

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

**PETITIONER'S OPPOSITION TO PATENT OWNER'S
CONTINGENT MOTION TO AMEND**

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Exhibit	Short Name	Description
Ex. 1001	'257 Patent	U.S. Patent No. 10,076,257 B2
Ex. 1002	'257 File History	Prosecution History of U.S. Patent No. 10,076,257 B2
Ex. 1003	Berger Declaration	Declaration of Dr. Ronald D. Berger
Ex. 1004	Berger CV	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, <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	Hobson	U.S. Patent No. 7,876,274

Exhibit	Short Name	Description
Ex. 1018	National Judicial Caseload Profile	U.S. District Courts – National Judicial Caseload Profile (accessed via https://www.uscourts.gov/sites/default/files/cms_na_distprofile0331.2022.pdf)
Ex. 1019	Ducker Decl.	Declaration of Philip Ducker
Ex. 1020	Engstrom	U.S. Patent Application Publication No. 2008/0113650
Ex. 1021	Berger Second Decl.	Second Declaration of Ronald D. Berger, M.D., Ph.D., F.H.R.S.
Ex. 1022	Kenny Tr.	Transcript of June 19, 2024 deposition of Dr. Thomas W. Kenny
Ex. 1023	Berger Third Decl.	Third Declaration of Ronald D. Berger, M.D., Ph.D., F.H.R.S.

I. INTRODUCTION

The Board should deny Apple's Contingent Motion to Amend (Paper 29, "Motion"). *First*, Apple's Motion fails to provide a reasonable number of substitute claims. *Second*, Apple's Motion fails to show that its amendments meet the non-enlargement requirement. *Third*, Apple's Motion fails to show that its amendments meet the written description requirement. *Fourth*, Apple's Motion is futile. As explained below, the substitute claims would have been obvious based on available prior art. Thus, Apple's Revised Motion to Amend should be denied.

II. APPLE'S MOTION FAILS TO PROVIDE A REASONABLE NUMBER OF SUBSTITUTE CLAIMS.

A motion to amend must have "a reasonable number of substitute claims" with the "presumption [being] . . . that only one substitute claim would be needed to replace each challenged claim." 37 C.F.R. § 42.121. A patent owner may rebut this presumption "upon demonstration of a need to present more than one substitute claim per challenged claim." *Lectrosonics, Inc. v. Zacom*, IPR2018-01129, Paper 15 at 4-5 (PTAB Feb. 25, 2019). "A patent owner bears the burden of persuasion to show, by a preponderance of the evidence, that the motion to amend complies with the [applicable] requirements." *Sisvel Int'l S.A. v. Sierra Wireless, Inc.*, 81 F.4th 1231, 1240-41 (Fed. Cir. 2023) (quoting 37 C.F.R. §41.121(d)(1)). Apple has failed to meet its burden.

First, Apple has effectively proposed more than one substitute claim for claim

12. Apple’s proposed substitute claim 25 is a replacement for original claim 12, which recites that “the *first* portion of the enclosure is a bezel.” In substitute claim 26, however, Apple amends claim 13 to replace “*second* portion” with “*first* portion.” Under Apple’s amendments, therefore, substitute claims 25 and 26 would *both* include all of original claim 12’s limitations, including that “the *first* portion of the enclosure is a bezel”; and neither of substitute claims 25 or 26 would include any limitations original to dependent claim 13. The practical effect is that Apple gets two bites at amending claim 12. Because Apple has effectively proposed more than one substitute claim for original claim 12 without demonstrating any need to do so (*see* Paper 29 at 10-11), the Motion should be denied. *Cf. Lectrosonics*, Paper 15 at 4-5.

Second, Apple’s amendments are voluminous and inconsistent with the intent of the motion-to-amend process. In fact, by amending to include many unrelated elements, Apple has failed to demonstrate that the features of the substitute claims are traceable to the features of the original claims. In its preliminary guidance, this Board indicated that Apple must show that the features of the substitute claims are “traceable to features . . . of the [five] original claims they are intended to replace.” Paper 26 at 4-5. This is consistent with *Lectrosonics*, which held that, in addition to just identifying the challenged claim that it is intended to replace, “[a]ll proposed claims should be traceable to an original challenged claim as a proposed substitute claim for that challenged claim.” *Lectrosonics*, Paper 15 at 5. Apple did not follow

the Board’s guidance and, therefore, has not met its burden to show that at least the following features are traceable to the features in the original dependent claims:

- “first pad is embedded in an inner surface of an electrically conductive metal bezel” (substitute claim 24) and “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” (original claim 11);
- “third lead comprising a third pad . . .” and “wherein the first pad detects signals through a first hand, and the second and third pads detect signals through a second hand” (substitute claim 26) and “second portion of the enclosure is a bezel” (original claim 13); and
- “wherein the detected cardiac signal is an electrocardiogram signal” and “wherein the processor is further configured to . . . authenticate[] the user” (substitute claim 27) and “first pad is positioned on the interior surface of the first portion” (original claim 14).

Indeed, Apple’s failure to meet its burden underscores an intent to exploit the motion-to-amend process and freely amend claims outside of normal prosecution.

III. APPLE FAILED TO MEET ITS BURDEN TO SHOW THAT THE SUBSTITUTE CLAIM 26 DOES NOT ENLARGE CLAIM SCOPE.

An amendment “may not enlarge the scope of the claims” and amendments that delete limitations are broadening. 35 U.S.C. § 316(d)(3). In *Samsung Electronics Co., Ltd. et al v. NuCurrent, Inc.*, the Board denied a motion to amend

because the substitute claims added certain limitations and deleted substantially all original limitations of corresponding original claims. *See* IPR2019-00859, Paper 88 at 48-49 (P.T.A.B. Feb. 23, 2021); *Lectrosonics*, Paper 15 at 7-8. This is consistent with case law. *See Sisvel*, 81 F.4th at 1240-41 (“[C]laim that does not include a limitation present in the original patent claims is broader in that respect”). Here, Apple’s substitute claim 26 broadened original claim 13 by deleting a limitation. *See* Paper 26 at 24 (deleting “second”). It is irrelevant that Apple replaced the deletion with a new element because substitute claim 26 is still presumptively broader, in some respects, than original claim 13. *See Samsung*, IPR2019-00859, Paper 88 at 48-49. Thus, the Board should deny Apple’s Motion as to substitute claim 26.

IV. SUBSTITUTE CLAIMS 23 AND 26-27 FAIL TO MEET THE WRITTEN DESCRIPTION REQUIREMENT.

A. Substitute Claims 23 and 27

“[T]he motion must set forth written description support for each proposed substitute claim *as a whole*, and not just the features added by the amendment.” *Lectrosonics*, Paper 15 at 7-8 (emphasis added). Apple’s Motion primarily relies heavily on a table that is devoid of detail, which is troubling given the voluminous and untraceable amendments made to each of the claims (Paper 29 at 12-14). For substitute claims 23 and 27, Apple’s Motion does not set forth *any* explanation for why paragraphs, claims, and figures cited in its table provide written description support (*id.* at 12-14). Patent Owner thus impermissibly relies on the incorporation

by reference and its table should be disregarded. 37 C.F.R. § 42.6(a)(3).

B. Substitute Claim 26

First, Apple has failed to show written description support for substitute claim 26’s recital of a “third pad that is embedded in the second portion of the enclosure.” Based on its dependency from claim 1, this claim language requires two different pads that are “embedded in” the *same* portion of the enclosure. For written description support, Apple relies on generic teachings that a bezel “can include any other suitable number of leads, or any other suitable distribution of leads” (Paper 29, 15 (citing APPLE-2016, [0042]; APPLE-2017, [0042]; APPLE-2012, [0041])). But Apple has failed to identify any disclosure that shows two leads or pads embedded in the same *portion* of the enclosure or bezel. The written description actually teaches the opposite—i.e., that leads are “placed along *different portions*” of the enclosure (APPLE-2016, [0047]; APPLE-2017, [0047]; APPLE-2012, [0046]). Indeed, Apple itself has relied on disclosure that the bezel is “separated into *any suitable number of electrically isolated segments*” (Paper 29 at 15-16 (citing APPLE-2016, [0048], [0050]; APPLE-2017, [0048], [0050]; APPLE-2012, [0047], [0048])). The written description repeatedly discloses leads embedded in *different* “portions,” “sections,” “segments,” and “positions” (APPLE-2016, [0046]-[0050]; APPLE-2017, [0046]-[0050]; APPLE-2012, [0046]-[0050]) and never discloses two or more leads embedded in the *same* portion of the enclosure. Disclosure that merely

renders obvious a claimed invention is not sufficient to satisfy the written description requirement of that invention. *See Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1356 (Fed. Cir. 2010); *NeuroDerm Ltd. v. AbbVie Inc.*, PGR2022-00040, Paper 77 at 31 (P.T.A.B. Oct. 31, 2023). Thus, Apple has failed to show written description for a “third pad that is embedded in the second portion of the enclosure.”

Second, Apple has failed to show written description support for substitute claim 26’s recital of a third pad embedded in a portion of the enclosure and exposed for “user’s skin’s contact with the third pad.” Figure 3 is the only figure with a third lead. Not only is that lead embedded in the display, which is a different element from the “enclosure” and a different portion than any other pad, it is also not exposed for “user’s skin’s contact with the third pad.”

V. THE PROPOSED SUBSTITUTE CLAIMS WOULD HAVE BEEN OBVIOUS OVER KNOWN PRIOR ART.

The Petition showed how claims 1, 3, and 11-14 (the claims from which the substitute claims newly depend) are unpatentable over Grounds 1 and 2 of *Markel* alone and/or in view of *Nissilä* (Pet., 7-84). Apple’s Motion has not addressed these references or the Petition. This Opposition thus addresses only the added limitations of proposed substitute claims 23-27 (Ex. 1021, ¶43; Ex. 1023, ¶¶38-41). *See Aqua Prod., Inc. v. Matal*, 872 F.2d 1290, 1326 (Fed. Cir. 2017).

Substitute claims 23-27 would have been obvious to a POSITA in view of *Markel* alone and/or in view of *Nissilä* (Grounds 1 and 2). In addition, substitute

claims 23-27 would also have been obvious over *Markel* in view of *Nissilä* and/or *Engstrom* (Ex. 1020). The level of skill of a POSITA remains the same as in the Petition and has not been disputed (Pet., 6-7; Ex. 1021, ¶¶31-32; Ex. 1023, ¶¶30-31).

A. U.S. Patent Appl. Publ. No. 2008/0113650 (“Engstrom”)

Engstrom is prior art known to Apple but not addressed in its Motion. *Engstrom* was identified in applicant’s information disclosure statement and considered by the Examiner during prosecution (albeit for the original claims) (Ex. 1002 at 106, 183; Ex. 1021, ¶¶36, 39; Ex. 1023, ¶35). The Office has not considered *Engstrom* in view of these newly presented claims.

Engstrom is directed to a wireless mobile phone (Ex. 1020, Abstract). The phone in *Engstrom* “includes a number of sensors to enable a user’s heart beat profile to be captured and be used for authentication” (*id.*). “[A]uthentication is performed by comparing the real time captured heart beat profile against a reference heart beat profile” (*id.*). *Engstrom* discloses an array of sensors “disposed along and underneath the side surfaces of phone 100” (*id.*, [0029], Fig. 1; Ex. 1021, ¶¶37-42).

Motivation to Combine Markel with Engstrom and/or Nissilä

A POSITA would have combined *Nissilä*’s electrode structure with *Markel*’s electronic device in order to accomplish *Markel*’s stated goal of an electrode that is substantially concealed or hidden (Pet., 69-71; Ex. 1021, ¶45, Ex. 1003, ¶¶351-355, 357, 360, 363, 366, 369, 372, 375, 379, 382, 385, 388, 391, 394). *Markel*’s hidden

electrode would have been desirable because it increased aesthetics while protecting the electrode from bumps or other damage (Ex. 1003, ¶355). A POSITA would have had a reasonable expectation of success in combining *Markel* and *Nissilä* (*id.*).

Further, a POSITA would have been motivated to combine *Markel*'s electronic device with *Engstrom*'s electrode placement (Ex. 1021, ¶46). *Markel* and *Engstrom* are directed to personal heart sensors. *Markel* is directed to “mobile communication device[s] . . . with cardiovascular monitoring capability” (Ex. 1005, [0004]; *see also* Ex. 1021, ¶46). *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; *see also* Ex. 1021, ¶46). 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]; *see also* Ex. 1021, ¶47). Specifically, *Engstrom*'s device uses “sensors 132 to facilitate real time capturing of heart beat profile of the user” (Ex. 1020, [0026]; *see also* Ex. 1021, ¶47). Indeed, *Engstrom* advantageously 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 a measurement (Ex. 1020, [0029]; *see also* Ex. 1021, ¶47).

Further, both *Markel* and *Engstrom* contemplate user authentication based on cardiac information (Ex. 1005, [0097]; Ex. 1020, Abstract; *see also* Ex. 1021, ¶¶48-

49). A POSITA would have looked to *Engstrom* to understand how to implement user authentication based on detected heart characteristics, such as using an ECG (Ex. 1021, ¶48; Ex. 1023, ¶59). A POSITA would also have had a reasonable expectation of success in combining *Markel* and *Engstrom* because they share relevant similarities in hardware and software of the disclosed communication devices (Ex. 1005, [0042], [0179]; Ex. 1020, [0034], [0046]; Ex. 1021, ¶¶49-50).

A. Sub. Claim 23: Obvious Over *Markel*, *Nissilä*, and/or *Engstrom*

***[23.a]: . . . electrically isolating component inserted between the first and second pads;*¹**

Markel teaches an insulating region between electrodes (Ex. 1005, [0045], [0047]). *Markel*'s insulating region is thus an “electrically isolating component inserted between the first and second pads” (as recited in element [23.a]). Further, a POSITA would have known that electrodes need to be electrically isolated in order to detect different cardiac signals (Pet., 33; Ex. 1003, ¶175). If there is no insulating region between pads, they functionally become the same pad. Thus, element [23.a] would have been obvious (Ex. 1021, ¶84; Ex. 1023, ¶36).

[23.b]: wherein the exterior surface of the enclosure . . . ;

Element [23.b] adds limitations directed to the positioning of the “second pad”

¹ The first part of this limitation (“wherein the first portion is electrically isolated from the second portion”) is original to original claim 3 and is not addressed herein.

that are substantially similar to the positioning required for the “first pad” in original claim 1. Therefore, element [23.b] is obvious for the same reasons elements [1.c.i], [1.c.ii], [1.c.iii], [6.a], [6.b], and claim 10 are obvious (Ex. 1021, ¶101; Ex. 1023, ¶36). Specifically, a POSITA would have been motivated to place the second pad underneath the conductive plastic of *Markel* in order to “substantially conceal[] (or [hide])” the pad of the electrode of the user (Ex. 1003, ¶200). A POSITA would have had a reasonable expectation of success because *Markel* teaches that conductive plastic “may provide sufficient conductivity for an electrode to perform adequately” (Ex. 1003, ¶202; *see also id.*, ¶¶115-140, 196-204, 236-240, 356-361, 378-383).

[23.c]: wherein the first and second pads are adjacent pads.

Markel and *Engstrom* disclose and render obvious adjacent pads. *Markel* discloses 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. The Board in the *Masimo* Proceeding found that the embodiment in *Markel*’s Figure 4 “appears to disclos[e] generally the same embodiment as that in Figure 15 directed to ‘an exemplary computer display device.’” *Masimo* Proceeding, Paper 8 at 43 (citing Ex. 1005, [0078]). In particular, Figure 15 discloses electrodes 1510 and 1530 on the left side portion that are adjacent. In addition, *Engstrom*’s sensors 132 on the left side portion of the device are adjacent. Element [23.c] is disclosed

Ex. 1005, Fig. 15 (annotated); Ex. 1020, Fig. 1 (annotated)



Markel alone and/or with *Nissilä* renders obvious (1) a first pad that is embedded in a first portion of the enclosure, (2) the first pad is positioned underneath the exterior surface of the first portion, and (3) the first portion of the enclosure is a bezel (Ex. 1003, ¶¶119-20, 126-40, 248-252, 357-58). Thus, *Markel* alone and/or with *Nissilä* renders obvious a first pad embedded in a bezel *and* underneath the exterior surface of the bezel. To be both embedded in and underneath the bezel, it would have been obvious that the first pad is embedded in an inner surface of the bezel (Ex. 1021, ¶62; Ex. 1023, ¶36). A POSITA would have been motivated to embed the pad on the inner surface of the enclosure in order to simultaneously create an electrically conductive connection between the pad and the outer surface of the enclosure while ensuring that the pad is accessible to the wiring inside the enclosure that is necessary to complete the electrical circuit (Ex. 1021, ¶63; Ex. 1023, ¶36).

For written description support, Apple relies on disclosures reciting that a lead can be “placed within the thickness of bezel 460 . . . but underneath the outer surface of the bezel” (Paper 29 (citing APPLE-2016, [0046]-[0047], Fig. 4B; APPLE-2017, [0046]-[0047], Fig. 4B; APPLE-2012, [0045]-[0046], Fig. 4B, cl. 18)). Apple has omitted disclosure that states “e.g., in a pocket within the bezel wall” (APPLE-2016, [0047]; APPLE-2017, [0047], APPLE-2012, [0046]). But Apple’s citation demonstrates that it is interpreting “embedded in an inner surface of the bezel” to require—or at least include—a “pocket” structure. Element [24.a] is obvious even under this narrower interpretation (Ex. 1023, ¶46).

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 POSITA 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]; Ex. 1023, ¶47). Indeed, the POSITA would have at least tried placing the pad in a pocket, given the finite number of locations for the pad and the understanding that the POSITA would want to hide the pad (*see* Pet., 69-71).

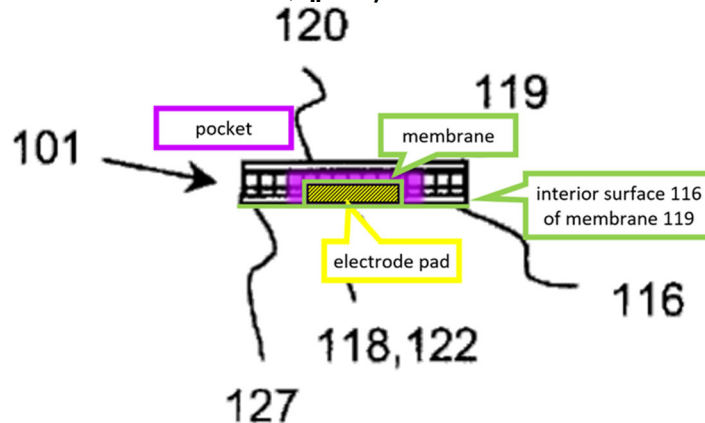
Additionally, a POSITA would have understood that bezel material around

the pad in a “pocket” structure would ensure that the pad does not move around during 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 keep the pad in the designated location, thus maintaining electrical connection between the user and the pad that is underneath the enclosure (Ex. 1023, ¶48).

Nissilä confirms what a POSITA would have known—a “pocket” structure is a known mechanism for retaining an electrode pad inside another structure, such as an enclosure or a bezel. (Ex. 1023, ¶49). *Nissilä*’s Figure 5 illustrates an electrode pad placed inside a “pocket” inside the thickness of the “band 101.” *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).

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 “at least one of the first pad and the second pad is placed within the at least one pocket” “underneath the exterior surface of the enclosure.” Apple did not dispute that *Markel* in view of *Nissilä* renders obvious claim 8, and Apple has thus waived any response regarding the combination (Paper 25 at 26). Element [24.a] is obvious over *Markel* in view of *Nissilä* for the same reasons elements [8.a] and [8.b] are obvious (Ex. 1023, ¶50; Ex. 1003, ¶¶219-224, 374-377).

Ex. 1006, Fig. 5 (annotated at Ex. 1003, ¶376)



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, and a POSITA would have been motivated to make the bezel out of metal. Thus, *Markel* renders obvious element [24.a] (Ex. 1021, ¶87; Ex. 1023, ¶36).

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). *Nissilä* further renders obvious element [24.a] (Ex. 1021, ¶88; Ex. 1023, ¶36).

[24.b]: wherein the second pad is exposed

The second pad can be configured to detect the user’s cardiac signal via the

user's skin's contact with the second pad (*see* Pet., 46-47 (cl. 11) (citing Ex. 1003, ¶244); Ex. 1005, [0037] (describing electrodes that “comprise a metallic surface exposed for user contact”)). Thus, *Markel* renders obvious element [24.b] (Ex. 1021, ¶89; Ex. 1023, ¶36).

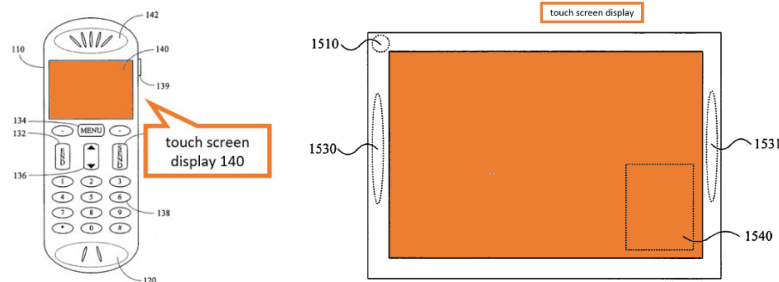
B. Sub. Claim 25: Obvious Over *Markel*, *Nissilä*, and/or *Engstrom*

[25.a]: a touch screen display,

Markel teaches that the “display 140” of *Markel*’s “MCD100” (illustrated in *Markel*’s Figure 4) can function as a “touch screen input feature” (Ex.1005, [0034]). Thus, *Markel*’s Figure 4 teaches element [25.a] (Ex. 1021, ¶53; Ex. 1023, ¶36).

Additionally, *Markel*’s Figure 15 discloses a 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 element [25.a] (Ex. 1021, ¶54; Ex. 1023, ¶36).

Ex. 1005, Figs. 1, 15 (annotated)



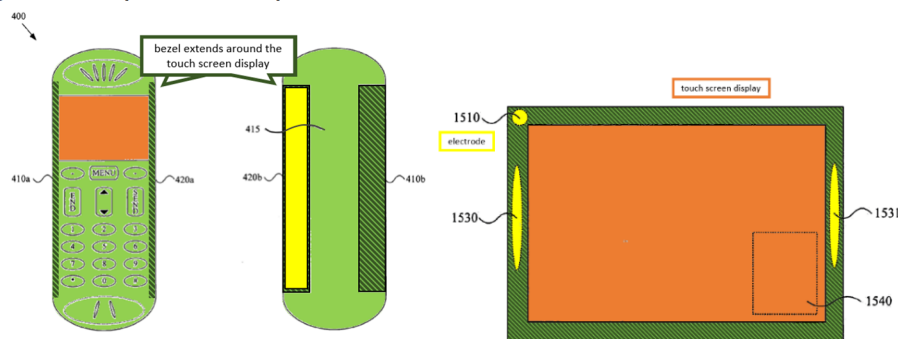
***[25.b]: wherein the bezel extends around the touch screen display;
and***

As discussed in the Petition, the “right side portion” of *Markel*’s Figure 4 is “like a bezel” (Pet., 48; Ex. 1003, ¶251). *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 around the display 140 so that they reached the “border of the display” (i.e., bezel) because this would have created additional contact area (Pet., 49; Ex. 1003, ¶252). *Markel*’s Figure 4 thus renders obvious element [25.b] (Ex. 1021, ¶57; Ex. 1023, ¶36).

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 (Ex. 1021, ¶58; Ex. 1023, ¶36).

Ex. 1005, Figs. 4, 15 (annotated)



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 as applied to Figure 4 renders obvious element [25.b] (Ex. 1021, ¶59; Ex. 1023, ¶36).

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

As discussed earlier for element [24.a] and substitute claim 24, it would have been obvious to a POSITA to embed the first pad in an inner surface of the bezel.

C. Sub. Claim 26: Obvious Over *Markel*, *Nissilä*, and/or *Engstrom*

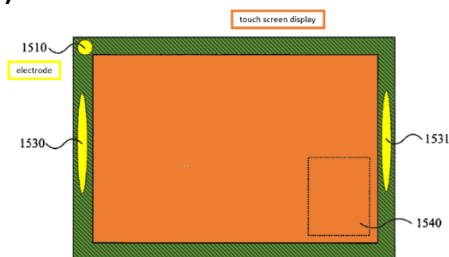
[26.a]: a third lead comprising a third pad that is embedded in the second portion of the enclosure, . . . user’s skin’s contact with the third pad; and

Markel teaches that “more than two electrodes might be utilized” (Ex. 1005, [0051]). For example, a POSITA would have been motivated to build a device with more than two electrode pads in order to simultaneously record the electrical potential difference between two hands while simultaneously measuring other cardiac signals with a third electrode pad (Ex. 1021, ¶67; Ex. 1023, ¶36). 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 element [26.a] (Ex. 1021, ¶67; Ex. 1023, ¶36).

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 renders

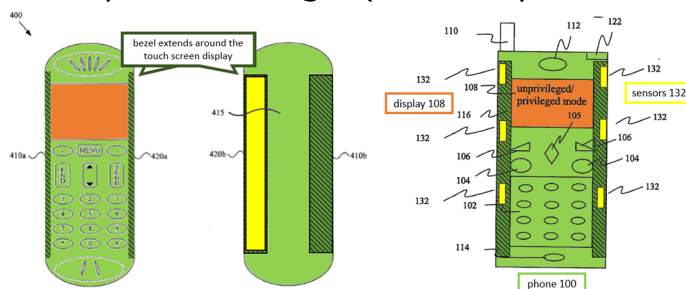
obvious element [26.a] (Ex. 1021, ¶¶68; Ex. 1023, ¶¶36).

Ex. 1005, Fig. 15 (annotated)



To the extent a POSITA sought additional detail on placement of another pad, she 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* to better position the electrode pads (*see* Motivation to Combine), and the combination renders obvious element [26.a] (Ex. 1021, ¶¶69; Ex. 1023, ¶¶36).

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



[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;

The second pad can be configured to detect the user's cardiac signal via the user's skin's contact with the second pad (*see* Pet., 46-47 (cl. 11) (citing Ex. 1003, ¶244); Ex. 1005, [0037] (describing electrodes that “comprise a metallic surface exposed for user contact”). Thus, *Markel* renders obvious element [26.b] (Ex. 1021, ¶72; Ex. 1023, ¶36).

[26.c] wherein the first pad detects signals through a first hand, and the second and third pads detect signals through a second hand.

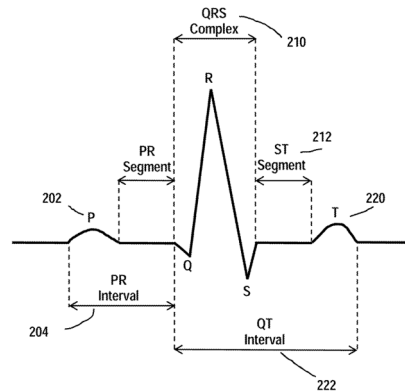
Markel teaches that placement of electrodes “provide[s] for convenient access for a user to contact both the first and second electrodes simultaneously (e.g., with different hands or different fingers)” (Ex. 1005, [0049]). Furthermore, an ECG is a measure of the difference in electrical activity between 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 (Ex. 1021, ¶75; Ex. 1023, ¶36). 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, element [26.c] would have been obvious to a POSITA in view of *Markel* (Ex. 1021, ¶75; Ex. 1023, ¶36).

D. Sub. Claim 27: Obvious Over *Markel*, *Nissilä*, and/or *Engstrom*

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

Element [27.a] is obvious over *Markel* alone and/or with *Nissilä*. 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). Dr. Berger testified that Figure 2 of the ’257 patent illustrates an exemplary ECG, shown below (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) (Ex. 1023, ¶54).

Ex. 1001, Fig. 2



The ’257 patent describes 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 “ST segment” is a term used only to describe a particular component of an ECG (Ex. 1023, ¶55; 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).

Markel discloses a “cardiac signal that is an [ECG] signal.” A POSITA would have known that an ECG requires a user to contact two or more electrodes on either side of the user’s body in order to measure the potential difference across the user’s heart (Ex. 1023, ¶56). *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 envisaged that the device of *Markel* is used to detect an ECG (Ex. 1023, ¶56). See *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015).

Markel further explains that its processing module “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, a POSITA would have understood that *Markel* was discussing an ECG because “ST-segment” is a term of art used to describe only a component of an ECG (Ex. 1023, ¶57; Ex.

1009 at 19-21 (explaining that ST segment is a component of an ECG trace)). Therefore, *Markel* renders obvious a cardiac signal that is an ECG signal (Ex. 1023, ¶57; Ex. 1009 at 28-29, 53-54 (describing using ST segment changes in ECGs for use in diagnostics)).

To the extent a POSITA sought additional detail on 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; Ex. 1023, ¶58). 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; Ex. 1023, ¶58).

[27.b]: wherein the processor . . . ; and
[27.c]: wherein . . . authenticates the user.

Elements [27.b] and [27.c] are obvious over *Markel* alone and/or with *Engstrom*. The '257 patent's “Background of the Invention” 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). *Markel* also teaches an embodiment in

which 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 MCD 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 the Petition. Thus, *Markel* renders obvious elements [27.b] and [27.c] (Ex. 1021, ¶¶92-93; Ex. 1023, ¶36).

A POSITA would have turned to *Engstrom* for additional detail on authentication technology based on cardiac signals (*see* Motivation to Combine). Specifically, *Engstrom* teaches “operating logic 240” “automatically invoke sensors 132 to capture heart beat profile of the user real time” (Ex. 1020, [0027]). *Engstrom* teaches that “authentication is performed by comparing the real time captured heart beat profile against a reference heart beat profile” (Ex. 1020, Abstract). The operating logic in *Engstrom* “captur[es]” “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]). *Engstrom* teaches this claim in a similar manner as the ’257 patent (Ex. 1001, 1:49-2:3, 10:34-55). Finally, *Engstrom* teaches that the “operating logic 240” enables phone 100 to operate in authenticate mode “if the input heartbeat profile substantially matches the previously

saved reference heart beat profile” (Ex. 1020, [0056]). Thus, *Engstrom* renders obvious elements [27.b] and [27.c] (Ex. 1021, ¶¶94-97; Ex. 1023, ¶36).

It would have been obvious to a POSITA to use an ECG, such as the ECG in *Markel* and/or *Nissilä*, 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 (Ex. 1023, ¶59). 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* (Ex. 1023, ¶59). *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* (Ex. 1023, ¶59).

VI. SUBSTITUTE CLAIM 24 IS INDEFINITE

When a POSITA, considering the intrinsic evidence, would not have been able to discern the correct antecedent basis for a claim term, the claim may be held invalid for being indefinite. *Bushnell Hawthorne, LLC v. Cisco Sys., Inc.*, 813 F. App’x 522,

526–27 (Fed. Cir. 2020). Here, Claim 1 requires that the “first pad is *embedded in a first portion of the enclosure.*” Claim 24 depends from claim 1 and requires that 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.*” Claim 24 thus requires that the first pad be simultaneously embedded in two different components, i.e., “*a first portion* of an enclosure” (Claim 1) and “*a portion* of an exterior surface of the electronic device” (Claim 24). And a POSITA would not have known with reasonable certainty whether “a portion” (in Claim 24) was meant to refer to “*a first portion*” (in Claim 1) or to some other “portion” entirely. Worse still, claim 24 recites a new “*an exterior surface.*” The first pad is “is positioned underneath *the exterior surface* of the first portion [of the enclosure]” (Claim 1) and also embedded in “an electrically conductive metal bezel,” a different component from the enclosure, “that forms a portion of *an exterior surface* of the electronic device” itself (Claim 24). Claim 24 is not reasonably certain and, thus, indefinite.

If Apple argues that it intends for the first pad to simultaneously be embedded in two different portions of the electronic device, then the claim lacks written description support.

VII. CONCLUSION

For the foregoing reasons, the Board should deny Apple’s Revised Motion.

Date: September 17, 2024

By: /Christopher TL Douglas /
Christopher TL Douglas (Reg. 56,950)

CLAIMS APPENDIX

<u>Claim</u>	<u>Recitation</u>
1.pre	An electronic device for detecting a user's cardiac signal, comprising:
1.a	an enclosure;
1.b	a heart sensor configured to detect the user's cardiac signal, the heart sensor comprising:
1.c.i	a first lead comprising a first pad that is embedded in a first portion of the enclosure,
1.c.ii	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, and
1.c.iii	wherein 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; and
1.d.i	a second lead comprising a second pad that is embedded in a second portion of the enclosure,
1.d.ii	wherein the second pad is configured to detect a second electrical signal of the user's cardiac signal via the user's skin's contact with at least one of the second pad and the second portion of the enclosure; and
1.e	a processor coupled to the heart sensor and configured to receive and process the detected cardiac signal, wherein the first lead further comprises a first connector coupled to the first pad and configured to provide the first electrical signal detected by the first pad to the processor, and wherein the second lead further comprises a second connector coupled to the second pad and configured to provide the second electrical signal detected by the second pad to the processor.
2.pre	The electronic device of Claim 1,

<u>Claim</u>	<u>Recitation</u>
2.a	wherein the first portion and the second portion are located on opposite sides of the electronic device.
3.pre	The electronic device of Claim 1,
3.a	wherein the first portion is electrically isolated from the second portion.
4.pre	The electronic device of Claim 1, wherein:
4.a	the first portion is separated from the second portion by a third portion of the enclosure;
4.b	at least the third portion is constructed from a material having a first conductivity; and
4.c	the first conductivity is insufficient to transmit the first electrical signal from the first pad to the second pad via the third portion.
5.pre	The electronic device of Claim 4, wherein:
5.a	the material having the first conductivity comprises one of aluminum and steel; and
5.b	the second pad is constructed from a silver based compound.
6.pre	The electronic device of Claim 4, wherein:
6.a	the exterior surface of the enclosure further comprises an exterior surface of the second portion;
6.b	the second pad is configured to detect the second electrical signal of the user's cardiac signal via the user's contact with the exterior surface of the second portion;
6.c	the second pad is positioned from the exterior surface of the second portion by a thickness of the second portion;
6.d	at least the thickness of the second portion is constructed from material having a second conductivity; and

<u>Claim</u>	<u>Recitation</u>
6.e	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.
7.pre	The electronic device of Claim 6,
7.a	wherein 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.
8.pre	The electronic device of Claim 1, wherein:
8.a	the enclosure further comprises at least one pocket underneath the exterior surface of the enclosure; and
8.b	at least one of the first pad and the second pad is placed within the at least one pocket.
9.pre	The electronic device of Claim 1, further comprising:
9.a	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; and
9.b	a third lead embedded with the display, wherein the third lead is configured to detect a third electrical signal of the user's cardiac signal via the user's contact with at least one of the third lead and the display.
10.pre	The electronic device of Claim 1,
10.a	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 portion of the enclosure.
11.pre	The electronic device of Claim 1,

<u>Claim</u>	<u>Recitation</u>
11.a	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.
12.pre	The electronic device of Claim 1,
12.a	wherein the first portion of the enclosure is a bezel.
13.pre	The electronic device of Claim 1,
13.a	wherein the second portion of the enclosure is a bezel.
14.pre	The electronic device of Claim 1,
14.a	wherein an interior surface of the enclosure comprises an interior surface of the first portion, wherein the first pad is positioned on the interior surface of the first portion.
15.pre	An electronic device for detecting a user's cardiac signal, comprising:
15.a	an enclosure;
15.b	a display screen exposed to the user through an opening in the enclosure;
15.c	a heart sensor configured to detect the user's cardiac signal, the heart sensor comprising:
15.d.i	a first lead embedded in a first portion of the enclosure of the electronic device,
15.d.ii	wherein the first lead is configured to detect a first electrical signal of the user's cardiac signal via the user's contact with at least one of the first lead and the first portion of the enclosure of the electronic device; and
15.e.i	a second lead embedded in the display screen of the electronic device,

<u>Claim</u>	<u>Recitation</u>
15.e.ii	wherein the second lead is configured to detect a second electrical signal of the user's cardiac signal via the user's contact with at least one of the second lead and the display screen of the electronic device; and
15.f	a processor coupled to the heart sensor and configured to process the first and second electrical signals of the user's cardiac signal.
16.pre	The electronic device of Claim 15,
16.a	wherein the first lead is configured to detect the first electrical signal of the user's cardiac signal via the user's contact with the first lead.
17.pre	The electronic device of Claim 16,
17.a	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.
18.pre	The electronic device of Claim 16,
18.a	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 display screen.
19.pre	The electronic device of Claim 15, wherein:
19.a	the first portion of the electronic device comprises a bezel of the enclosure;
19.b	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.
20.pre	The electronic device of Claim 15,
20.a	wherein the first lead is configured to detect the first electrical signal of the user's cardiac signal via the user's contact with the first portion of the enclosure.

<u>Claim</u>	<u>Recitation</u>
21.pre	The electronic device of Claim 20,
21.a	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.
22.pre	The electronic device of Claim 20,
22.a	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 display screen.

PROPOSED SUBSTITUTE CLAIMS

<u>Claim</u>	<u>Recitation</u>
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.
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.

<u>Claim</u>	<u>Recitation</u>
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.
26.pre	The electronic device of claim 1, wherein the first portion of the enclosure is a bezel, the electronic device further comprising:
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.
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.

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§42.6(e), 42.105, the undersigned hereby certifies that true and correct copies of the above-captioned PETITIONER'S RESPONSE TO PATENT OWNER'S REVISED MOTION TO AMEND and all associated exhibits were served via electronic mail to the following attorneys of record for Patent Owner:

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