

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

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

TABLE OF CONTENTS

I. INTRODUCTION.....	1
II. BACKGROUND AND QUALIFICATIONS	2
III. MATERIALS REVIEWED	2
IV. LEGAL STANDARDS	4
A. Anticipation.....	4
B. Obviousness	5
C. Claim Construction	10
D. Indefiniteness	11
V. PERSON OF ORDINARY SKILL IN THE ART AND THE TIME OF THE ALLEGED INVENTION.....	11
VI. TECHNICAL BACKGROUND	12
VII. SUMMARY OF THE '257 PATENT.....	12
A. The '257 Patent's Specification.....	12
B. The '257 Patent's Prosecution History	12
VIII. APPLE'S REVISED MOTION TO AMEND	13
IX. KNOWN PRIOR ART RENDERS OBVIOUS SUBSTITUTE CLAIMS 24-25 AND 27.....	15
A. Motivation to Combine <i>Markel</i> with <i>Nissilä</i> and/or <i>Engstrom</i> ..	16
B. Proposed Substitute Claims 24 and 25 Are Obvious Over <i>Markel</i> , <i>Nissilä</i> , and/or <i>Engstrom</i>	17
Claim 24, Element [24.a]: wherein the first pad is embedded in an inner surface of an electrically conductive metal bezel . . . : and	17

Claim 25, Element [25.c]: wherein the first pad is embedded in an inner surface of the bezel.....	17
C. Proposed Substitute Claim 27 Is Obvious Over <i>Markel</i> Alone and/or in View of <i>Nissilä</i> and/or <i>Engstrom</i>	20
Claim 27, Element [27.a]: wherein the detected cardiac signal is an electrocardiogram signal;	20
X. CONCLUSION.....	24
APPENDIX A – The Substitute Claims	25

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 Third Declaration on behalf of Petitioner.

2. I understand that Apple moved to amend certain claims of the ’257 patent in the event that the Board finds that certain of the of original claims is unpatentable. I submitted my Second Declaration to address the patentability of the substitute claims in Apple’s original motion to amend (Ex-1021). I understand that the Board provided preliminary guidance on Apple’s motion. I also understand that Apple has filed a revised motion to amend (“RMTA”), changing the dependency of the proposed substitute claims, abandoning certain substitute claims, and adding a new limitation.

3. I have been asked to analyze whether, in view of the revisions made in

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 and other papers filed in this proceeding.

Apple's RMTA, certain references disclose or render obvious the features recited in Apple's proposed substitute claims 23-27 ("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 the substitute claims.

4. 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.

5. All of my opinions stated in this Third 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 Third Declaration.

II. BACKGROUND AND QUALIFICATIONS

6. I incorporate my background and qualifications set forth in my earlier Declaration, Ex-1003 ("First Declaration").

III. MATERIALS REVIEWED

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

8. In forming my opinions expressed in this Third 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>Righter</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> ”)
APPLE-2017	U.S. Patent App. Ser. No. 12/358,905
APPLE-2018	Transcript of July 26, 2024 Deposition of Dr. Ronald D. Berger

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

10. My opinions contained in this Third 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

11. 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.

12. 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

13. 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.

14. 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

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

16. 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.

17. 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.

18. 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.

19. 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.

20. 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.

21. 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.

22. 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.

23. 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.

24. 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.

25. 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

26. 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.

27. 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

28. 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.

29. 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

30. 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.

31. In my analysis, the level of skill of a POSITA remains the same as in

my First 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

32. I incorporate by reference Section VI ("Technical Background") in my First Declaration, Ex-1003.

VII. SUMMARY OF THE '257 PATENT

A. The '257 Patent's Specification

33. I incorporate by reference Section VII.A ("The '257 Patent's Specification") in my First Declaration, Ex-1003.

B. The '257 Patent's Prosecution History

34. I incorporate by reference Section VII.B ("The '257 Patent's Prosecution History") in my First Declaration, Ex-1003.

35. 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. APPLE'S REVISED MOTION TO AMEND

36. I understand that Apple contends that the new substitute claims 23-27 in Apple's RMTA were drafted to "include features drawn from the original substitute claims 23-29" in the original motion to amend ("MTA") in order to "streamline the proceeding and avoid the introduction of new issues." Consistent with Apple's stated purpose, the opinions I provided in my Second Declaration (Ex-1021) are still applicable to the new substitute claims 23-27 in Apple's RMTA. Below, I have provided a mapping that compares Apple's RMTA claim elements with the corresponding MTA claim elements and applicable opinions in my Second Declaration:

RMTA Number	Claim Language	MTA Number	Ex-1021
[23.a]	wherein the first portion is electrically isolated from the second portion by an electrically isolating component inserted between the first and second pads;	[28.b]	¶¶103-105
[23.b]	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.a]	¶¶100-102
[23.c]	wherein the first and second pads are adjacent pads.	[28.b]	¶¶103-105

RMTA Number	Claim Language	MTA Number	Ex-1021
[24.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	[26.a]	¶¶86-90
[24.b]	wherein the second pad is exposed on the exterior surface of the electronic device for direct contact from a user.	[26.b]	¶¶86-90
[25.a]	further comprising a touch screen display,	[23.a]	¶¶52-55
[25.b]	wherein the first portion of the enclosure is a bezel; wherein the bezel extends around the touch screen display; and	[23.b]	¶¶56-60
[25.c]	wherein the first pad is embedded in an inner surface of the bezel.	[23.c]	¶¶61-64
[26.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.a]	¶¶66-70
[26.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.b]	¶¶71-73
[26.c]	wherein the first pad detects signals through a first hand, and the second and third pads detect signals through a second hand.	[24.c]	¶¶74-76
[27.a]	wherein the detected cardiac signal is an electrocardiogram signal;	N/A ²	N/A

² Element [27.a] is a newly added feature that does not correspond to any of Apple's originally proposed substitute claims.

RMTA Number	Claim Language	MTA Number	Ex-1021
[27.b]	wherein the processor is further configured to extract one or more characteristics of the electrocardiogram 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.a]	¶¶91-98
[27.c]	wherein if the extracted one or more characteristics match those of an authorized user, the electronic device authenticates the user.	[27.b]	¶¶91-98

(see also Appendix A).

37. I also understand that Apple selected a different set of “original” claims to amend. Instead of moving to amend original claims 16-22, Apple now proposes amending claims 3 and 11-14 (see Appendix A). I also understand that Apple is now retaining most of the corresponding original claim language from original claims 3 and 11-14 (see *id.*). Because I addressed only the additional limitations of the proposed substitute claims (Ex-1021, ¶43), it is my opinion that Apple changing the “original” claims and retaining the claim language does not have any effect on the opinions I provided in my Second Declaration.

IX. KNOWN PRIOR ART RENDERS OBVIOUS SUBSTITUTE CLAIMS 24-25 AND 27.

38. In my First Declaration, Ex-1003, I explained how original claims 3 and 11-14 are unpatentable as obvious based on the following Grounds: (1) *Markel*

(Ex-1005), (2) *Markel* in view of *Nissilä* (Ex-1006), and/or (3) *Markel* in view of *Nissilä* and/or *Richter* (Ex-1007) (Ex-1003, Sections IX.A, IX.B, IX.C). In my Second Declaration, Ex-1021, I explained how the additional elements in Apple's original motion to amend are unpatentable as obvious in view of *Markel* alone, *Markel* in view of *Nissilä*, and/or *Markel* in view of *Nissilä* and/or *Engstrom* (Ex-1020).

39. I understand that the Apple is interpreting “embedded in an inner surface of the bezel” (elements [24.a] and [25.c]) to have a narrower interpretation of the claim language than I do. I address Apple's narrower interpretation below.

40. I also understand that Apple has added an additional claim element (new element [27.a]), which requires that the “detected cardiac signal is an electrocardiogram signal.” I address the new element [27.a], below.

41. In conclusion, it is my opinion that the revised substitute claims would have also been obvious over *Markel* alone and/or in view of *Nissilä*. In addition, each of the substitute claims would have been obvious over *Markel* in view of *Nissilä* and/or *Engstrom*.

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

42. I incorporate my reasoning for a motivation to combine *Markel* with *Nissilä* and/or *Engstrom* that was set forth in my Second Declaration, Ex-1021.

B. Proposed Substitute Claims 24 and 25 Are Obvious Over *Markel*, *Nissilä*, and/or *Engstrom*

43. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious the “embedded in an inner surface of a bezel” limitations of substitute claims 24 and 25.

Claim 24, Element [24.a]: wherein the first pad is embedded in an inner surface of an electrically conductive metal bezel . . . : and

Claim 25, Element [25.c]: wherein the first pad is embedded in an inner surface of the bezel.

44. As discussed in my Second Declaration, it is my opinion that *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim elements [24.a] and [25.c].

45. I have been informed that Apple contends that “embedded in an inner surface of the bezel” may require more than (1) being embedded in a portion of the enclosure, (2) being positioned underneath the exterior surface of that portion, and (3) that portion also being a bezel. I have not been asked to provide any opinion on the correctness of this interpretation at this time, but it is my opinion that the claim is still obvious under Apple’s narrower reading.

46. I have been informed that Apple is relying on the following (and similar) disclosures as written description support for the “embedded in an inner surface of the bezel” requirement: “[L]ead 472 can be placed within the thickness of bezel 460 (e.g., in a pocket within the bezel wall), but underneath the outer surface

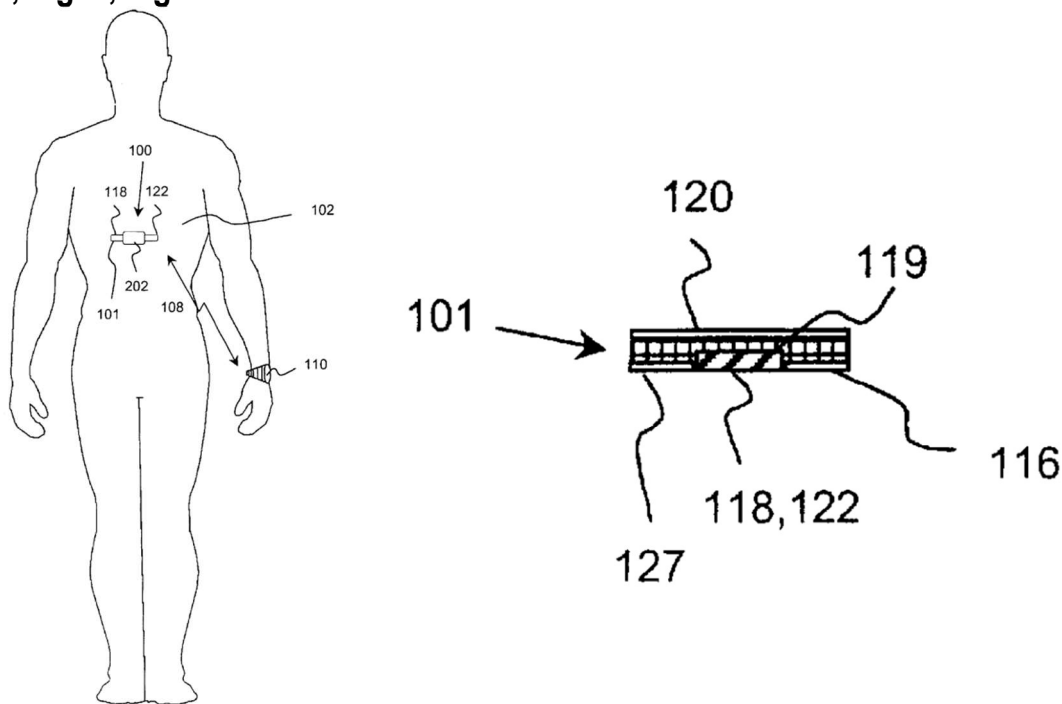
of the bezel” (APPLE-2017, [0047]). Thus, I understand Apple is interpreting “embedded in an inner surface of the bezel” to require—or at least include—a “pocket” structure.

47. A POSITA would have been motivated to modify the inner surface of the enclosure of *Markel* to include a “pocket” because it is a simple design choice for manufacturing cardiovascular monitoring devices. A POSITA would have known that electrical signals get weaker as distance increases, and so a person of ordinary skill would have been motivated to minimize the distance between the pad and the outer surface of the enclosure. This design choice would have improved conductivity while advancing *Markel*’s stated purpose of concealing the location of the electrodes (Ex-1005, [0040]).

48. Additionally, a POSITA would have understood that bezel material around the pad in a “pocket” structure would ensure that the pad does not move during normal operation. A POSITA would have understood this structure to be well-adapted for *Markel*’s mobile communication devices, which may be dropped (Ex-1005, [0004], [0034]). A POSITA would have understood that extra support would help keep the pad in the designated location during operation, thus maintaining electrical connection between the user and the pad that is underneath the enclosure.

49. *Nissilä* confirms what a POSITA would have known—a “pocket” structure is a mechanism for retaining an electrode pad inside another structure, such as an enclosure or a bezel. *Nissilä*’s Figure 5 illustrates an electrode pad placed inside a “pocket” inside the thickness of the “band 101.” Indeed, *Nissilä* teaches that “[t]he electrodes 118, 122 at both ends of the electrode structure 100 can be equal or narrower in width to the band-like component 101” (Ex-1006, 5:33-40).

Ex-1006, Fig. 2, Fig. 5



50. Additionally, Apple’s apparent interpretation of “embedded in an inner surface” of a bezel is substantially similar to the requirements of original claim 8, which requires that 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 place within the at least one pocket.” As discussed in my First Declaration, claim 8 is obvious over *Markel* alone and/or in view of *Nissilä*.

51. Thus, *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious substitute claim elements [24.a] and [25.c].

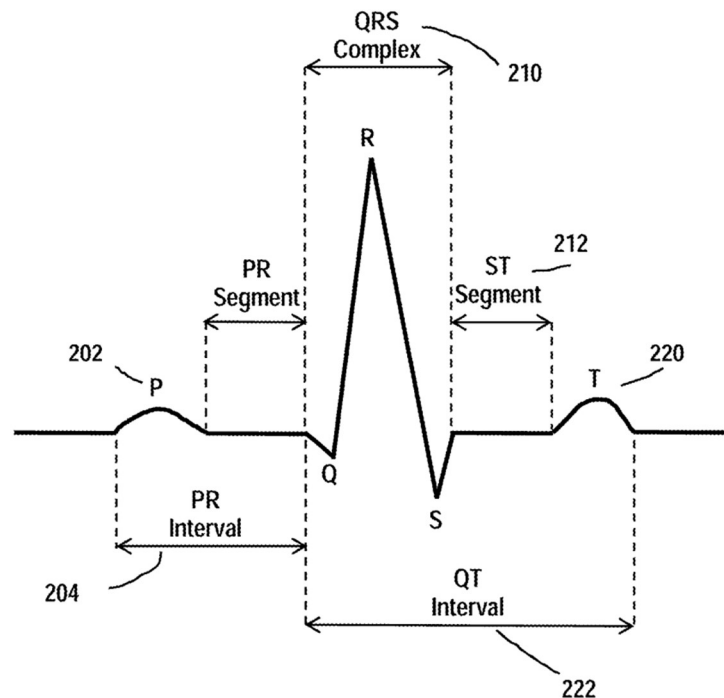
C. Proposed Substitute Claim 27 Is Obvious Over *Markel* Alone and/or in View of *Nissilä* and/or *Engstrom*

52. *Markel* alone and/or in view of *Nissilä* and/or *Engstrom* renders obvious the new limitation of substitute claim 27.

Claim 27, Element [27.a]: wherein the detected cardiac signal is an electrocardiogram signal;

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

54. As discussed in my First Declaration, an electrocardiogram (“ECG”) is the measurement of the electrical potential of the heart (Ex-1003, ¶43 (citing Ex-1008, 1:45-50)). ECGs were well known prior to the ’257 patent (Ex-1003, ¶¶42-46). As discussed during my deposition on July 26, 2024, Figure 2 of the ’257 patent illustrates an exemplary ECG (APPLE-2018, 9:8-10:5). The ’257 patent explains that Figure 2 is a graphical representation of “electrical activity of a heart during a heartbeat” (Ex-1001, 6:46-47).



55. The '257 patent also describes the known components of an ECG (Ex-1001, 6:46:7-56; *see also* APPLE-2018, 9:8-10:5). Specifically, an “ST-segment” is a component of an ECG that measures the amount of time that it takes from one cardiac event to another (Ex-1001, 7:19-20; APPLE-2018, 9:4-10:5). A POSITA would have known that an “ST segment” is a term of art used to describe only that particular component of an ECG (*see also* Ex-1009 at 19-21 (explaining that ST segment is a component of an ECG trace)). The '257 patent explains that an “ST segment 212 can be measured from QRS complex 210 to T wave 220” on an ECG (Ex-1001, 7:29-33). The '257 patent further explains that “[t]he combination of the length of ST segment 212, and the concavity or elevation of ST segment 212 can

also be used to generate characteristic information unique to each user's heartbeat" (Ex-1001, 7:34-37).

56. *Markel* discloses a "cardiac signal that is an [ECG] signal." A POSITA would have known that generating an ECG signal requires a user to contact two or more electrodes on different sides of the user's body in order to measure the potential difference across the user's heart. *Markel* describes a device with "cardiovascular monitoring capability" that "utilizes the first and second electrodes 1020, 1022 to detect and acquire various cardiac (i.e., heart-related) signals from a user" (Ex-1005, Abstract, [0058], Fig. 10). *Markel* also teaches that "[t]he [device] may be adapted to detect cardiac activity of a user that is conductively coupled to at least two of a first, second and third (or N) electrodes." (Ex-1005, [0051] (emphasis added)). Consequently, a POSITA would have at once understood that the device of *Markel* is used to detect an ECG.

57. *Markel* further explains that the processing module of *Markel* "may be adapted to compare changes in a cardiac signal to known pathologic patterns (e.g., ST-segment depression or ST-segment elevation)" (Ex-1005, [0115]). As explained above, a POSITA would have understood that *Markel* was discussing an ECG because "ST-segment" is a term of art used to describe only a particular component of an ECG signal (*see also* Ex-1009 at 19-21 (explaining that ST segment is a component of an ECG trace)). Therefore, a POSITA would have understood that

Markel discloses or renders obvious detecting cardiac signal that is an ECG signal (see also Ex-1009 at 28-29, 53-54 (describing using ST segment changes in ECGs for use in diagnostics)).

58. To the extent a POSITA sought additional information on different types of cardiac signals that are detectable using two or more electrodes, a POSITA would have turned to *Nissilä*, which discloses an “electrode structure and a heart rate measuring arrangement for measuring an ECG signal” (Ex-1006, Abstract, 2:17–57). Specifically, *Nissilä* teaches an electrode structure comprising an electronic unit that in turn comprises “ECG processing means, by which the potential difference caused by the ECG signal between the first and second electrodes is measured, and an estimate for detected heart beat time instants is formed from the heart rate signals measured by the electrodes, and further the heart beat rate is calculated on the basis of the detected heart beat time instants” (Ex-1006, 3:56-62).

59. It would have been obvious to a POSITA to use an ECG in the authentication technology of *Engstrom* because ECGs allow a number of detailed and specific measurements and characteristics that would enable authentication of a user, and that would distinguish multiple different users. A POSITA would have known that an ECG is the most sophisticated and detailed cardiac measurement that can be performed on a user, and that an ECG measurement would be able to provide any other measurement that is needed to create a “heart beat profile” in *Engstrom*.

In fact, a POSITA would have understood that an ECG is the *best* way to create a “heart beat profile” of *Engstrom*. In addition, *Nissilä* confirms that a POSITA would have been able to extract characteristics such as a heart beat rate from an ECG (Ex. 1006, 3:56-62). Thus, a POSITA would have had a reasonable expectation of success using the authentication system of *Engstrom* with the ECG measurement collected by the device described in *Markel* alone and/or with *Nissilä*.

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

X. 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.

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APPENDIX A – The Substitute Claims

Claim Element	Substitute Claim Language
Claim 23 (Substitute for claim 3, if found unpatentable)	
[23.pre]	The electronic device of claim 1,
[23.a]	wherein the first portion is electrically isolated from the second portion by an electrically isolating component inserted between the first and second pads;
[23.b]	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;
[23.c]	wherein the first and second pads are adjacent pads.
Claim 24 (Substitute for claim 11 if found unpatentable)	
[24.pre]	The electronic device of claim 1, wherein the second lead is configured to detect the second electrical signal of the user's cardiac signal via the user's contact with the second lead;
[24.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
[24.b]	wherein the second pad is exposed on the exterior surface of the electronic device for direct contact from a user.
Claim 25 (Substitute for claim 12 if found unpatentable)	
[25.pre]	The electronic device of claim 1,
[25.a]	further comprising a touch screen display,
[25.b]	wherein the first portion of the enclosure is a bezel; wherein the bezel extends around the touch screen display; and
[25.c]	wherein the first pad is embedded in an inner surface of the bezel.
Claim 26 (Substitute for claim 13 if found unpatentable)	
[26.pre]	The electronic device of claim 1, wherein the first portion of the enclosure is a bezel, the electronic device further comprising:

Claim Element	Substitute Claim Language
[26.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
[26.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;
[26.c]	wherein the first pad detects signals through a first hand, and the second and third pads detect signals through a second hand.
Claim 27 (Substitute for claim 14 if found unpatentable)	
[27.pre]	The electronic device of claim 1, wherein an interior surface of the enclosure comprises an interior surface of the first portion, wherein the first pad is positioned on the inner surface of the first portion;
[27.a]	wherein the detected cardiac signal is an electrocardiogram signal;
[27.b]	wherein the processor is further configured to extract one or more characteristics of the electrocardiogram 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.c]	wherein if the extracted one or more characteristics match those of an authorized user, the electronic device authenticates the user.