

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MASIMO CORPORATION
Petitioner,

v.

APPLE INC.
Patent Owner.

Case No. IPR2023-00745
U.S. Patent No. 10,076,257

FOURTH DECLARATION OF ALAN L. OSLAN

I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, 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.

I reserve the right to supplement my opinions in the future to respond to any arguments or positions Apple may raise, taking account of new information as it becomes available to me.

Dated: June 24, 2024

By: Alan L. Oslan

Alan L. Oslan

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I. INTRODUCTION

309. I previously submitted three declarations in connection with this IPR on March 17, 2023, April 1, 2024, and April 22, 2024. For convenience, I continue paragraph numbering in this declaration at paragraph 309 because my previous declaration contained 308 numbered paragraphs.

310. I have been asked by counsel to review additional materials and render my expert opinion in connection with additional technical matters related to U.S. Patent 10,076,257 (the “257 Patent”). Specifically, I have been asked to render opinions for which my technical expertise is relevant, including whether the substitute claims in Apple’s Revised Motion to Amend filed May 13, 2024 would have been obvious in view of the prior art. I understand that a motion to amend also must satisfy other requirements that are primarily legal, and, thus, do not rely significantly on technical issues for which my expertise is relevant. I do not analyze or opine about those legal requirements.

311. I continue to be compensated for my work in this matter at my standard hourly rate for expert consulting services. My compensation in no way depends on the outcome of this proceeding. I have no financial interest in any of the parties to these matters.

II. INFORMATION AND MATERIALS CONSIDERED

312. In order to render opinions on this matter, in addition to the materials I listed in my previous declarations, I have reviewed the following materials:

- Apple's Exhibit EX2011.

313. I have also reviewed any other materials referenced directly or indirectly in this declaration.

III. EXPERIENCE AND QUALIFICATIONS

314. In my earlier declaration, I outlined my qualifications. A true and correct copy of my curriculum vitae (CV) has been submitted as Exhibit 1004.

315. I make this declaration based on personal knowledge, education and experience, as well as the materials I have reviewed. I am competent to testify about the matters set forth herein.

IV. APPLICABLE LEGAL STANDARDS

316. I am an electrical and biomedical engineer by training and profession. The opinions I express in this Declaration involve the application of my knowledge and experience to the evaluation of the '257 Patent and certain prior art to the '257 Patent.

317. Although I have been involved as a technical expert in patent matters before, I am not an expert in patent law. As set forth in my initial declaration, I have

been advised of certain principles of patent law applicable in this matter, which I have used in arriving at my determinations and opinions.

318. In addition to the principles set forth in my initial declaration, I have been informed that a patent claim may lack written description if the specification and earlier-filed priority applications fail to describe the invention sufficiently to convey to a person of skill in the art that the patentee had possession of the claimed invention at the time of the application and that the patentee invented what is claimed. I understand that even if a description would render obvious a claimed invention, such obviousness is not sufficient to satisfy the written description requirement for that claim. I have also been informed that a patent claim may be indefinite if, read in light of the specification and prosecution history, it fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

V. OVERVIEW

319. It is my opinion that Apple's proposed substitute claims are unpatentable. The added limitations of the proposed substitute claims are nothing more than common features that would have been obvious to a POSITA in view of the art cited in the petition and alternatively the additional art discussed herein. Several references disclose the limitation of a pad "embedded in an inner surface" of a bezel and every other limitation in the substitute claims.

VI. “ENCLOSURE”

A. Mills’s Plating 14b Is Part Of An “Enclosure”

320. I understand that the Board issued Preliminary Guidance in this proceeding, inviting Masimo and Apple to address whether the claim term “enclosure” is broad enough to conclude Mills’s plating 14b of electrode 14 is an exterior surface of the enclosure enclosing components including base metal 14a. P.G., 33. It is my opinion that it is. A POSITA would have understood that the ordinary meaning of “enclosure” is “something that encloses.” Nothing in the ’257 patent or the intrinsic evidence suggests departing from the ordinary meaning of enclosure. Mills’s plating 14b, along with housing 12, encloses components including base metal 14a. Accordingly, plating 14b is part of Mills’s enclosure.

321. A POSITA would have understood that “enclosure” is a broad, generic term for “something that encloses.” Indeed, a POSITA would have understood “enclosure” to be an autological or self-referential noun that defines itself by its *function*—to enclose—not by any specific structure. Thus, the term encompasses *any* structure that encloses.

322. Several dictionary definitions support the self-referential ordinary-meaning of “enclosure,” namely that it means “something that encloses.” For example, Merriam-Webster defines “enclosure” as “something that encloses.” EX1072 at 1. Dictionary.com likewise defines “enclosure” as “something that

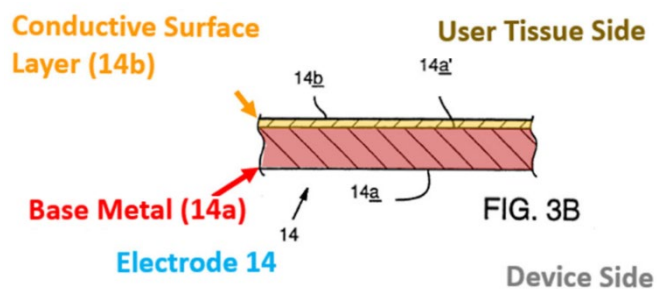
encloses.” EX1071 at 1. Moreover, The American Heritage Dictionary defines enclosure as “something that encloses.” EX1073 at 2.

323. The intrinsic evidence also supports the ordinary meaning of “enclosure” as “something that encloses.” Nothing in the claims, specification, or file history of the ’257 patent limits the “enclosure” to a specific structure. The intrinsic evidence does not define “enclosure” or disclaim its ordinary meaning. The specification provides non-limiting examples that are encompassed by the ordinary meaning: “portion of the device enclosure, (*e.g.*, a metallic bezel or housing forming the exterior of the device.)” EX1001, 2:48-50. The general description of components “forming the exterior of the device” shows “enclosure” is not limited to specific structure but encompasses *any* structure that encloses. A POSITA would have understood “bezel” and “housing” to be just two of many exterior structures that may be part of the enclosure.

324. I understand that the Board was concerned whether “*an outer layer* (e.g., 14b in Mills’ Figure 3B) *of such a multi-layer electrode* could be considered an exterior surface *of an enclosure*.” P.G., 32. The intrinsic evidence supports that Mills’s multi-layer electrode can include both the first pad and the exterior surface of the enclosure. Indeed, the ’257 patent expressly discloses that “an entire portion of the ... enclosure ... *can serve as a lead* for the heart sensor.” EX1001, 6:33-36. A POSITA would have understood that disclosure to mean sensing components such

as leads or electrodes can be part of the enclosure. The '257 patent's fundamental goal of embedding pads into the enclosure is to seamlessly merge the pads with an enclosure. EX1001, 9:14-15 (“Leads 322 and 324 can be integrated in bezel 310 using any suitable approach.”), 2:7-8. Even the patent title, “Seamlessly Embedded Heart Rate Monitor” means that the pads, a necessary element of a heart rate monitor, are seamless with an enclosure. *Id.*, Title. The specification contradicts any suggestion that the electrodes must be entirely separate components from the enclosure.

325. Mills's plating 14b is part of the enclosure because it and housing 12 form the device exterior that encloses metal base 14a and other components. Just like the '257 patent describes a lead “integrated” with a bezel (EX1001, 9:14-15), Mills discloses electrodes 14 and 16 are an “integral part” of housing 12. EX1006, 3:8-11. The plating 14b is the exterior surface covering the metal base 14a, as shown by Figure 3B. *Id.*, 4:4-13.



Thus, housing 12 and its “integral” plating 14b enclose the metal base 14a and other internal components. EX1006, abstract, 3:8-11; 3:46-51; 3:58-59; 4:18-19; 6:55-56. Additionally, plating 14b is not merely an ornamental coating. Rather, it protects and “*greatly extend[s] the life* of ... electrode 14 by producing an *extremely hard*, exterior, skin-contactable surface.” EX1001, 4:43-47 (emphasis added). A POSITA

would have understood that enclosing and protecting internal parts like base metal 14a are functions of an enclosure, as Apple's expert, Dr. Kenny, agreed. EX1052, 185:1-15. Mills's plating 14b cooperates with housing 12 to perform both of those functions.

326. I understand Apple has argued that "the electrode 14 cannot be both the first pad and the first portion of the enclosure in which the first pad is embedded." POR, 29. However, this mischaracterizes the electrode 14 as a single, unitary component, and the Petition's mapping related to this argument relies on different parts of the electrode: plating 14b as part of the enclosure and 14a as the first pad. Pet., 21-22. Moreover, Apple's dictionary definition of "embedded" contradicts such a rigid distinction between pad and enclosure. That definition explains that a pad embedded in an enclosure is "incorporated into a[n] . . . enclosure." EX2005, 3. In other words, the pad is part of the enclosure. Further, the '257 provisional also contradicts Apple's rigid distinction between a pad and an enclosure. The provisional expressly claims an enclosure comprised of a housing and a bezel where the bezel comprises a pad embedded in the bezel's outer surface. EX2002, 29-30 (Claim 9). In other words, the embedded pad is part of the enclosure. Therefore, Apple's contention is wrong. The electrode 14 can include both the first pad and part of the first portion of the enclosure covering the first pad.

327. Accordingly, in view of the structure and function of Mills's plating 14b, a POSITA would have understood that the plating 14b is part of the claimed "enclosure," because that enclosure is something that encloses. Consistent with this understanding, the Board correctly found that Mills's plating 14b is Claim 1's "exterior surface of the first portion" of the enclosure and Mills's "embedded lead 14a" is claim 1's "first pad ... positioned underneath the exterior surface of the first portion." D.I., 23-24.

B. Mills's Electrode 14 Is Part Of An "Enclosure"

328. Masimo's Mills anticipation and Markel-Mills obviousness theories relying on the top of Mills's leaf spring 62 as the first and second pads are not affected by the Board's inquiry whether Mills's plating 14b can be part of an "enclosure." In the unpatentability theories involving the top of Mills's leaf spring 62 as a "pad," the entire electrode and housing of Mills alone or combined with Markel are the "enclosure." Pet., 20, 44-48; Reply, 21-23. The electrode and housing are an "enclosure" because they enclose internal components, including the leaf spring 62.

VII. THE SUBSTITUTE CLAIMS WOULD HAVE BEEN OBVIOUS OVER THE ART CITED HEREIN

329. In my initial declaration I explained how original Claim 1, 3, and 11 are unpatentable as obvious over Ground 1 of Mills and Claims 1, 3, and 11-14 are unpatentable as obvious over Ground 2 of Markel in view of Mills. EX1003, Section

IX (§§56-132). Accordingly, in this supplemental declaration I only focus on the added limitations of the proposed substitute claims 23-27. It is my opinion that proposed substitute claims 23-27 would have been obvious to a POSITA in view of the art cited in the petition and alternatively the additional art provided herein. The level of skill of a POSITA remains the same as in the Petition and my original declaration. Pet. at 7.

A. Substitute Claim 23 Is Unpatentable Over Mills Alone Or The Combination of Mills and Markel

- 1. “The electronic device of claim 1, wherein the first portion is electrically isolated from the second portion by an electrically isolating component inserted between the first and second pads;”**

a. Anticipation

330. The petition and my original declaration established that Mills teaches an electrically isolating component, namely acrylonitrile-butadiene-styrene (ABS) plastic, between its first and second electrodes, 14 and 16. Pet. at 34-35. ABS is a well-known electrical insulator. *Id.* Thus, Mills teaches an electrically isolating component between two pads.

b. Obviousness

331. Markel teaches an embodiment shown in Figures 1-8 with electrodes “integrated into various molded components” of the device ([0037]) such as on the back (410b/420b) of the device ([0045]), in “a border of [a] display” ([0044]), or “an electrode (or other sensor) may be disposed on a pushbutton of the MCD 100.”

EX1005, [0042]. On the back of the device an “insulating region 415 may separate” electrodes 410b/420b and pushbutton electrodes may be “separated by an insulating portion 243.” EX1005, [0045], [0047]. *see also* Pet. at 56-57. Consistent with Markel’s teachings, a POSITA would have known that if electrodes are provided in relative proximity, an insulating portion would be needed. *See* EX1052, 230:7-231:5 (Apple’s expert testifying that ECG electrodes would be “shorted out” without insulation between them). A POSITA would have known that electrodes should be separated by an electrically isolating (insulating) component and would have been motivated to provide one between the two adjacent electrodes to avoid crosstalk and mixing of signals. Thus, these limitations are disclosed by and would have been obvious in view of Markel.

2. “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; and”

a. Anticipation

332. The Petition established for claim 1 that Mills discloses a first pad (base metal 14a of electrode 14) positioned underneath the exterior surface (plating 14b of electrode 14) of the first portion of the enclosure. Pet. at 19-24; Reply at 2-6. This limitation of substitute Claim 23 adds that the second pad is also underneath the exterior surface of the second portion. As explained in the Petition, Mills’s electrodes 14 and 16 have the same structure with a base metal (14a/16a) and plating

(14b/16b).¹ Pet. at 29; Reply at 4. Accordingly, for the reasons explained in the Petition that Mills's first pad 14a of electrode 14 is underneath the exterior surface plating 14b of the first portion, its second pad of electrode 16 is underneath the exterior surface plating of the second portion. Pet. at 28-30; Reply at 10-11.

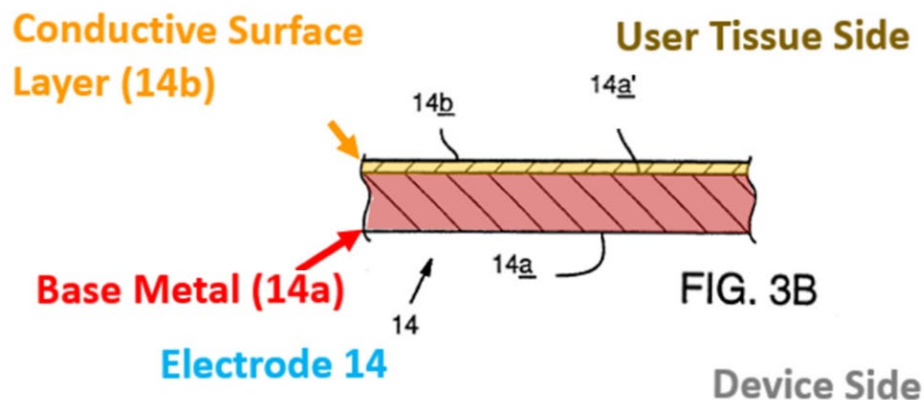
b. Obviousness

333. In Ground 2, the Petition showed for claim 1 that it would have been obvious to use leaf springs as taught by Mills to connect Markel's electrodes 410b and 420b to internal processing components. Pet., 44-48; Reply, 22-23. The Petition explained that in this Markel/Mills combination, the top of each leaf spring would be a pad embedded in the enclosure underneath the exterior surface. Pet., 46-48; Reply, 22-23. Therefore, the Petition further explained that in the Markel/Mills combination, "the first pad is positioned underneath the exterior surface of the first portion" because the pad of leaf spring 62 is "positioned underneath the electrodes/first portion 410b exterior surface of Markel." Pet., 49; Reply, 23. It would have been obvious to locate the second pad under the second portion's exterior surface in the Markel/Mills combination for the same reasons established

¹ While there is no item number 16a or 16b in Mills, I have carried over the numbering strategy of 14a and 14b of electrode 14 to electrode 16 for clarity.

for the first pad. Pet. at 44-48; Reply at 22-23. And the additional references and evidence provided below further shows the obviousness of this added limitation.

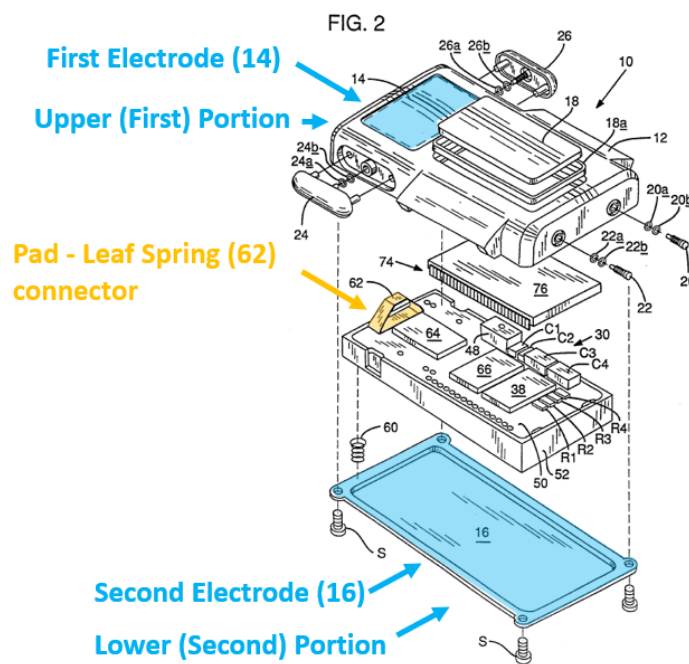
334. Consistent with Markel’s teaching that an electrode may be “integrated into various molded components” (EX10005, [0037]) and Mills’s teaching of an electrode forming an integral part of a housing (EX1006, 6:51-56), a POSITA would have found it obvious to use electrodes like Mills’s metal-plated electrodes in Markel’s bezel such that they are “positioned underneath the exterior surface” of this plating. Mills teaches embedding a base metal electrode (14a, a pad) underneath an exterior surface of metal plating (14b), as shown in Figure 3B (rotated 180°):



335. A POSITA would have been motivated to use electrodes like Mills’s metal-plated electrodes in Markel’s bezel because Mills teaches that the plating 14b protects the device and produces an “an extremely hard, exterior, skin-contactable surface.” EX1006, 4:39-43. *See also* Pet. at §IV(B). Mills also teaches that applying the plating “greatly extend[s] the life” of electrode 14 and “obviates use of a messy, conductive gel.” EX1006, 4:39-43, 4:19-24. Thus, a POSITA would have integrated

Mills's metal-plated electrodes into Markel's bezel to provide a protective surface as well as an improved electrode that functions as a portion of the enclosure of the device.

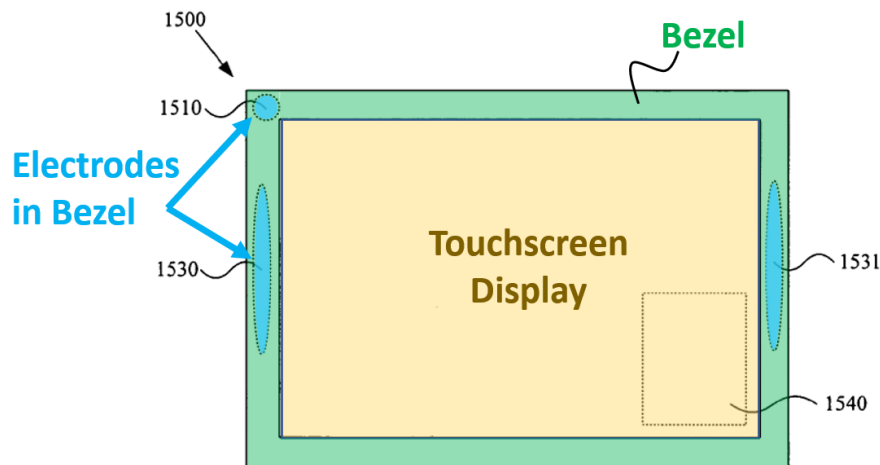
336. Alternatively, Mills illustrates a leaf spring positioned underneath the exterior surface of electrode 14:



337. The top of the leaf spring 62 is a pad that is configured to convey an ECG signal of the user via its contact with electrode 14. The top surface of the leaf spring is embedded underneath the inner surface of electrode 14 under Apple's construction because it is at least partially surrounded by the electrode 14. Thus, the pad on the top of the leaf spring is embedded on the inner surface of a portion of the housing.

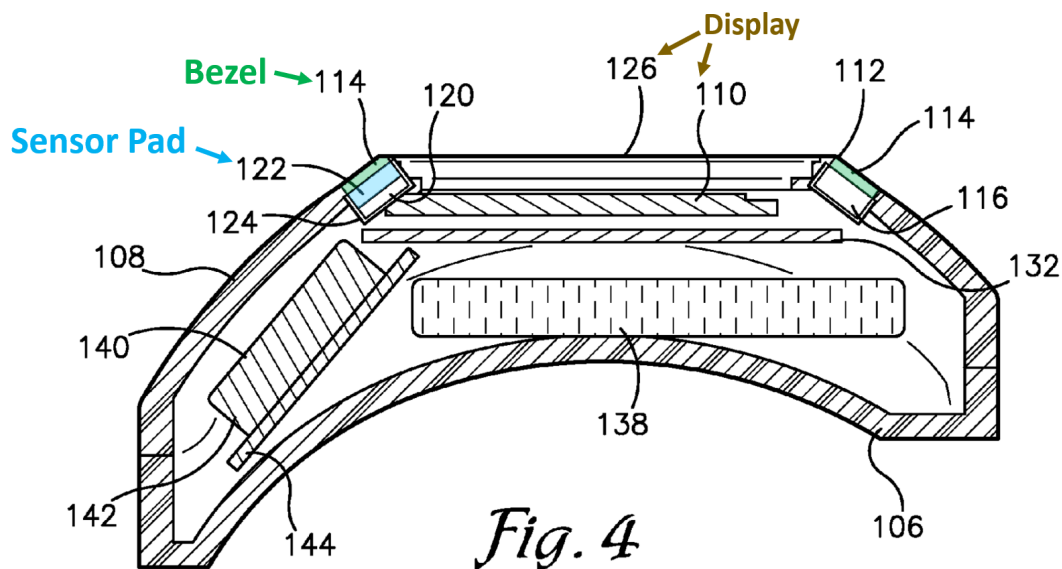
338. A POSITA would have been motivated to provide Mills’s leaf spring below Markel’s various electrodes (pushbutton electrodes, back side electrodes, or bezel electrodes) at least because leaf springs ensure continuous, reliable, low-resistance connections (EX1059, 1; EX1060, 1; EX1061, 2); avoid soldering, allow easier device assembly, disassembly, and maintenance (EX1060, 1); reduce movement and mating cycles without significantly reducing performance (*Id.*, 1, 4; EX1061, 7); are resilient under harsh conditions and rapid temperature changes (EX1060, 1; EX1061, 7; EX1059, 5); are compact and ideal for small consumer devices (EX1061, 7); and have a “self-adjusting nature” to “compensate for any minor misalignments” to reduce connection-failure risk (EX1061, 7).

339. Markel further suggests integrating or embedding pads or electrodes in its bezel. Markel teaches that MCD 100 (Figure 1-8) may have a first pad (electrode) embedded in a bezel: “an electrode may be disposed on a video display device 140 (e.g., a border of the display or integrated into a touch screen).” EX1005, [0044]. Markel shows exemplary positioning of electrodes (1510, 1530, 1531) in the bezel of Figure 15 with the dashed lines below:



340. With regard to Markel’s bezel, the preliminary guidance notes Markel’s use of the words “disposed on” and takes a narrow interpretation of these words to deduce that Markel may not teach embedding under a surface such as Markel’s bezel. P.G., 25-26. But Markel uses the term “disposed on” in a figurative sense to refer to the location, not the depth, of the electrode. For instance, Markel states that a pad “*disposed on* a video display device” is a pad “integrated into a touch screen.” EX1005, [0044]. This pad cannot be literally “disposed on” the touchscreen as it would obscure the display. Moreover, Figure 15’s dashed lines suggest that those electrodes are under the surface. This is further confirmed by the fact that electrode 1540, which uses the same dashed lines, would be underneath the display. Therefore, Markel’s pads are not literally “disposed on” its display and not necessarily “disposed on” the border of its display. Therefore, Markel teaches embedded electrodes, such as in the bezel of a display.

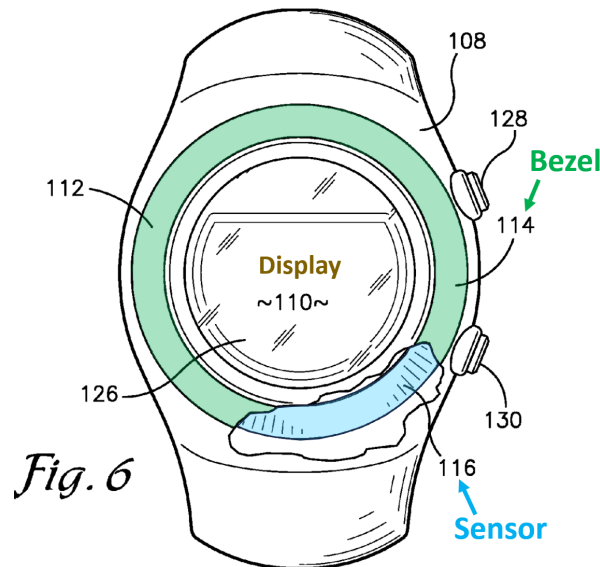
341. In addition to Markel’s teachings of electrodes in a display, Lyons provides an explicit teaching for positioning a pad underneath a portion of an enclosure bezel that forms an exterior surface of the device and would have further motivated a POSITA to position the second pad underneath the exterior surface of the second portion of Markel’s bezel. Lyons teaches placing capacitive touch sensor pads 122 on an inner surface of bezel 114 as illustrated below:



Lyons’s bezel 114 may be made of plastic or metal. EX1068, [0020].

342. Sensor pad 122 is a portion of capacitive sensor 116 and “detects changes in capacitance on the pads 122” specifically “when a user touches the bezel 114 with [a] fingertip” ([0026]) and can “sense various electrical properties of the

human body” ([0044]) for determining contact with the user. EX1068, [0026], [0044].²



343. A POSITA would have combined Markel and the structural placement of the sensor pad in Lyons because Lyons explicitly states that its sensor placement may be applied to other types of sensors: “While a capacitive flex sensor is shown specifically in the drawings and discussed herein, it is contemplated that other touch

² Lyons teaches that its “bezel 114 and/or the sensor 116 may be ... comprised [of] two C-shaped regions positioned on either side of the display 110, comprised of two or more curvilinear segments spaced around the display 110, or the like.” EX1068, [0028]. Two C-shaped regions on either side of the display is almost identical to the configuration shown in Figure 5 of the ’275 patent, with isolating portions 530 and 532 separating the two c-shaped regions. EX1001, Fig. 5.

based sensor technologies (e.g., resistive, etc.) may be utilized.” EX1068, [0027]. Therefore, Lyons’s sensor pad placement on the inner surface of a bezel is not limited to capacitive sensors. Its teachings regarding electrode placement may apply to other sensors, such as Markel’s conductive electrodes. Thus, a POSITA would understand that the electrodes shown in Fig. 15 of Markel could be implemented using the positioning of the sensor pad in Lyons.

344. A POSITA would have been motivated to use the sensor concealment in Lyons and combine it with the electrode placement in the bezel of the display in Markel and at least because they both teach sensors embedded in a bezel. A POSITA would have looked to Lyons at least because Lyons’s sensor placement accomplishes Markel’s goal of having electrodes that are “concealed (or hidden) from a user.” EX1005, [0040]. Although Lyons sensor is a capacitive touch sensor, capacitive ECG sensors were known for several decades prior to the ’257 patent, as evidenced by Larson (4,230,127, EX1075). Larson teaches electrode 16, a “capacitive type electrode,” embedded adjacent to a display screen in a device. EX1075, 3:38-44, Fig. 1, 4A-4C. Therefore, it is my opinion that a POSITA would have seen the teachings related to capacitive sensors, capacitive ECG sensors, and conductive ECG sensors as “familiar items” and a POSITA would have been “able to fit the teachings of [these] patents together like pieces of a puzzle.” *KSR Intern. Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1732 (2007). For example, a POSITA would

have known that capacitive ECG electrodes may have a metallic layer (such as a metal bezel) provided on their outermost surface. This is taught by Taheri (EX1076, 8:40-47, Fig. 12), which illustrates an ECG electrode with a metallic contact (1202) that is exposed to the skin (1208; *see* EX1076 8:48-61), a dielectric 1204, and metallic contact 1206 connected to the internal circuitry 1210:

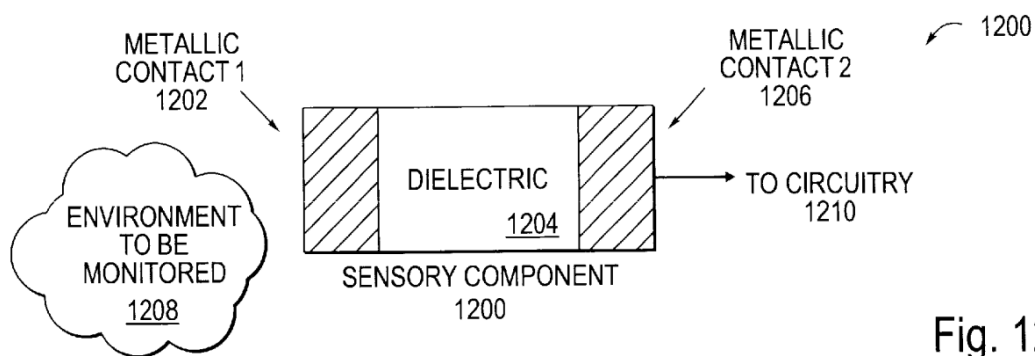


Fig. 12

EX1076, Figure 12.

345. A POSITA would have known that adding a metal layer on top of a capacitive ECG sensor would have been desirable because it “minimizes interference noise” and “provides an improved signal to noise ratio.” EX1076, 5:27-31; *see id.*, 9:47-52 (teaching use as an EKG sensor). Although sensor placement from Lyons, not the sensors themselves, would be provided in Markel’s bezel, Taheri confirms that these sensor configurations are analogous to Markel’s ECG electrodes. For example, adding a metal layer on a conductive or capacitive electrode pad would have been known to a POSITA.

346. Finally a POSITA would have found it desirable to position a pad underneath Markel’s bezel for reliability and aesthetics. Lyons states that sensor pad 122 is “*protected from impingement by liquids and other foreign object beneath the bezel 114.*” EX1068, [0027].³ Lyons additionally teaches that providing a sensor under a bezel provides a “robust, reliable and stylish” look to its device. EX1068, [0027]. Therefore, a POSITA would have found the combination of Markel and Lyons as obvious.

347. Additional supporting evidence shows that a POSITA would have known that a user may indirectly contact an ECG pad. This is demonstrated by Rytky (EX1074) which teaches that a pad (equivalent to Rytky’s electric conductor layer 206) may have “an electrode area 208, which establishes an electric indirect or direct contact when used on the surface of the user’s skin and generates as output an electric signal . . . proportional to a momentary value of the electrocardiogram.” EX1074, [0046]. With regard to the indirect contact, Rytky explains that a “[c]onducting material may be provided between the surface of the skin and the electrode area.” *Id.* Accordingly, a POSITA would have found it obvious to embed an electrode on the inner surface of a conducting material (such as a metal bezel) in order to have indirect skin contact with the electrode pad. *See id.*, [0055] (“The electric contact

³ All emphasis has been added herein unless noted otherwise.

may be a direct contact or an indirect one. *In the latter case conducting material may be provided* between the surface of the skin and the [electrode components].”). A conducting material added between the surface of the skin and Rytiky’s electric conductor layer 206 (pad) could have been configured as shown below with the dashed lines indicating the added layer:

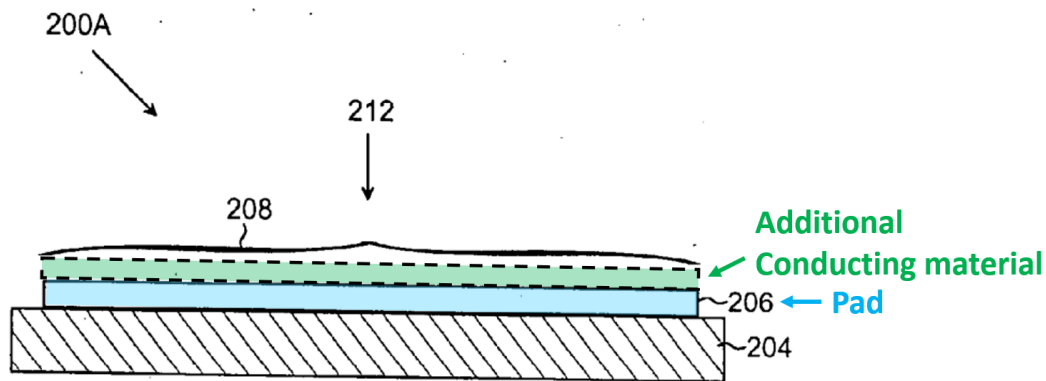


Fig. 2A

EX1074, Fig. 2A.

348. Therefore, in view of these prior-art teachings, a POSITA would have been motivated to combine Markel and Mills, and would reasonably have expected success, to position the second pad underneath the exterior surface of the second portion of Markel’s bezel.

3. “wherein the first and second pads are adjacent pads.”

a. Anticipation

349. The ’257 patent does not define “adjacent” but consistently describes adjacent pads as separated from each other by a “sufficiently large” distance or near each other but separated by an insulating portion to avoid electrical interference.

EX1001, 9:53-57, 2:51-59. Mills's first and second pads are near each other in opposite top-and-bottom enclosure faces separated by an insulating portion of housing 12. Mills's top-and-bottom-face placement is nearly identical to the left-and-right-face placement of leads 322 and 324 in Figure 3 of the '257 patent. Thus, Mills's first and second pads are adjacent.

b. Obviousness

350. The pads in the Markel/Mills combinations—which are located at the position of the electrodes to which they are connected, as explained in the Petition—are also adjacent. The pads of Markel's electrodes 410b/420b are near each other on left and right sides of MCD 100 separated by an insulating portion, like leads 322 and 324 of Figure 3 of the '257 patent. Pet. at 56-57. Additionally, the pads of Markel's Figure 15 bezel electrodes 1510 and 1530 are near each other on the same side of the bezel. *Id.*, 62. Figure 15's electrode placement would have been obvious in MCD 100 because Markel teaches electrodes in “a border of the display” ([0044]) and, as the Board determined, Figures 4 and 15 generally disclose the same embodiment. D.I., 43. Thus, Markel discloses adjacent pads.

B. Substitute Claim 24 Is Indefinite or Would Have Been Obvious Over Markel and Mills or Markel, Mills, and Lyons

- 1. “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;”**

351. This limitation is obvious for the reasons provided in the Petition. Pet. at 61-62. For example, Markel teaches the possibility of an electrode “exposed for user contact.” EX1006, [0037].

- 2. “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”**

352. As shown by the Petition, a first pad embedded in a bezel would have been obvious in view of Markel and Mills. Pet., 62. The limitations of substitute Claim 24 differ from Claim 12 because the bezel is metal, and the first pad must be embedded in an “inner surface” of the bezel. These added limitations would have been obvious in view of Markel and Mills. As shown in the Petition, it would have been obvious to put Mills’s pad under Markel’s bezel, in which case it would be embedded in an interior surface of the bezel. Pet., 62; Reply, 26-27. As discussed with respect to Claim 23, Markel’s disclosure of electrodes “disposed on” the device suggests electrodes being “integrated into” the bezel. *See* §VII.A.2.b. A POSITA would have found it obvious to configure Markel’s bezel from a metallic conductive material to facilitate conduction of cardiac signals through the bezel. *See* EX1074, ¶46 (“Conducting material may be provided between the surface of the skin and the

electrode area”).

353. Alternatively, the added limitations would have been obvious in view of Markel, Mills, and Lyons. Lyons clearly teaches a sensor pad embedded in an “inner surface” of a metal bezel. *See* Lyons, Figure 4, ¶20. As explained above in §VII.A.2.b, a POSITA would have been motivated to embed a pad like Mills’s in the inner surface of the bezel for reliability, protecting the device from water, and aesthetics and style. Markel does not explicitly disclose a metal bezel, but Lyons teaches that its “bezel 114 may be formed of metal or plastic.” EX1068, ¶27. A POSITA would have found it obvious to configure Markel’s bezel from a metallic conductive material to facilitate conduction of cardiac signals through the bezel. For example, Lyons teaches that the electric field is conveyed through the bezel: “[w]hen a user touches the bezel 114 with his or her fingertip (or other conductive object) the electric field around one or more of the sensor pads 122 is changed.” EX1068, [0026]. Thus, a metal bezel would have been desirable to transfer electrical signals. *See* EX1074, [0046] (“Conducting material may be provided between the surface of the skin and the electrode area.”).

354. Accordingly, it would have been obvious to a POSITA to embed the pad in the inner surface of a metal bezel in view of Markel and Mills or Markel, Mills, and Lyons.

3. “wherein the second pad is exposed on the exterior surface of the electronic device for direct contact from a user”

355. This limitation would have been obvious under any construction of “embedded in” that does not require the top surface of the pad to be covered by the enclosure. However, the limitation is indefinite if “embedded in” requires the top surface of the pad to be covered by the enclosure because, under that construction, the pad could not both be “embedded in” the enclosure (as required by Claim 1) and have “direct contact from the user.”

356. The possibility of having some electrodes exposed while other electrodes are hidden is envisioned by Markel: “*an electrode* (or all electrodes) or other sensor may be substantially concealed (or hidden) from a user.” EX1005, [0040]. Markel teaches the possibility of a surface “electrode [that] may comprise a metallic surface exposed for user contact.” EX1005, [0037]. Thus, Markel teaches this limitation, and the selection of a hidden or exposed electrode would have been a design choice. A POSITA would have chosen a hidden electrode for aesthetic reasons or an exposed electrode for maximizing signal strength.

C. Substitute Claim 25 Would Have Been Obvious Over Markel and Mills or Markel, Mills, and Lyons

1. “The electronic device of claim 1, further comprising a touch screen display, wherein the first portion of the enclosure is a

**bezel; wherein the bezel extends around the touch screen display;
and”**

357. As shown in the Petition and Markel’s Figure 15 reproduced above in Section VII.A.2.b, Markel’s bezel extends around “a touch screen portion of the display device.” EX1005, [0078]; Pet., 62.

2. “wherein the first pad is embedded in an inner surface of the bezel”

358. A pad embedded on an inner surface of a bezel would have been obvious to a POSITA, as discussed in Sections VII.B.2.

D. Substitute Claim 26 Is Indefinite or Would Have Been Obvious Over Markel and Mills or Markel, Mills, and Lyons

1. “The electronic device of claim 1, wherein the ~~second~~ first portion of the enclosure is a bezel, the electronic device further comprising:”

359. As discussed above in Section VII.A.2.b, Markel in view of Mills and Markel in view of Mills and Lyons teaches electrodes embedded in a device bezel.

2. “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”

360. These limitations would have been obvious under any construction of “embedded in” that does not require the top surface of the pad to be covered by the enclosure. However, these limitations are indefinite if “embedded in” requires the top surface of the pad to be covered by the enclosure because, under that

construction, the pad could not both be “embedded in” the enclosure and have contact with the user’s skin. As discussed above, Markel teaches both electrodes that are hidden and others that are exposed to the user’s skin. §VII.B.3; EX1005, [0037]. The selection of a hidden or exposed electrode would have been a mere design choice. A POSITA would have chosen a hidden electrode for aesthetic reasons or an exposed electrode for maximizing signal strength.

361. As shown above in Section VII.A.2.b regarding Markel’s Figure 15, Markel teaches at least three leads (1510, 1530, 1531), including a third lead with a third pad that is embedded in the second portion of the enclosure (bezel) around a touchscreen. Markel’s third pad is configured to detect a third electrical signal via the user’s skin’s contact with the third pad. For example, Markel states that “[t]hough the previous exemplary illustrations generally discuss one or two electrodes . . . the MCD 100 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.” EX1005, [0051]. Thus, Markel discloses these limitations, including detecting cardiac signals through first, second, and third electrodes (1510, 1530, 1531).

3. **“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; wherein the first pad detects signals**

through a first hand, and the second and third pads detect signals through a second hand.”

362. As discussed in Section VII.B.3, Markel discloses a second pad configured to detect the second electrical signal via the user’s skin’s contact with the second pad. For example, Markel discloses an “exposed” electrode surface. EX1005, [0037]. Thus, Markel discloses the first part of this limitation.

363. With regard to detecting signals “through a first hand” and “through a second hand,” Markel teaches that electrodes may have a “*placement . . . for convenient access* for a user to contact both the first and second electrodes simultaneously (e.g., with different hands or different fingers).” EX1006, [0049]. A POSITA would have found it obvious to contact Markel’s second electrode along with Markel’s additional electrode (third electrode) with the same “second hand” to provide redundancy, noise cancellation for the signal, or as a reference/neutral electrode that may also include a right-leg drive configuration. *See* EX1006, [0051] (“third (or N) electrodes”); [0088] (“additional “Nth electrode”); EX1052 at 230:2-4 (Apple’s expert testifying “if you can have a third electrode, you have an opportunity to capture a cleaner signal”); EX1056, 4:12-18 (“one hand makes contact with two of the contacts, and the other hand makes contact with the third contact.”); *Id.*, 7:33-34; EX1057, abstract. The figure below shows how it would have been obvious from the placement in Figure 15 that a user naturally would touch the three electrodes with two hands:

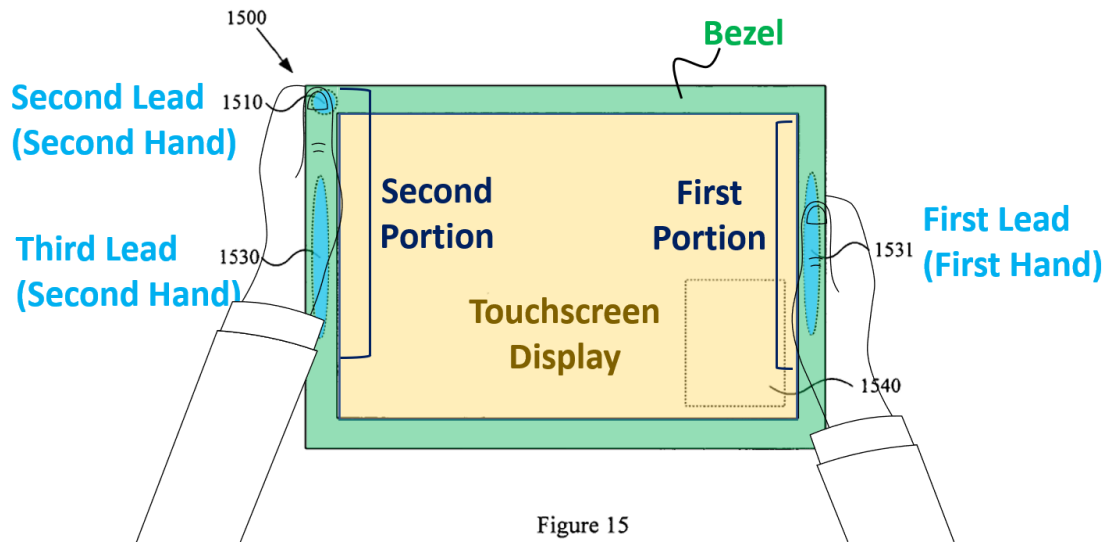


Figure 15

364. A POSITA would have understood that a user can easily touch three electrodes with two hands in the Figure 4 format as well, since Figure 15 provides sample placement for electrodes. Finally, Claim 26’s recitation regarding the *use* of a device with a first hand and second hand does not limit the device, as the preliminary guidance correctly concludes. P.G., 13.

E. Substitute Claim 27 Would Have Been Obvious over Markel and Mills or Markel, Mills, and Kyoso

1. **“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 interior surface of the first portion; The electronic device of claim 1, 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 wherein if the extracted one or more**

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

365. The limitations of original Claim 14, including a first pad “positioned on the interior surface,” is anticipated by Mills or obvious in view of Markel and Mills for the reasons provided in the Petition. Pet. 39-40, 63-64. Additionally, a pad positioned on an interior surface would have been obvious for the reasons provided above in Section VII.A.2.b.

366. Regarding authentication, Markel discloses a cardiac information processing system (MCD 1700) that is applicable to each embodiment in Figures 1-16. EX1005, [0085]. This processing system has a “cardiac information acquisition module 1710 [that] acquires cardiac information from a plurality of users” and “may store at least a portion of such acquired information in the memory 1740 (e.g., indexed by user identification).” EX1005, [0098]. The module 1710 is “adapted to identify the user” based on acquired cardiac information. EX1005, [0097]. This cardiac information acquisition performs authentication and “such identification (or *authentication*) may be utilized in an exemplary scenario where a variety of users may be utilizing the MCD 1700.” EX1005, [0097]. The processing system “MCD 1700 may store, *analyze* and/or communicate acquired cardiac information.” EX1005, [0098]. Thus, it would have been obvious to compare acquired signals to the “stored” cardiac signals to match a user “indexed by user identification” and perform “authentication.” *See* EX1005, [0097]-[0098].

367. Alternatively, Kyoso also teaches an “ECG identification system” that “identifies subjects based on a *comparison* of a patient’s ECG with *previously registered* ECG feature parameters.” EX1070 at Abstract. Kyoso teaches that “[i]n order to perform any identification process, feature parameters must be *extracted* from the ECG” and those extracted signals are used to “discriminate between the registered ECGs.” EX1070 at 1. Using the extraction and comparison techniques taught in Kyoso “the system can discriminate between registered subjects within a single [heart]beat.” EX1070 at 1.

368. A POSITA would have found it obvious to combine the authentication process taught by Markel with the extraction, comparison, and authentication techniques of Kyoso at least because Markel and Kyoso both teach identification of an individual based on heart signals. Furthermore, a POSITA would have found authentication beneficial to 1) ensure device security, 2) add a unique identifier used in conjunction with fingerprint reading or other biometrics, 3) enable an identifier that does not require keys or passcodes, and 4) secure protected healthcare information for the user. Finally, it would have been obvious because many other references taught such ECG authentication years before the ’257 patent priority. *See* EX1077 at 13-14 (teaching ECG authentication in a “convenient [] low cost” measurement hardware to be used “in daily life”), EX1055, EX1078 (an ECG

identification system should “require[] only to be touched by the hands or two fingers while still providing the required signal quality”); EX1079, Fig. 1.

369. Thus, the limitations of Claim 27 are disclosed by the references and would have been obvious in view of Markel and Mills and alternatively Kyoso.

VIII. CONCLUSION

370. For these reasons, it is my opinion that each of substitute Claims 23–27 is unpatentable.