for example, be adapted to identify the user of the MCD 1700” Ex-1005, [0097]. *Engstrom* teaches that a “wireless mobile phone includes a number of sensors to enable a user’s heart beat profile to be captured and be used for authentication.” Ex-1020, Abstract. A POSITA would have looked to *Engstrom* to better understand how to implement user authentication based on detected heart characteristics.

49. A POSITA would have had a reasonable expectation of success in combining the “operating logic 240” of *Engstrom* with the “cardiac acquisition module” of *Markel*, because the operating logic of *Engstrom* can be “implemented in firmware and/or hardware” (Ex-1020, [0046]) and the cardiac acquisition module of *Markel* “may be implemented in hardware, software, or a combination thereof” (Ex-1005, [0179]).

50. A POSITA would also have a reasonable expectation of success in combining *Markel* and *Engstrom* because they share relevant similarities in the structure of the disclosed communication devices. For example, both *Markel* and *Engstrom* describe a display, an audio output element, alphanumeric input buttons, “talk” and “end” buttons, and a scroll button (Ex-1005, [0042]; Ex-1020, [0034]).

B. Proposed Substitute Claim 23 Is Obvious Over *Markel* Alone and/or in view of *Nissilä*

51. *Markel* alone and/or in view of *Nissilä* renders obvious substitute claim 23.

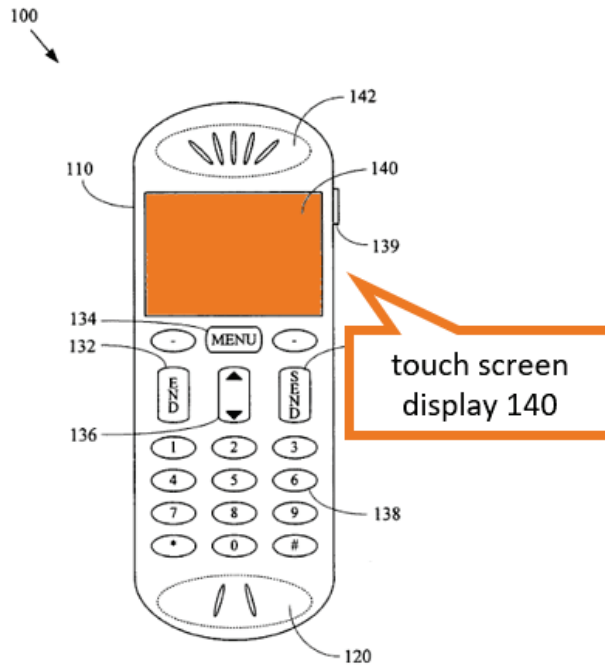
Claim 23, Element [23.a]: a touch screen display:

52. *Markel* alone and/or in view of *Nissilä* renders obvious substitute claim element [23.a].

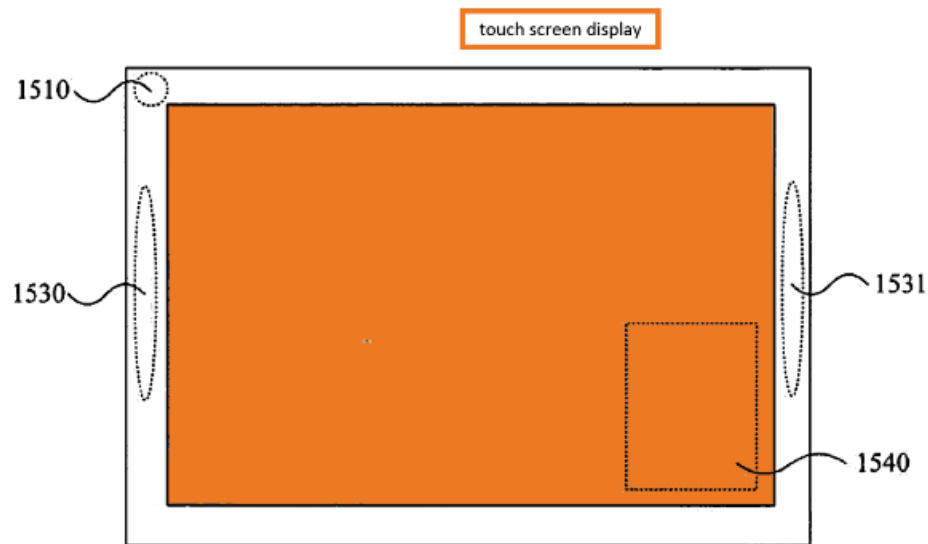
53. *Markel* teaches that the “display 140” of *Markel*’s “MCD100” can function as a “touch screen input feature” (Ex.1005, [0034]). *Markel*’s Figure 4, which is discussed in the Petition, discloses a non-limiting example of electrode

placement for MCD100. (Ex-1005, [0045]). Thus, the embodiment in *Markel*'s Figure 4 teaches claim element [23.a].

Ex-1005, Fig. 1 (annotated)



54. In addition, *Markel* teaches that teachings related to Figure 4 can “apply to user interfaces discussed herein,” including Figure 15 (Ex-1005, [0068]). A POSITA would have been motivated to incorporate the teachings of *Markel*'s Figure 15 in *Markel*'s Figure 4. In particular, Figure 15 discloses a video display device 1500 that has a touch screen display. Ex-1005, [0034], [0078]. As applied to *Markel*'s Figure 4, *Markel*'s Figure 15 renders obvious substitute claim element [23.a].



55. Thus, *Markel* alone and/or in view of *Nissilä* renders obvious substitute claim element [23.a].

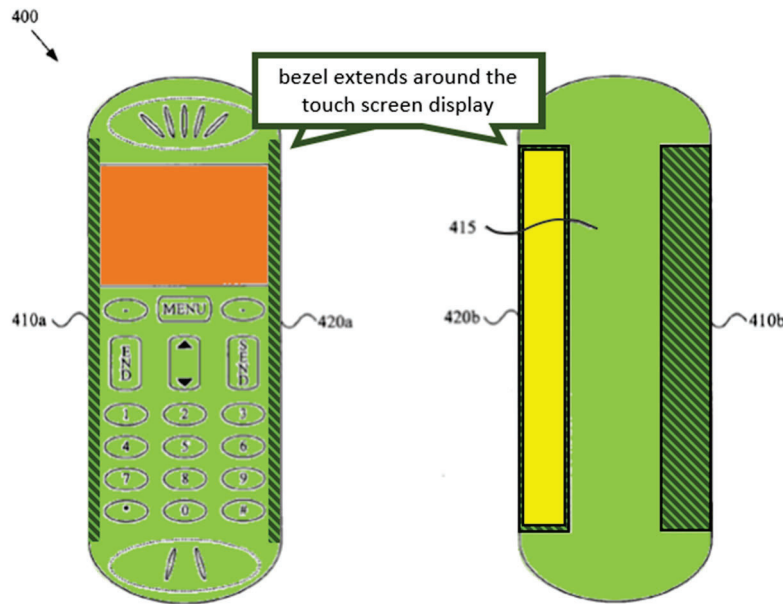
Claim 23, Element [23.b]: wherein the bezel extends around the touch screen display; and

56. *Markel* alone and/or in view of *Nissilä* renders obvious substitute claim element [23.b].

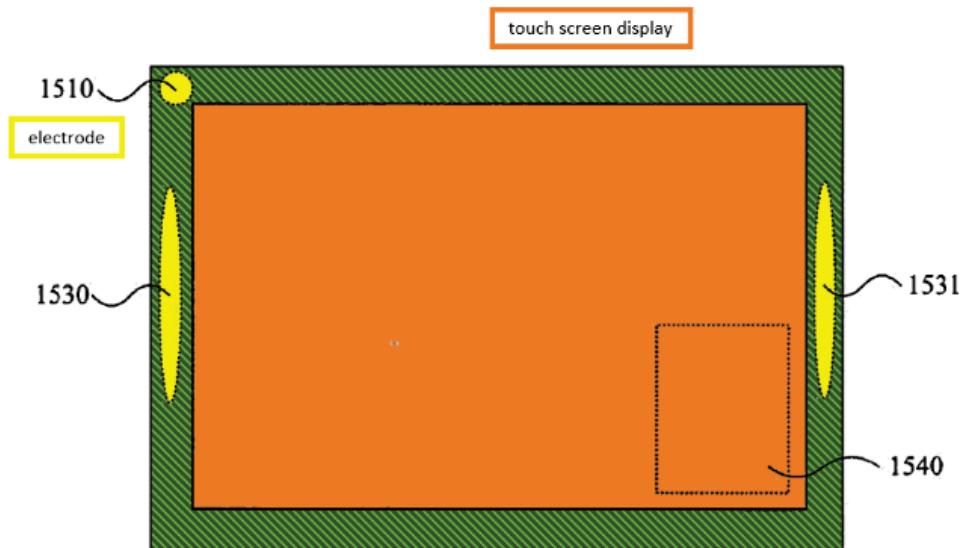
57. As discussed in my earlier Declaration, the “right side portion” of *Markel*’s Figure 4 is “like a bezel” (Ex-1003, ¶¶ 251-52). Specifically, I explained *Markel* teaches that “an electrode may be disposed on a video display device 140 (e.g., a *border* of the display or integrated into a touch screen)” (Ex-1005, [0044] (emphasis added)). A POSITA would have been motivated to extend the edges of *Markel*’s “second electrode” in 420b so that they reached the “border of the display”

(i.e., bezel) because this would have created additional contact area (Ex-1003, ¶ 251). A POSITA would understand that the “border of the display” extends around the display 140. Thus, *Markel*’s Figure 4 renders obvious element [23.b].

Ex-1005, Fig. 4 (annotated)



58. In addition, *Markel*’s Figure 15 further discloses a bezel that extends around a touch screen display. *Markel* teaches that “display device 1500 may, for example, comprise an electrode 1510 *on a border portion* of the display device 1500” (Ex-1005, [0078] (emphasis added)). The “border portion” of the display in Figure 15 extends around the touch screen display. Thus, as applied to *Markel*’s Figure 4, *Markel*’s Figure 15 renders obvious element [23.b].



59. Furthermore, Markel’s Figure 15 discloses electrodes on two sides of the device, like Figure 4 (Ex. 1005, [0078] (“an electrode 1530 on a first side of the display device 1500” and “an electrode 1531 on a second side of the display device 1500”)). As shown above, the sides of the display device “extend around the touch screen,” like a bezel. Thus, Markel’s Figure 15 renders obvious claim element [23.b].

60. Thus, *Markel* alone and/or in view of *Nissilä* renders obvious substitute claim element [23.b].

Claim 23, Element [23.c]: wherein the first pad is embedded in an inner surface of the bezel.

61. *Markel* alone and/or in view of *Nissilä* renders obvious substitute claim element [23.c].

62. As discussed in my earlier Declaration, Ex-1003, *Markel* alone and/or in view of *Nissilä* renders obvious (1) a first pad that is embedded in a first portion of the enclosure (Ex-1003, ¶¶ 119-20, 357-58), (2) the first pad is positioned underneath the exterior surface of the first portion (Ex-1003, ¶¶ 126-40, 357-58), and (3) the first portion of the enclosure is a bezel (Ex-1003, ¶¶ 248-252). Thus, *Markel* alone and/or *Nissilä* renders obvious a first pad that is both embedded in a bezel *and* underneath the exterior surface of the bezel. Therefore, to be both embedded in and underneath the bezel, it would have been obvious to a POSITA that the first pad is embedded in an inner surface of the bezel.

63. As discussed in my earlier Declaration, Ex-1003, a lead comprises both the electrode and the associated wiring (*see, e.g.*, Ex-1003, ¶ 118). A POSITA would have been motivated to embed the pad of the electrode on the inner surface of the bezel in order to simultaneously (1) create an electrically conductive connection between the pad and the outer portion of the enclosure, and (2) ensure that the pad is accessible to the components inside the enclosure, including the associated wiring necessary to complete the electrical circuit and connect the pad to the cardiac acquisition module of *Markel*.

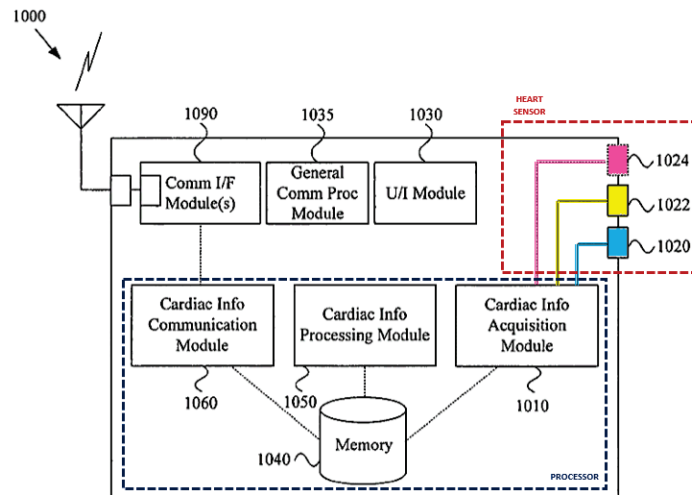


Figure 10

64. Thus, *Markel* alone and/or in view of *Nissilä* renders obvious substitute claim element [23.c].

C. Proposed Substitute Claim 24 Is Obvious Over *Markel* Alone and/or in view of *Nissilä* and/or *Engstrom*

65. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim 24.

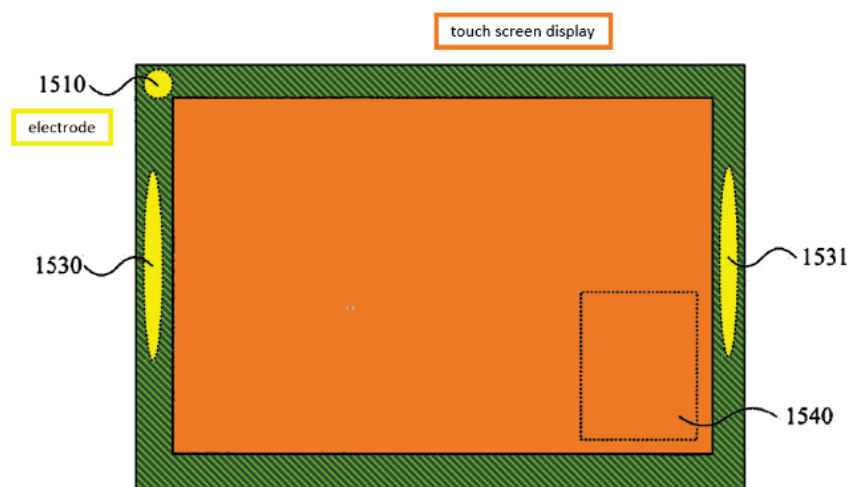
Claim 24, Element [24.a]: a third lead comprising a third pad that is embedded in the second portion of the enclosure, wherein the third pad is configured to detect a third electrical signal of the user's cardiac signal via the user's skin's contact with the third pad; and

66. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [24.a].

67. *Markel* teaches that “more than two electrodes might be utilized” (Ex-1005, [0051]). For example, a POSITA would be motivated to build a device with more than two electrodes in order to simultaneously record the electrical potential difference between two hands while at the same time measuring other cardiac signals with a third electrode. Thus, a POSITA would have been motivated to add additional electrode pads to the “left side portion 410” of *Markel*’s Figure 4, which corresponds to the second portion of the enclosure, in order to provide additional points of contact for the user. *Markel*’s Figure 4 renders obvious substitute claim element [24.a].

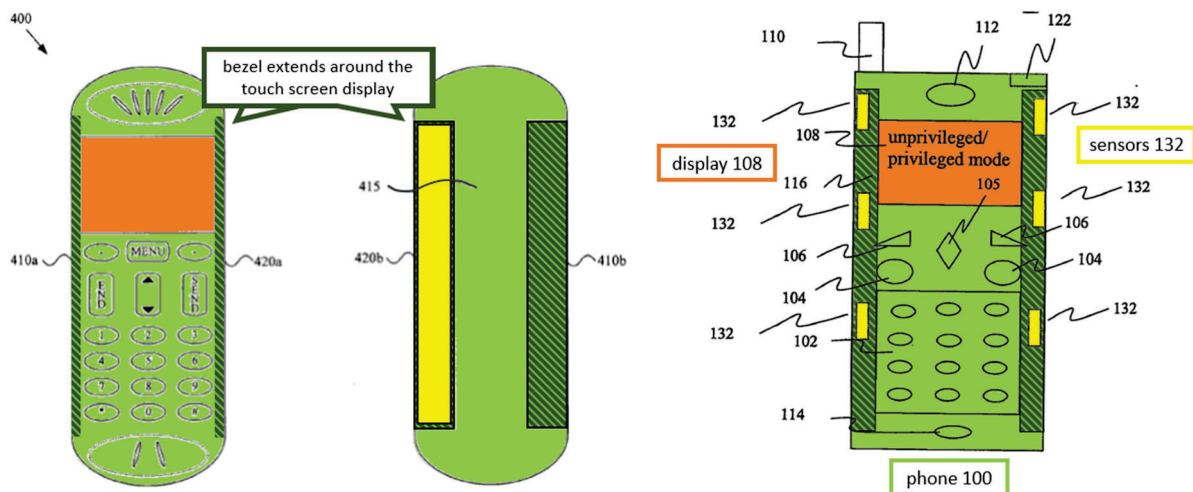
68. In addition, *Markel*’s Figure 15 discloses two electrodes on the left side portion of the device. Thus, the pads of electrode 1310 and electrode 1330 are embedded in the same portion of the enclosure, and *Markel*’s Figure 15, as applied to *Markel*’s Figure 4, renders obvious substitute claim element [24.a].

Ex-1005, Fig. 15 (annotated)



69. To the extent a POSITA sought additional detail on placement of another pad, that POSITA would have turned to *Engstrom*, which teaches electrode placement that “advantageously . . . facilitate[s] real time capturing of a heart beat profile of the user” (Ex-1020, [0026]). Specifically, *Engstrom* teaches that “sensors 132 are disposed along and underneath the side surfaces of phone 100” (Ex-1020, [0029]). As shown below (next to *Markel*’s Figure 4), *Engstrom*’s Figure 1 shows two electrode pads embedded in the left side portion of the phone. Thus, a POSITA would have been motivated to place a third pad in the “left side portion” of *Markel*, and the combination renders obvious substitute claim element [24.a].

Ex-1005, Fig. 4 (annotated); Ex-1020, Fig. 1 (annotated)



70. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [24.a].

Claim 24, Element [24.b]: wherein the second pad is configured to detect the second electrical signal of the user's cardiac signal via the user's skin's contact with the second pad;

71. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [24.b].

72. As I discussed in my earlier Declaration, Ex-1003, the second pad can be configured to detect the user's cardiac signal via the user's skin's contact with the second pad (Ex-1003, ¶ 244 (discussing claim 11)).

73. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [24.b].

Claim 24, Element [24.c]: wherein the first pad detects signals through a first hand, and the second and third pads detect signals through a second hand.

74. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [24.c].

75. *Markel* teaches that placement of electrodes “provide[s] for convenient access for a user to contact both the first and second electrodes simultaneously (e.g., with different hands or different fingers)” (Ex-1005, [0049]). Further, as discussed in my earlier Declaration, Ex-1003, an ECG is a measure of the difference in electrical activity between two points (Ex-1003, ¶ 49). It would have been obvious to a POSITA to take a measurement between the first and second hand because that would result in a measurement that goes across the heart. It also would have been

obvious to a POSITA to contact the second and third pads with the same hand because they are in the same portion of the enclosure. Thus, claim element [24.c] would have been obvious to a POSITA in view of *Markel*.

76. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [24.c].

D. Proposed Substitute Claim 25 Is Obvious Over *Markel* Alone and/or in view of *Nissilä* and/or *Engstrom*

77. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim 25.

Claim 25, Element [25.a]: The electronic device of Claim 24, wherein the second and third pads are adjacent pads; and

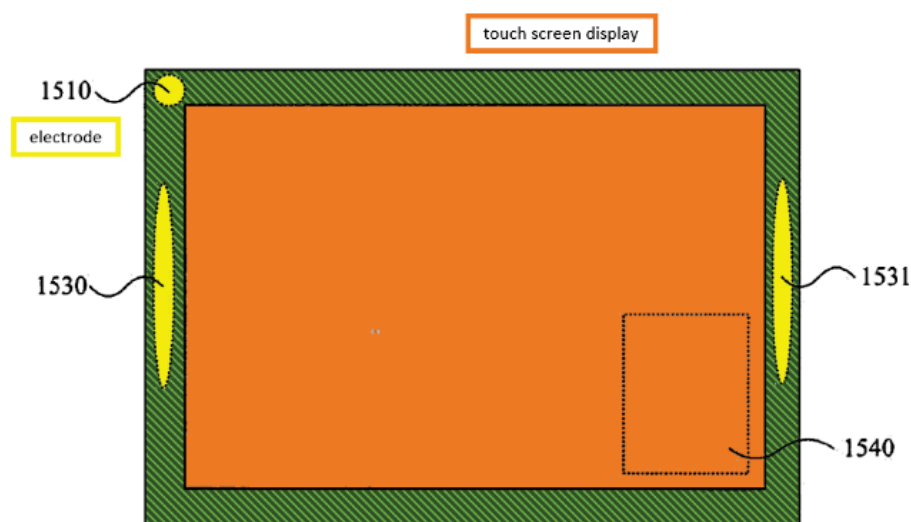
78. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [25.a].

79. As an initial matter, and as explained further in Section X, it is my opinion that the specification and prosecution history fail to provide reasonable guidance as to scope of the term “adjacent.” But I have been informed that Apple has relied on at least ¶[0010] of Ex-2011 as providing written description support for claim 25. This paragraph states: “the distance along the enclosure between adjacent leads can be sufficient to isolate the leads” (Ex-2011, [0010]). For purposes of analyzing this claim element in view of the prior art, therefore, I have interpreted

“adjacent” to include, at a minimum, pads that are separated by a distance that is sufficient to electrically isolate the pads.

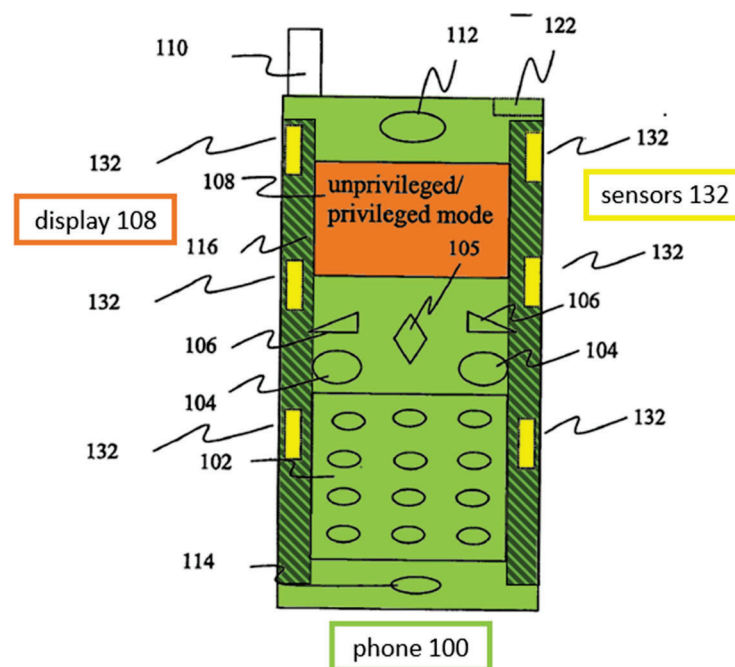
80. As shown in *Markel’s* Figure 15, electrodes 1510 and 1530 on the left side portion comprise pads that are separated by a distance along the enclosure that is sufficient to electrically isolate the pads. As discussed in my earlier Declaration, Ex-1003, a POSITA would have known that electrodes need to be electrically isolated in order to detect different cardiac signals and avoid being short circuited (Ex-1003, ¶ 175). Thus, I understand that the electrode pads of electrodes 1510 and 1530 are adjacent. To the extent Apple argues that electrodes 1510 and 1530 are not adjacent for any reason, then the scope of the term is not reasonably certain to a POSITA (*See infra* Section X). Thus, as applied to *Markel’s* Figure 4, *Markel’s* Figure 15 renders obvious substitute claim element [25.a].

Ex-1005, Fig. 15 (annotated)



81. In addition, *Engstrom*'s sensors 132 on the left side portion of the device are separated by a distance along the enclosure that is sufficient to electrically isolate the pads. As discussed in my earlier Declaration, Ex-1003, a POSITA would have known that electrodes need to be electrically isolated in order to detect different cardiac signals and avoid being short circuited (Ex-1003, ¶ 175). Thus, I understand that *Engstrom*'s sensors 132 on the left side portion of the device are adjacent. To the extent Apple argues that electrodes 1510 and 1530 are not adjacent for any reason, then the scope of the term is not reasonably certain to a POSITA (*See infra* Section X). Thus, *Engstrom* renders obvious substitute claim element [25.a].

Ex-1020, Fig. 1 (annotated)



82. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [25.a].

Claim 25, Element [25.b]: wherein an electrically isolating component is inserted between the second and third pads.

83. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [25.b].

84. *Markel* teaches an insulating region between electrodes (Ex-1005, [0045], [0047]). Further, as discussed in my earlier Declaration, Ex-1003, a POSITA would have known that electrodes need to be electrically isolated in order to detect different cardiac signals and avoid being short circuited (Ex-1003, ¶ 175). If there is no isolating or insulating region between pads, a POSITA would understand that they are functionally the same pad. Thus, claim element [25.b] would have been obvious.

85. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [25.b].

E. Proposed Substitute Claim 26 Is Obvious Over *Markel* Alone and/or in View of *Nissilä*

Claim 26, Element [26.a]: wherein the first pad is embedded in an inner surface of an electronically conductive metal bezel that forms a portion of an exterior surface of the electronic device;

Claim 26, Element [26.b]: and wherein the second pad is exposed on the exterior surface of the electronic device for direct contact from a user.

86. *Markel* alone and/or in view of *Nissilä* renders obvious substitute claim elements [26.a] and [26.b].

87. As discussed above with respect to substitute claim 23, it would have been obvious to a POSITA to embed the first pad on the inner surface of the bezel. Further, a POSITA would have found it obvious to make the bezel from a metallic conductive material because, like conductive plastic in *Markel*, conductive metal “may provide sufficient conductivity for an electrode to perform adequately” (Ex-1005, [0037]). A POSITA would also have known that metals, such as aluminum and steel, were regularly used in the construction of mobile devices. A POSITA would have constructed the bezel from metal because it can be more aesthetically pleasing than plastic and it would provide a protective barrier around the display. Thus, *Markel* renders obvious substitute claim element [26.a]

88. A POSITA would have had a reasonable expectation of success in making *Markel*’s bezel out of a metal instead of plastic in view of *Nissilä*, which teaches that the outer “membrane 119” of the electrode structure can be made of

“metal, electrically conductive plastic or a similar conductive material” (Ex. 1006, 5:33-38). Thus, *Nissilä* further renders obvious claim element [26.a].

89. As discussed in my earlier Declaration, Ex-1003, the second pad can be configured to detect the user’s cardiac signal via the user’s skin’s contact with the second pad (Ex-1003, ¶244 (discussing claim 11)). Thus, *Markel* renders obvious substitute claim element [26.b].

90. Thus, *Markel* alone and/or in view of *Nissilä* renders obvious substitute claim elements [26.a] and [26.b].

F. Proposed Substitute Claim 27 Is Obvious Over *Markel* Alone and/or in View of *Nissilä* and/or *Engstrom*

Claim 27, Element [27.a]: wherein the processor is further configured to extract one or more characteristics of the detected cardiac signal and compare the extracted one or more characteristics with one or more characteristics previously stored in memory that were associated with an authorized user;

Claim 27, Element [27.b]: and wherein if the extracted one or more characteristics match those of an authorized user, the electronic device authenticates the user.

91. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim elements [27.a] and [27.b].

92. As an initial matter, the ’257 patent’s “Background of the Invention” section indicates that it was known that “an electronic device can authenticate a user based on the attributes of the user's heartbeat” (Ex-1001, 1:49-2:3).

93. Furthermore, *Markel* teaches that the “cardiac information acquisition module 1710 may also, for example, be adapted to identify the user of the MCD 1700. For example, such identification (or authentication) may be utilized in an exemplary scenario where a variety of users may be utilizing the MCD 1700” (Ex-1005, [0097]). The mobile communication device in *Markel*’s Figure 17 “share[s] various characteristics with the mobile communication devices, and other exemplary devices, illustrated in FIGS. 1-16,” including Figures 4, 6, 10, and 15 discussed here and in my earlier Declaration, Ex-1003. Thus, *Markel* renders obvious a processor configured to authenticate a user based on one or more characteristics of the user’s cardiac signal.

94. To the extent a POSITA sought additional detail on implementation of authentication technology based on cardiac signals, that POSITA would have turned to *Engstrom*, which discloses a “wireless mobile phone [that] is equipped to operate in an unauthenticated and an authenticated mode of operation” (Ex-1020, Abstract). A POSITA would have had a reasonable expectation of success in combining the “operating logic 240” of *Engstrom* with the “cardiac acquisition module” of *Markel*, because the operating logic of *Engstrom* can be “implemented in firmware and/or hardware” (Ex-1020, [0046]) and the cardiac acquisition module of *Markel* “may be implemented in hardware, software, or a combination thereof” (Ex-1005, [0179]).

95. *Engstrom* teaches that “operating logic 240” “automatically invoke[s] sensors 132 to capture heart beat profile of the user real time” (Ex-1020, [0027]). The “heart beat profile” corresponds to the “characteristics of the cardiac signal.” Thus, *Engstrom*’s “operating logic 240” is “configured to extract one or more characteristics of the detected cardiac signal” as claimed.

96. *Engstrom* further teaches that “authentication is performed by **comparing** the real time captured heart beat profile against a reference heart beat profile” (Ex-1020, Abstract (emphasis added)). The “reference heart beat profile” corresponds to the “characteristics previously stored in memory that were associated with an authorized user” as claimed. The operating logic in *Engstrom* “the captur[es] of a heart beat profile of the user, and [saves] as a reference for subsequent analysis of a real time captured heart beat profile of the user to authenticate the user” (Ex-1020, [0031]). Thus, *Engstrom* teaches “compar[ing] the extracted one or more characteristics with one or more characteristics previously stored in memory that were associated with an authorized user.” Indeed, *Engstrom* teaches this limitation in a similar manner as the ’257 patent (Ex-1001, 1:49-2:3, 10:34-55).

97. Finally, *Engstrom* teaches “if the inputted heart beat profile substantially **matches** the previously saved reference heart beat profile . . . , operating logic 240 . . . enables phone 100 to operate in the authenticated mode” (Ex-1020, [0056]). Thus, *Engstrom* teaches “wherein if the extracted one or more

characteristics match those of an authorized user, the electronic device authenticates the user.”

98. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim elements [27.a] and [27.b].

G. Proposed Substitute Claim 28 Is Obvious Over *Markel* Alone and/or in View of *Nissilä* and/or *Engstrom*

99. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim 28.

Claim 28, Element [28.a]: wherein the exterior surface of the enclosure comprises an exterior surface of the second portion, wherein the second pad is positioned underneath the exterior surface of the second portion of the enclosure;

100. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [28.a].

101. For the same reasons claim elements [1.c.i], [1.c.ii], [1.c.iii], and claim 10 are obvious in view of *Markel* alone and/or in view of *Nissilä*, claim element [28.a] is obvious. I incorporate by reference the analysis in my earlier Declaration here (Ex-1003, ¶¶ 115-140, 236-40, 356-61).

102. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [28.a].

Claim 28, Element [28.b]: wherein the first and second pads are adjacent pads; and wherein an electrically isolating component is inserted between the first and second pads.

103. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [28.b].

104. Claim element [28.b] is obvious for the same reasons provided regarding substitute claim 25. I incorporate my above analysis in Section IX.D.

105. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [28.b].

H. Proposed Substitute Claim 29 Is Obvious Over *Markel* Alone and/or in View of *Nissilä* and/or *Engstrom*

106. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim 29.

Claim 29, Element [29.a]: wherein the first pad detects signals from a first hand and the second pad detects signals from a second hand;

107. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [29.a].

108. *Markel* teaches that placement of electrodes “provide[s] for convenient access for a user to contact both the first and second electrodes simultaneously (e.g., with different hands or different fingers)” (Ex-1005, [0049]). As discussed with respect to claim element [24.c], it would have been obvious to detect signals from two different hands. Thus, claim element [29.a] would have been obvious.

109. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders

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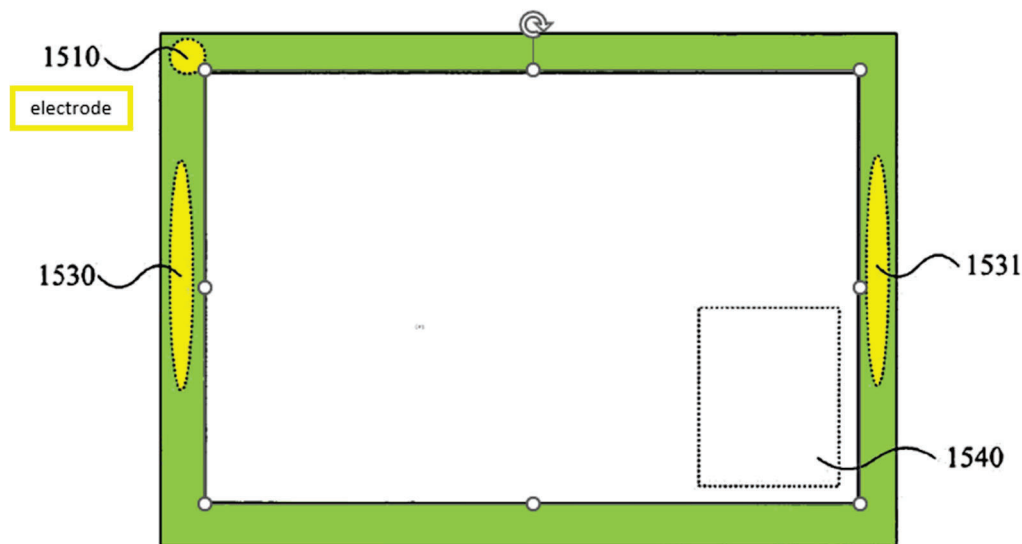
obvious substitute claim element [29.a].

Claim 29, Element [29.b]: wherein the first and second portions of the enclosure are located on a same face of the electronic device; and

110. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [29.b].

111. *Markel*'s Figure 15 discloses electrodes 1530 and 1510 that are both adjacent and located on the same face of the electronic device. Thus, *Markel*'s Figure 15 renders obvious substitute claim element [29.b].

Ex-1005, Fig. 15 (annotated)



112. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [29.b].

Claim 29, Element [29.c]: wherein the first and second portions of the enclosure each comprise metallic conductive portion exposed for direct user contact.

113. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [29.c].

114. As discussed in my earlier Declaration, Ex-1003, a POSITA would have understood the “main body portion” of *Markel* to be an enclosure (Ex-1003, ¶ 108-10). In addition, as discussed above with respect to substitute claim 26, a POSITA would have found it obvious to make the enclosure from a metallic conductive material because, like conductive plastic in *Markel*, conductive metal “may provide sufficient conductivity for an electrode to perform adequately” (Ex-1005, [0037]). A POSITA would also have known that metals, such as aluminum and steel, were regularly used in the construction of mobile devices (*see also* Ex-1005, [0181] (“In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from its scope.”)). A POSITA would have constructed the enclosure from metal because metal can be more aesthetically pleasing than plastic and it would provide a protective barrier around the device.

115. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim element [29.c].

X. PROPOSED SUBSTITUTE CLAIMS 25, 28, AND 29 ARE INDEFINITE

116. Substitute claims 25, 28, and 29 require two portions of the enclosure to be “adjacent.” The specification and prosecution history fail to provide reasonable guidance as to scope of the term “adjacent.” Although the specification provides an example of when leads *are* “adjacent” (i.e., when their “distance” is “sufficiently large” that they “cannot detect the same electrical signal” (Ex-1001, 9:52-57)), neither the specification nor prosecution history provide any examples of when leads are *no longer* “adjacent,” or how they may be positioned. Thus, the claim term is indefinite.

XI. CONCLUSION

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



Dated: June 26, 2024

Ronald D. Berger, M.D., Ph.D., F.H.R.S.

APPENDIX A - The Substitute Claims

Claim Element	Substitute Claim Language
Claim 23 (Substitute for claim 16, if found unpatentable)	
[23.pre]	The electronic device of claim 12,
[23.a]	further comprising a touch screen display,
[23.b]	wherein the bezel extends around the touch screen display; and
[23.c]	wherein the first pad is embedded in an inner surface of the bezel.
Claim 24 (Substitute for claim 17 if found unpatentable)	
[24.pre]	The electronic device of Claim 23, further comprising:
[24.a]	a third lead comprising a third pad that is embedded in the second portion of the enclosure, wherein the third pad is configured to detect a third electrical signal of the user's cardiac signal via the user's skin's contact with the third pad; and
[24.b]	wherein the second pad is configured to detect the second electrical signal of the user's cardiac signal via the user's skin's contact with the second pad;
[24.c]	wherein the first pad detects signals through a first hand, and the second and third pads detect signals through a second hand.
Claim 25 (Substitute for claim 18 if found unpatentable)	
[25.pre]	The electronic device of claim 24
[25.a]	wherein the second and third pads are adjacent pads; and
[25.b]	wherein an electrically isolating component is inserted between the second and third pads.
Claim 26 (Substitute for claim 19 if found unpatentable)	
[26.pre]	The electronic device of claim 1,
[26.a]	wherein the first pad is embedded in an inner surface of an electrically conductive metal bezel that forms a portion of an exterior surface of the electronic device; and

Claim Element	Substitute Claim Language
[26.b]	wherein the second pad is exposed on the exterior surface of the electronic device for direct contact from a user.
Claim 27 (Substitute for claim 20 if found unpatentable)	
[27.pre]	The electronic device of claim 1,
[27.a]	wherein the processor is further configured to extract one or more characteristics of the detected cardiac signal and compare the extracted one or more characteristics with one or more characteristics previously stored in memory that were associated with an authorized user; and
[27.b]	wherein if the extracted one or more characteristics match those of an authorized user, the electronic device authenticates the user.
Claim 28 (Substitute for claim 21 if found unpatentable)	
[28.pre]	The electronic device of claim 1,
[28.a]	wherein the exterior surface of the enclosure comprises an exterior surface of the second portion, wherein the second pad is positioned underneath the exterior surface of the second portion of the enclosure;
[28.b]	wherein the first and second pads are adjacent pads; and wherein an electrically isolating component is inserted between the first and second pads.
Claim 29 (Substitute for claim 22 if found unpatentable)	
[29.pre]	The electronic device of claim 28,
[29.a]	wherein the first pad detects signals from a first hand and the second pad detects signals from a second hand;
[29.b]	wherein the first and second portions of the enclosure are located on a same face of the electronic device; and
[29.c]	wherein the first and second portions of the enclosure each comprise a metallic conductive portion exposed for direct user contact.