

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

SUPPLEMENTAL 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: April 1, 2024

By: 

Alan L. Oslan

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I. INTRODUCTION

136. I previously submitted an initial declaration on March 17, 2023, in connection with this IPR. Also for convenience, I continue paragraph numbering in this declaration at paragraph 136 because my previous declaration contained 135 numbered paragraphs.

137. 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: (1) whether the specification provides written description for the substitute claims proposed in Apple’s Motion to Amend filed January 8, 2024, (2) whether the substitute claims satisfy the definiteness requirement, and (3) whether the substitute claims 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.

138. 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

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

- Apple's Exhibits EX2001-EX2003 and EX2008 .
- EX1052-1058.

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

III. EXPERIENCE AND QUALIFICATIONS

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

142. 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

143. 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.

144. 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.

145. 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

146. It is my opinion that Apple's proposed substitute claims are unpatentable. The substitute claims deviate so significantly from the '257 patent's original claims and disclosure that they lack written description support. Further, the substitute claims would have been obvious in view of the prior art asserted in my first declaration. Apple proposes a substitute Claim 22 even though the '257 patent already recites a Claim 22. Therefore, it is unclear whether Claims 23 and 24 depend

from original Claim 22 or substitute Claim 22. Substitute Claims 22, 23, and 24 are unclear and indefinite for that reason alone. However, for my analysis herein, I treat Claims 23 and 24 as depending from substitute Claim 22.

**VI. PROPOSED SUBSTITUTE CLAIMS 22-28 LACK WRITTEN
DESCRIPTION SUPPORT UNDER 35 U.S.C. § 112(A)**

147. It is my opinion that Apple's proposed substituted claims lack written description support. Apple has not shown that the substitute claims are supported by the '257 Patent disclosure. Rather, Apple identifies paragraphs from the '257 Patent with broad statements regarding combining features from different embodiments or Apple fabricates features that are not found anywhere in the specification or drawings.

148. For some of the substitute claims, Apple's alleged support is based upon the combination of several features from different embodiments in the '257 Patent, but a POSITA would have understood that these combinations of features are not supported by the '257 Patent. For example, for Claim 23 Apple relies on EX2001 paragraphs [0034] (related to FIG. 1), paragraphs [0043]-[0044] and [0046]-[0047] (related to FIG. 3) *and* FIGS. 3, 4B, and 5, and similar paragraphs in EX2002. A POSITA would have understood that the combination of these separate features from different embodiments is not disclosed in the '257 Patent and does not satisfy the written description embodiment. Each substitute claim suffers from this deficiency.

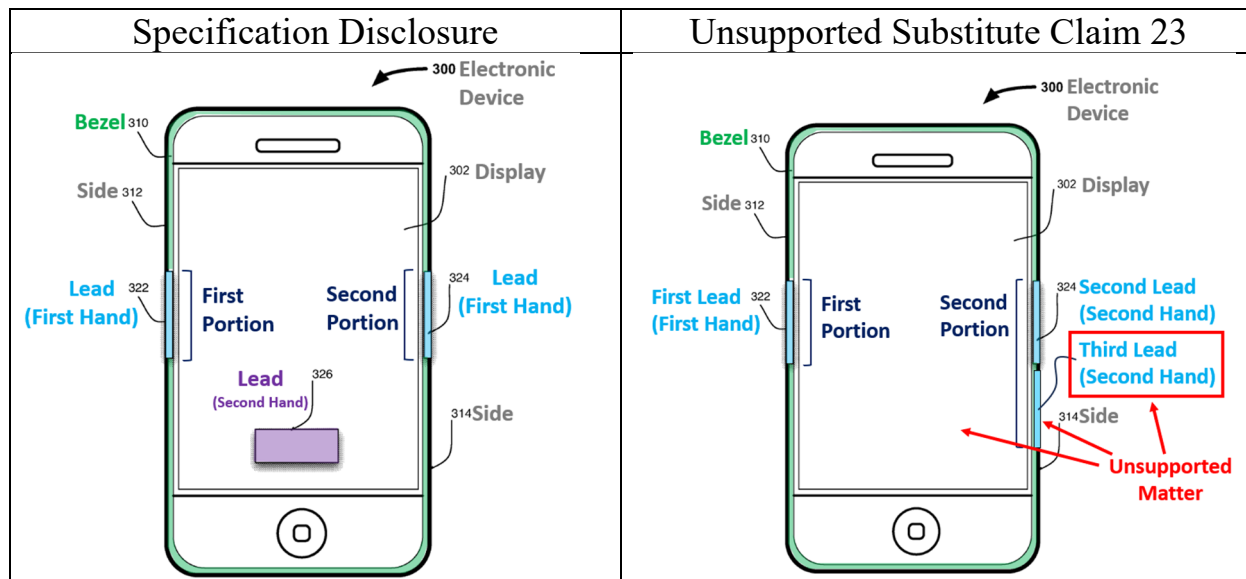
149. Regarding substitute Claim 22, a POSITA would have understood that the specification does not disclose or describe a “first pad is embedded in an inner surface” of a bezel that “extends around the touch screen display.” The specification does not use the words “embedded in an inner surface” or describe any embodiments as having this feature. Apple generally identifies paragraph [0034] of EX2001 and paragraph [0033] of EX2003, but this paragraph simply states that “each lead can include a pad or extended area placed on the outer or inner surface of an electronic device bezel or housing.” Placed on does not provide support for “embedded in.” I understand that Apple argued in its patent owner response that “embedded in” was distinct from “embedded” and that “‘embedded in’ requires more than two materials or substrates that are merely positioned adjacent to, parallel, or against each other.” POR at 9-10. *See also* EX1001 at 51 (arguing that prior art electrodes are not “embedded in” a first portion or second portion because the electrodes are “mounted on” a swing arm). *See also* EX1034, Fig. 1 (showing electrodes) and 2:9-12 (“With combined reference to FIGS. 1-3, the swing arm assembly 10 with electrodes 12 mounted thereon is rotatably mounted on the bottom case 14 of the housing of an ECG monitor 16”). Thus, according to Apple, “embedded in an inner surface” cannot equate to “placed on an inner surface” and the specification fails to support “embedded in an inner surface.” Likewise, features such as a bezel (FIG. 3, bezel 310), a touch screen display ([0024]-[0025] & FIG. 1), and a “first pad” ([0034])

embedded ([0044]) in the inner surface of that bezel surrounding the touch screen are not supported as a whole, but are rather disparate elements combined from various figures and paragraphs. For at least these reasons, Claim 22 lacks written description support.

150. A POSITA would understand that Claim 23 also includes new subject matter that was never disclosed. For example, the specification does not describe a “third lead” that is embedded in a second portion of the enclosure. Apple relies on Figures 3, 4B, and 5. Figure 4B shows one lead and Figure 5 shows no leads. Figure 3 is the only figure with a third lead and its third lead is under the display, which is not “the enclosure” according to the ’257 specification. *See* EX1001, FIG. 3. *See also* EX1001, 3:9-11 (“electronic signals can be transmitted through the steel or aluminum enclosure”); 10:24-28 (“the enclosure is constructed from a bezel supporting a display and a housing forming the exterior surface of the device behind the display”). Additionally, Claim 15 recites “a display screen exposed to the user through an opening in the enclosure,” which a POSITA would understand to mean that the display is not part of the enclosure. EX1001, 14:1-2. Also, Claim 23 depends from Claim 22 which requires that the first pad is “embedded on an inner surface of the bezel” as I explained above, but also requires that third pad is exposed for a “user’s skin’s contact with the third pad.” Figure 3 is the only figure with a third lead and its third lead is under the display, which is not exposed for a user’s skin contact.

The '257 specification does not describe or suggest the combination of pads (including a “third pad”) being exposed, while other pads are not exposed and “embedded in an inner surface.” Such a configuration is not found in the '257 Patent.

151. The specification also fails to disclose that the “third pad that is . . . in the second portion of the enclosure” and “the second and third pads detect signals through a second hand.” Instead, the specification only mentions particular hands associated with one configuration of leads: “leads 322 and 324 detect signals through a first hand, and lead 326 detects signals through the second hand.” EX1001, 8:48-49. Additionally, lead 326 is positioned under the touch screen display, not in a second portion. The specification does not disclose that a second hand touches any particular lead other than lead 326. A POSITA would have understood that this new arrangement would require modifying the embodiments disclosed in the '257 Patent to have new and different features, as I have illustrated in the annotated figures below:



152. Substitute Claim 24 depends from Claim 23 and includes additional new features not described in the '257 Patent. For example, Claim 24 states that the second and third pads are “adjacent” pads and that an electrically isolating component is inserted between these specific pads. Figure 3 is the only figure Apple relied upon that has three leads, but none of its leads are adjacent. Apple’s expert even admitted “I don’t think anyone would describe [leads] 322 through, 324, or 326 as adjacent to one another.” EX1052 at 227:1-5. The specification does not disclose that any particular leads (“the second and third pads”) are adjacent and located in the “second portion of the enclosure.” EX2002, [0009]; EX2001, [0010]. A POSITA would have also understood that the '257 Patent fails to explain what “adjacent” means. In fact, the specification’s only quantitative measure regarding “adjacent” is

that “the distance between adjacent leads can be *sufficiently large*.” EX2001, [0010].¹ Thus, Claim 24 is not supported.

153. Similar to Claim 22, Claim 25 states that the first pad is “embedded in an inner surface” of a bezel. This is unsupported for the reasons provided above with regard to Claim 22. The specification merely states that “each lead can include a pad or extended area placed on the outer or inner surface of an electronic device bezel or housing.” Thus, under Apple’s interpretation of “embedded in,” this feature is not disclosed in the ’257 Patent. *See* POR at 8-9 (distinguishing “embedded with,” “embedded in” and “embedded” under the doctrine of claim differentiation).

154. Claim 25 also includes that the second pad is “exposed,” while the first pad is not. The specification does not describe or suggest an embodiment having a “first pad” embedded under the “inner surface” of a “metal bezel” while at the same time a second pad is “exposed.” The specification does not contain any figure that shows an exposed pad and a pad embedded under.

155. Substitute Claim 26 also lacks written description in the ’257 Patent. The claimed extraction and authentication are not disclosed, especially when combined with the limitations of Claim 1 instead of Claim 15. For example, paragraph [0051] of EX2001 only teaches “extracted characteristics” and

¹ All emphasis has been added unless otherwise noted.

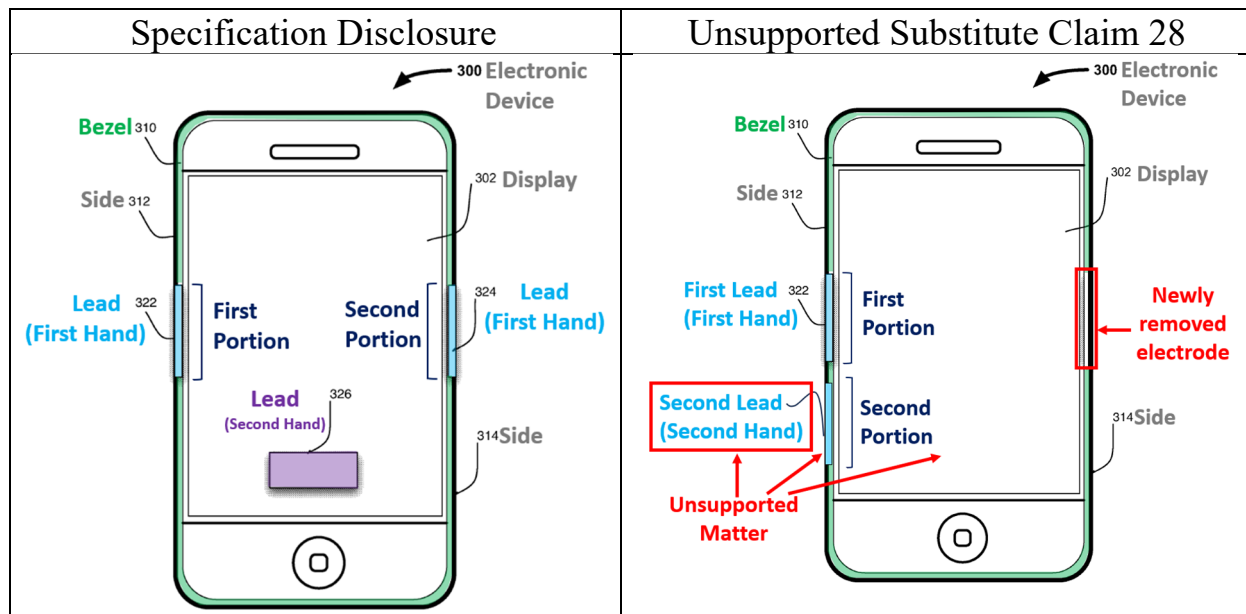
authentication using the lead 326 which is embedded under the display during the process of unlocking the device. Claim 1, from which Claim 26 depends, does not include a lead embedded under a display. The specification does not describe or suggest extraction and authentication only with leads outside of the display. A POSITA would have understood that none of the disclosed embodiments has these limitations.

156. Claim 27 adds more new and unsupported limitations that the second pad is “positioned underneath the exterior surface of the second portion” and that specifically the “first and second pads” are “adjacent pads.” These limitations are unsupported at least for the reasons provided with respect to Claim 24. The specification text never states that these particular pads are adjacent pads, nor does it explain what adjacent means. Instead, the specification only discloses generally that “an electrically isolating component can be inserted between adjacent leads.” EX2002, [0009]; EX2001, [0010]. Apple also argues that the figures can support this claim, but the figures do not help or disclose how two particular pads are adjacent. For example, Figure 3 shows three leads (322, 324, 326) on three different faces of the device and Figure 5 does not show the location of any leads at all. *Id.*, Fig. 3, 5. A POSITA would not have understood these figures as describing adjacent pads. The specification fails to explain what “adjacent” means in context of the ’257 specification, as I explained above with respect to Claim 24.

157. Claim 28 is the last substitute claim and depends from Claim 27. Claim 28 includes additional features that are not described or suggested in the '257 Patent. For example, Claim 28 requires the first pad and the second pad (located in the first portion and second portion respectively) to be located on the same face, but the specification never uses the term “face” and never describes or illustrates pads being on the “same face of the electronic device” as recited in the claim. A POSITA would have understood that Figure 3 shows electrodes/pads on three different faces of the device and Figure 5 does not show the location of electrodes at all. EX2001, Figure 3, 5.

158. Substitute Claim 28 also includes new locations for the hands and the pads, which are not shown or described in the '257 Patent. For example, the claim includes “wherein the first pad detects signals from a first hand and the second pad detects signals from a second hand” and “wherein the first and second portions of the enclosure each comprise a metallic conductive portion exposed for direct user contact.” The '257 Patent does not describe or show any embodiment that has these features. As mentioned above with respect to substitute Claim 23, the specification only teaches a “second hand” associated with lead 326, located under the display, while unlocking the display. EX2001, [0043]; EX2002, [0042]. Thus, the second hand lead does not have a metallic portion exposed for direct user contact. A POSITA would have understood that the disclosed embodiment of the '257 Patent

would need to be modified to include the new limitations of Claim 28. These necessary modifications would have been significant, as I have illustrated in the annotated figures below:



VII. THE SUBSTITUTE CLAIMS WOULD HAVE BEEN OBVIOUS OVER MARKEL IN VIEW OF MILLS

159. In my initial declaration I explained how the limitations in Claims 1 and 12 are unpatentable as obvious over Ground 2 of Markel in view of Mills. EX1003, ¶¶78-93, ¶104. Claims 1 and 12 are the claims that all of Apple’s new substitute claims depend from. Accordingly, in this supplemental declaration I only address the added limitations of the proposed substitute claims. It is my opinion that substitute Claims 22-28 would have been obvious to a POSITA in view of Markel (Figure 4, 15, or a combination) and Mills. In my analysis the level of skill of a POSITA remains the same as in my first declaration. Pet. at 7.

A. Substitute Claim 22 Would Have Been Obvious in View of Markel and Mills

- 1. “The electronic device of claim 12, further comprising a touch screen display, wherein the bezel extends around the touch screen display;”**

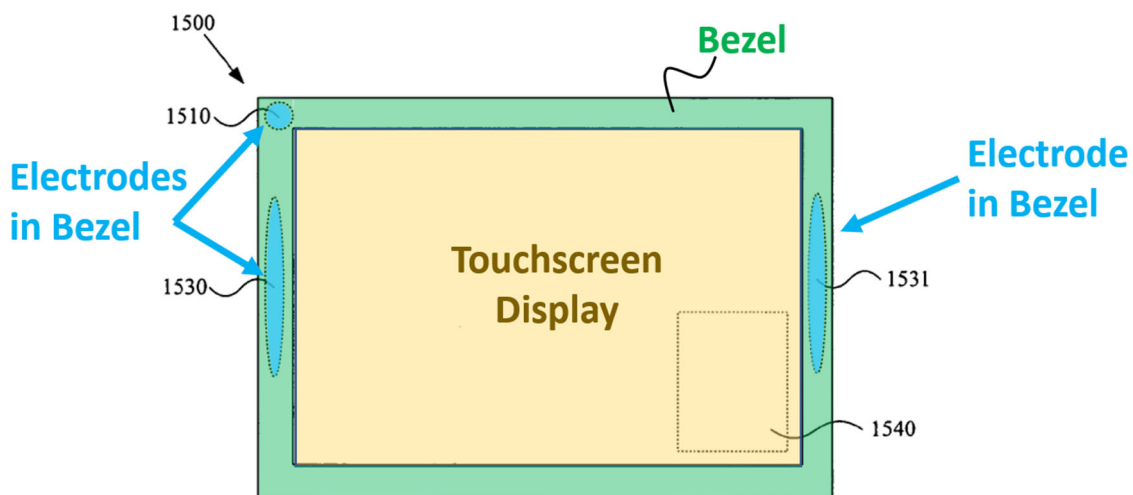
160. As I discussed in Ground 2 of my initial declaration, Markel and Mills render obvious Claim 12.

161. Markel discloses a mobile communication device (MCD 100) in Figure 1 that can have a touch screen display 140. EX1005, [0034]. For example, Markel explains “[t]he MCD 100 may also comprise various user output features, for example, a display 140 (which may also function as a touch screen input feature).” EX1005, [0034]. Although Markel annotates this touchscreen display in Figure 1, Figure 4 illustrates additional aspects of the embodiment shown in Figure 1. EX1005, [0045] (“electrodes may be disposed on a main body portion 110 [shown in Fig 1] of the MCD 100. FIG. 4 provides a non-limiting example of such electrode placement.”) Markel’s Figure 15 also discloses a display with a touch screen: “display device 1500 may comprise . . . a touch screen portion.” *Id.*, [0078].

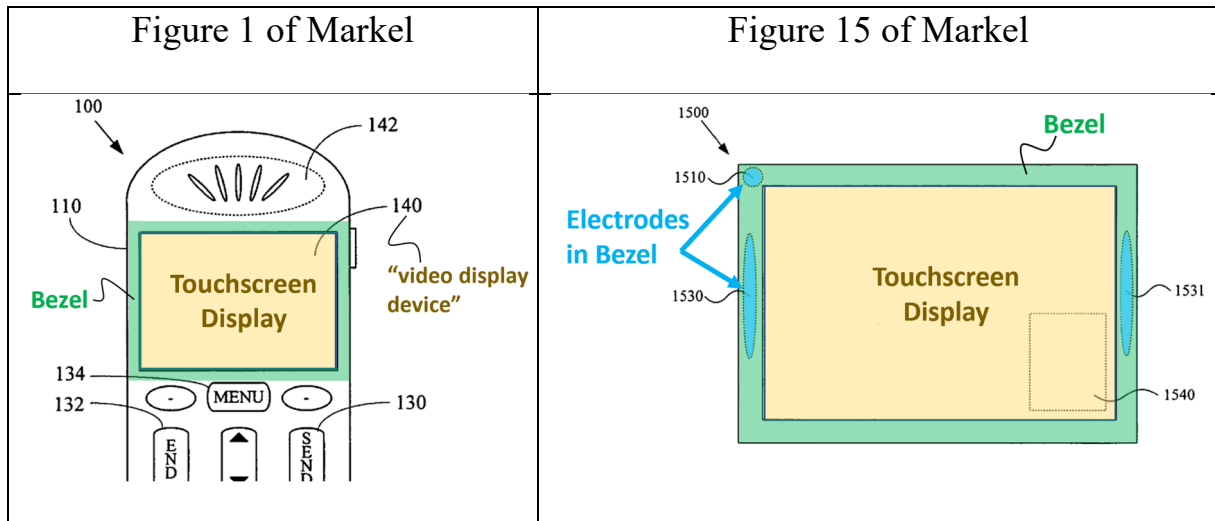
162. Markel teaches that the video display device 140 may include an electrode in “a *border of the display* or integrated into a touch screen.” EX1005, [0044]. Similarly, Figure 15 may have “an electrode 1510 on a border portion of the display device 1500,” an “electrode 1530 on a first side of the display device 1500,” “an electrode 1531 on a second side of the display device,” or “one or more

electrodes 1540 on a touch screen portion of the display device 1500.” EX1005, [0078]. Thus, a POSITA would have understood that Figure 4 and Figure 15 disclose generally the same embodiment.

163. Markel’s display device 1500 has a bezel (“border portion of the display device”) extending around the touchscreen display with various electrodes (1510, 1530, 1531) in the bezel, as shown in annotated Figure 15 below. *Id.*, [0078]. Therefore, a POSITA would have understood that Markel discloses these limitations.



164. The embodiments in Figure 1 and 15 both have touchscreens, as I explain in this section, with bezels or borders surrounding the touchscreens, as illustrated below. Moreover, a POSITA would have understood that the locations of the electrodes in display device 140 could be the same as the electrode locations shown in Figure 15.



165. A POSITA would have also known that these limitations would have been obvious in view of Markel. Markel contemplates having “[a] plurality of electrodes (or other sensors) ... disposed in any of a variety of locations” on the video display device with touchscreen 140. EX1005, [0044]-[0045]. Thus, a POSITA would have been motivated to combine the features of Markel’s Figure 1 and Figure 15 embodiments since they both have touchscreens that may have electrodes in the screen bezel. For example, a POSITA would have been motivated to position the electrodes in the bezel surrounding the display 140 because it is a convenient location for the user to touch the electrodes without obstructing the display. Additionally, Markel states that teachings related to “mobile communication device(s)” (i.e. FIG. 1) can “apply to user interface devices discussed herein” (i.e. FIG. 15). *Id.*, [0068] (“It should be noted that various electrode characteristics discussed previously (e.g., electrode formation, placement,

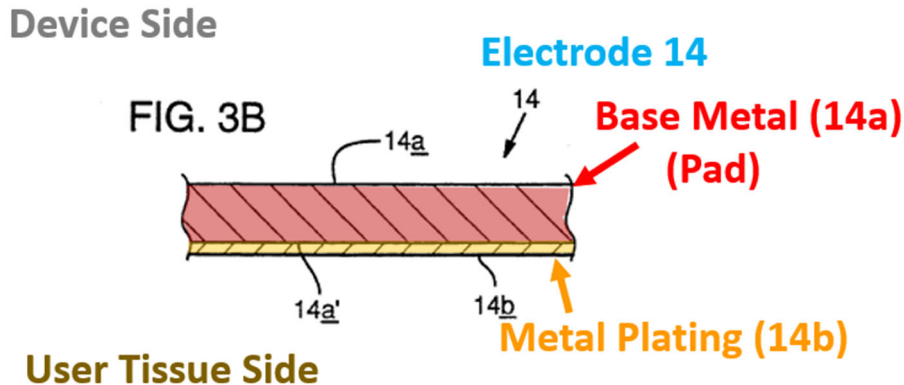
shape, size, integration, identification, numbers, features, etc.) apply to the user interface devices discussed herein as well as the mobile communication device(s) discussed previously.”). To add to this, the electrode placement in Markel is not particularly limited and “[a] plurality of electrodes (or other sensors) may be disposed in any of a variety of locations.” *Id.*, [0045]. Providing electrodes in a bezel of a display would also allow for additional touchpoints for cardiac measurement. *Id.*, [0037]-[0038]. Markel also teaches that “[W]hile the invention has been described with reference to certain aspects and embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted without departing from the scope of the invention. *Id.*, [0181]. Accordingly, a POSITA would have known that Markel’s teachings are not particularly limited and the features of Figures 1 and 15 are entirely compatible.

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

166. Markel discloses a first pad (electrode) that is “embedded” in a bezel. For example, Markel states “an electrode may be disposed on a video display device 140 (e.g., a border of the display or integrated into a touch screen)” and that “an electrode (or all electrodes) or other sensor may be substantially concealed (or hidden) from a user.” EX1005, [0040], [0044].

167. Moreover, Mills teaches how a first pad of an electrode may be embedded in an *inner surface of the bezel*. Specifically, Mills teaches embedding a

base metal electrode (pad 14a) in the inner surface of a metal plating (14b), as shown in annotated Figure 3B below.



168. A POSITA would have understood that Mills is in the same field of endeavor as Markel and the '257 Patent as they both teach embedding electrodes in electronic devices. In my initial declaration, I explained why a POSITA would have been motivated to combine Markel's concealed electrodes with Mill's metal plating and why a POSITA would have had a reasonable expectation of success in doing so. *See* EX1003, *generally* and ¶84-87. For example, Mills provides a metal-plating composition over its electrodes for "aesthetic reasons." EX1006, 4:37-40. One metal-plating material cited by Mills is titanium carbide (TiC). EX1006, 4:32-35. TiC has a light grey, satin visual appearance with a conductivity of 0.02 Ω -m. EX1053 at 3-4. A POSITA would have understood that plastic material, for example, surrounding a TiC-coated electrode could be chosen with a color and texture to blend with the TiC coating. Thus, this plating also accomplishes Markel's goal of having

electrodes that are “substantially concealed (or hidden) from a user ... with little or no visible indication of the electrode presence.” EX1005, [0040].

169. Accordingly, a POSITA would have understood that Mills and Markel share common goals and provide desirable aesthetic appearances for electrodes, and their combination would have been a mere substitution of one element for another known in the field that yields predictable results. A POSITA would have also been motivated to use the plating taught in Mills for various electrodes in Markel as Mills teaches its “plating [exterior surface 14b] also has been found to provide high conductivity and thus to produce a high quality electrical interface between an electrode such as electrode 14 and the patient's skin surface, which may be very dry.” EX1006, 4:43-47.

B. Substitute Claim 23 Is Indefinite or Would Have Been Obvious in View of Markel and Mills

- 1. “The electronic device of claim 22, further comprising: 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;”**

170. The 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. 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 and have contact with the user’s skin.

171. As I discussed above with respect to Markel’s Figure 15 and substitute Claim 22, Markel teaches at least three leads (1510, 1530, 1531), including a *third pad that is embedded in the second portion of the enclosure* (bezel) around a touchscreen. Markel also discloses detecting 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]. Additionally, Figure 10 of Markel shows first, second, and third electrodes (1020, 1022, and 1024, respectively) for cardiac measurement and this arrangement is repeated in several other figures and paragraphs. EX1005, Fig. 10 and [0058], Fig. 16 and [0082], Fig. 17 and [0088], Fig. 18 and [0101], Fig. 20 and [0110], Fig. 23 and [0139]. Based on this, a POSITA would have understood that Markel discloses a system that detects cardiac signals through first, second, and third electrodes, such as electrodes 1510, 1530, and 1531. Moreover, a POSITA would have been motivated to include a third electrode that receives cardiac signals to have lower noise and a cleaner signal, a “right-leg drive” configuration, additional touchpoints for user contact, etc. 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”).

172. Right-leg drive, also referred to as driven right leg, is a misnomer as the electrode used does not necessarily need to be attached to the right leg. It generally refers to the use of two differential electrodes referenced to a third electrode with the third electrode supplying a small current to counteract the common-mode voltage seen at the two differential electrodes. *See* EX1054 (reporting the concept of right-leg drive to reduce interference).

173. Markel also discloses that the third electrode is configured to detect a third electrical signal via the user's skin contact with the third pad. For the third electrode pad placement, Markel teaches two options: 1) an electrode may have a “a metallic surface exposed for user contact” or 2) an electrode may be “integrated into various molded components” (such as an electrode “hidden” from a user, discussed above). EX1005, [0037]-[0039]. Thus, Markel teaches the use of hidden and exposed electrodes and that the two options may be used interchangeably. Accordingly, it would have been an obvious design choice among “a finite number of identified, predictable solutions” to have one of the pads exposed for *user's skin's contact* (e.g. a third pad) while the other pad is *embedded in an inner surface* (e.g. “a first pad” recited in Claim 22). Based on this disclosure and teachings, a POSITA would have also known it was obvious to have an electrode “hidden” or “exposed” as a mere design choice from a finite number of identified, predictable solutions. As

disclosed in Markel, a POSITA would have found it obvious to have a third electrode (1530) *exposed for user contact*. EX1005, [0037].

2. **“and 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.”**

174. As I explained in the previous section, including a *second pad* configured for *the user’s skin’s contact with the second pad* is disclosed by Markel. For example, Markel discloses an electrode surface “exposed for user contact.” EX1005, [0037]. Markel’s second pad can be configured to detect a signal via the user’s skin contact. Thus, Markel discloses the first part of this limitation.

175. 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]. Markel also teaches that more than two electrodes might also be utilized.” EX1006, [0051], [0088]. A POSITA would have found it obvious to contact a first electrode with a *first hand* and contact a second electrode along with an additional electrode (third electrode) with the same *second hand* to provide improved 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] (“exemplary

MCD 1700 may comprise a first electrode 1720 and a second electrode 1722 (e.g., and a third electrode 1724 or 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 ("The digital watch embodiment uses a three contact approach to help eliminate noise"). EX1057, abstract (Francis describing "three electrode" ECG monitoring as "ubiquitous"). Additionally, a POSITA would have understood that for proper ECG measurement, contact with at least two electrodes must be configured to be physically across the heart, such as a first electrode detects a cardiac signal through a first hand and a second electrode detects a cardiac signal through a second hand. The figure below shows how it would have been obvious that a user would have been able to touch three electrodes using two hands, as claimed. For the reasons I provided above, a POSITA would have been motivated to use this type of an arrangement.

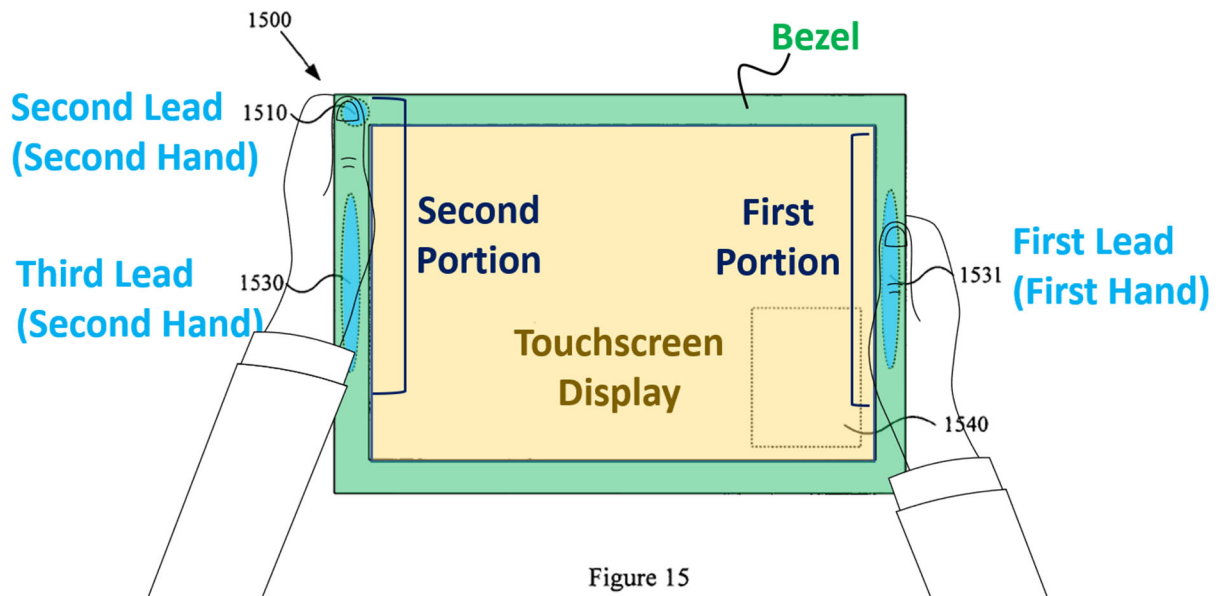


Figure 15

176. A POSITA would have understood that a user can easily touch three electrodes with two hands in the Figure 4 configuration as well.

C. Substitute Claim 24 Would Have Been Obvious in View of Markel and Mills

1. “The electronic device of claim 23, wherein the second and third pads are adjacent pads;”

177. As shown in the figure directly above in the previous section, Markel discloses electrodes 1510 and 1530 as second and third pads that are adjacent pads. Likewise, a POSITA would have implemented the same configuration in Figure 4. Thus, Markel discloses this limitation.

2. “and wherein an electrically isolating component is inserted between the second and third pads.”

178. Markel also discloses this limitation. For example, Markel teaches that adjacent electrodes (such as multiple electrodes on a pushbutton) should be

“separated by an insulating portion 243.” EX1005, [0047]. Based on this disclosure and the general knowledge of a POSITA at the relevant time, a POSITA would have known that if electrodes are adjacent or located in relative proximity to one another, an insulating portion would be needed. EX1052 at 230:7-231:9 (Apple’s expert testifying that ECG electrodes would be “shorted out” without insulation between them and at the time of the ’257 patent “you would want insulating materials”). Markel’s electrodes 1510 and 1530 are provided adjacent to each other, and a POSITA would have been motivated to provide an insulating portion between these two electrodes to avoid crosstalk and mixing of signals. A POSITA would have readily known this important feature at the relevant time of the ’257 Patent priority date. Thus, this limitation is disclosed by Markel and also would have been obvious to a POSITA in view of Markel’s teachings.

D. Substitute Claim 25 Would Have Been Obvious in View of Markel and Mills

- 1. “The electronic device of claim 1, 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 wherein the second pad is exposed on the exterior surface of the electronic device for direct contact from a user.”**

179. As I explained above with respect to Claims 22 and 23, having an electrode embedded on an inner surface of a bezel or exposed for user contact would have been obvious to a POSITA in view of Markel. A POSITA would have found it obvious to make the bezel from a metallic conductive material in order to facilitate

conduction of cardiac signals through the bezel. Mills teaches that a “high conductivity” metal plating covering the electrode would conduct cardiac signals to the electrode. EX1006, 4:43-47.

180. With regard to the second portion of the claim, Markel also discloses a second pad that is *exposed on the exterior surface* of device for direct contact with the user. For example, Markel additionally teaches that an electrode may “be adapted to detect cardiac activity of a user ... that is conductively coupled to the electrodes (e.g., by touching the electrodes).” *Id.*, [0035]. A POSITA would have known that various electrode configurations above or below the housing are possible based upon user preference and aesthetics. Thus, a POSITA would have understood that Markel discloses these limitations and also would have found these limitations obvious in view of Markel and Mills.

E. Substitute Claim 26 Would Have Been Obvious in View of Markel and Mills

- 1. “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.”**

181. A POSITA would have understood that Markel discloses these limitations. For example, Markel discloses a processor with these specific features

including processor (MCD 1700) that is applicable to all the embodiments discussed in Markel, such as Figures 1-16. EX1005, [0085]. This processor (MCD 1700) has cardiac “characteristics previously stored in memory” because it contains a “a profile (e.g., stored in the memory 1740)” and the “cardiac information acquisition module 1710 may store acquired cardiac information (or a portion thereof) in the memory 1740.” *Id.*, [0093], [0098]. Markel’s processing circuitry uses this information and is “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.” EX1005, [0097]. Thus, Markel’s device *authenticates an authorized user.*

182. Regarding the limitations *extract[ing] one or more characteristics* of a cardiac signal and *match[ing] those of an authorized user*, Markel also explains that its device may “perform[] spectral analysis on a cardiac signal” where a “processing module 2150 may be adapted to analyze the cardiac information by determining a difference between a current cardiac signal [and] [sic] at least one previous cardiac signal.” *Id.*, [0130]. Although this spectral analysis is performed to detect a cardiac pathology, a POSITA would have understood that Markel likewise performs a comparison to identify a user’s heart signal from “acquired information in the memory 1740 (e.g., indexed by user identification).” *Id.*, [0098].

183. Alternatively, a POSITA would have found such spectral analysis or comparison obvious to perform authentication in view of Markel's teachings. For example, a POSITA would have found electrode authentication beneficial in order to 1) ensure device security, 2) add a unique identifier that could be used in coordination with another biometric measurement such as fingerprint reading, 3) provide an identifier that does not require keys or passcodes, and 4) secure protected healthcare information with the user. Non-patent literature in the field of the '257 patent confirms that such extraction and authentication would have been obvious to a POSITA prior to the filing of the '257 patent. For example, Israel et al. teach that human identification can be accomplished via attributes "extracted from the P, R, and T complexes" of the heart and that the particular "sensor position does not affect the observed timing of the individual P, R, and T complexes." EX1055 at 136, 137. By sensing characteristic heart signatures, users can be biometrically authenticated after enrolling in a security or authentication system. *Id.* at 140. Thus, a stored dataset can uniquely "identify a population of individuals." *Id.* at 141.

184. Thus, a POSITA would have understood that Markel discloses these limitations and would have also found them to be obvious in view of Markel.

F. Substitute Claim 27 Would Have Been Obvious in View of Markel and Mills

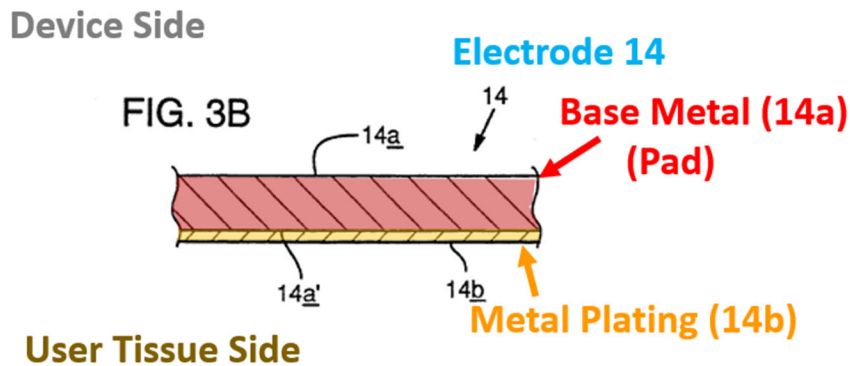
- 1. "The electronic device of claim 1, wherein the exterior surface of the enclosure comprises an exterior surface of the second portion,**

wherein the second pad is positioned underneath the exterior surface of the second portion of the enclosure;”

185. A POSITA would have understood that Markel discloses this limitation. For example, Figure 15 of Markel illustrates a bezel on the *exterior surface of the enclosure* that surrounds a display screen and contains one or more “pads”, as I showed and explained above with respect to Claim 22. Markel discloses electrodes or pads embedded in and positioned underneath the exterior surface of the enclosure.

186. Because this claim depends on Claim 1, both the first and second electrodes are *positioned underneath the exterior surface* of the bezel. Markel teaches exactly this arrangement, for example “an electrode (or all electrodes) or other sensor[s] may be substantially concealed (or hidden) from a user.” *Id.*, [0040]. A POSITA would have understood that these concealed electrodes necessarily contain a pad or conductive material for transferring signals. *Id.*, [0037].

187. To the extent Markel somehow does not explicitly teach how the electrodes may be positioned underneath the exterior surface, Mills (EX1006) illustrates embedding a base metal electrode (14a, a pad) under a metal plating (14b) in its Figure 3B, as shown in the annotated figure below.



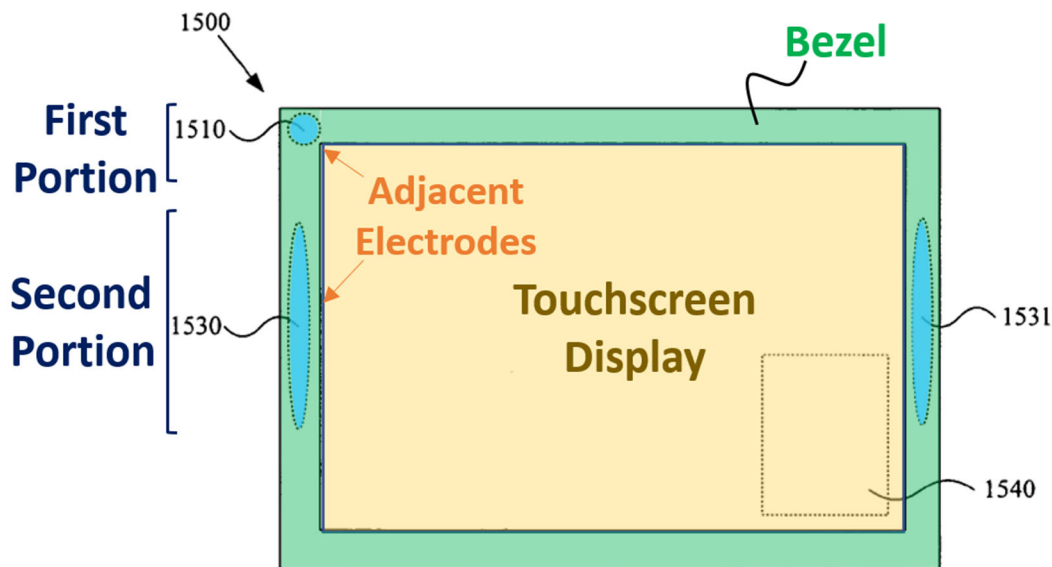
188. A POSITA would have been motivated to combine Markel’s electrodes with the plating of Mills for the reasons discussed in my initial declaration at ¶¶84-87 and above with respect to Claim 22. For example, a POSITA would have been motivated to use this plating on the *exterior surface of [a] second portion* of the bezel as Mills teaches the plating is aesthetically pleasing, “provide[s] high conductivity,” and “produce[s] a high quality electrical interface” for the electrode. EX1006, 4:35-47. Thus, a POSITA would have understood that Markel discloses these limitations and they would have also been obvious in view of Markel and Mills.

2. “wherein the first and second pads are adjacent pads; and wherein an electrically isolating component is inserted between the first and second pads.”

189. As I explained above with respect to Claim 24, Markel discloses these limitations. Markel illustrates, for example in Figure 15, *first and second pads* that are *adjacent* (Electrodes 1510 and 1530). *See supra* Section VII.C.2. A POSITA would have understood that these adjacent pads should be electrically separate to prevent cross-talk or mixing of signals. *See id.* Markel recognized this and provided

that pushbutton electrodes in relative proximity should be “separated by an insulating portion 243.” EX1005, [0047]. A POSITA would have known that if electrodes are provided in relative proximity an insulating portion would be beneficial to improve signal. EX1052 at 230:7-231:5 (Apple’s expert testifying that ECG electrodes would be “shorted out” without insulation between them and at the time of the ’257 patent “you would want insulating materials”).

190. Electrodes 1510 and 1530 in Figure 15 are *adjacent* to each other, and a POSITA would have been motivated to provide an insulating portion between these two electrodes to avoid crosstalk and mixing of signals from these electrodes. I have illustrated this arrangement in the annotated Markel figure below.

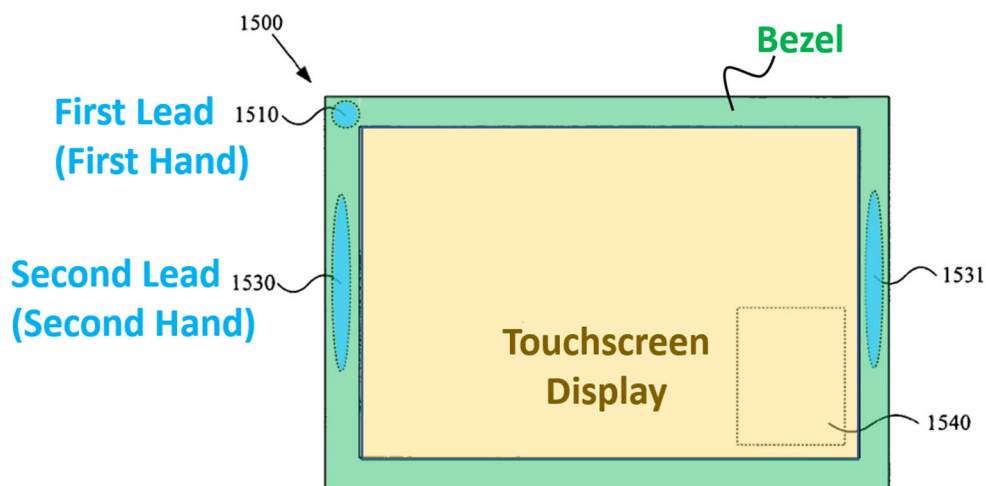


191. Therefore, the limitations of Claim 27 would have been obvious in view of Markel and Mills.

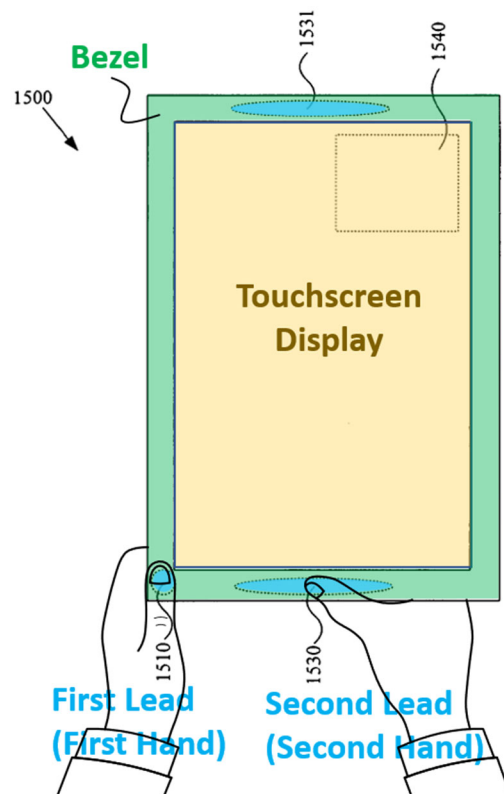
G. Substitute Claim 28 Would Have Been Obvious in View of Markel and Mills

1. **“The electronic device of claim 27, wherein the first pad detects signals from a first hand and the second pad detects signals from a second hand;”**

192. A POSITA would have understood that Markel discloses these limitations, as I explained above with respect to Claim 23. For example, Markel discloses a configuration whereby a *first pad (1510) detects signals from a first hand* and a *second pad (1530) detects signals from a second hand*. As I explained above in discussing Substitute Claim 23, Markel’s teachings enable the particular “placement [to] provide for convenient access for a user to contact both the first and second electrodes simultaneously (e.g., with different hands or different fingers.)” EX1005, [0049]. A POSITA would understand this to mean *the first pad detects signals from a first hand and the second pad detects signals from a second hand*. Thus, a POSITA would have known that Figure 15 of Markel discloses this limitation, as I have shown in the annotated illustration below.



193. Multiple scenarios may be envisioned for the user to contact these electrodes, such as in a portrait orientation where both hands are at the bottom of the touch display, providing an ECG reading with an adjacent first hand and second hand on electrodes 1510 and 1530, or a first hand may be positioned on lead 1510 while a second hand touches a power button near lead 1530.



194. Further, since this claim is an apparatus claim, the electrodes need only be capable of a configuration where different hands touch electrodes 1510 and 1530. Finally, Markel teaches that “one or more electrodes may be disposed in any of a variety of locations on the MCD.” EX1005, [0052].

2. “wherein the first and second portions of the enclosure are located on a same face of the electronic device;”

195. As shown in Figure 15 of Markel, the electrodes 1510 and 1530 are on the same face of the electronic device. Moreover, Markel discloses that the location of its electrodes is not limited to what is shown in the figures: “A plurality of electrodes (or other sensors) may be disposed in any of a variety of locations.” *Id.*, [0045].

3. “and wherein the first and second portions of the enclosure each comprise a metallic conductive portion exposed for direct user contact.”

196. Both Markel and Mills disclose using an exposed conductive material, such as metal, for the *first and second portions of the enclosure* exposed for direct contact with the user. For example, Markel teaches that its “[e]lectrodes may generally comprise conductive material” and that there may be “a metallic surface exposed for user contact.” *Id.*, [0037]. Markel does not explicitly state the material of the electrodes (1510, 1530) located in the bezel of Figure 15. However, Markel discloses that “[e]lectrodes may generally comprise conductive material. For example, an electrode may comprise a metallic surface exposed for user contact.” *Id.*, [0037]. A POSITA would have understood that the bezel may have metallic conductive portions exposed for direct user contact.

197. Regarding embedding the electrode pads under metal portions, Mills teaches a metal electrode plating that covers electrodes embedded under the surface

of the enclosure, as I explained above with respect to Claim 27. For example, a POSITA would have been motivated to use this metal plating over the *first and second portions* to “produce a high quality electrical interface between an electrode such as electrode 14 and the patient's skin surface, which may be very dry.” EX1006, 4:43-47. Also, the plating provides a “smooth finish” that is desirable for “aesthetic reasons.” *Id.*, 4:35-39.

198. Thus, the limitations of Claim 28 are disclosed by the references and would have been obvious in view of Markel and Mills.

VIII. CONCLUSION

199. For these reasons, it is my opinion that each of substitute Claims 22–28 is unpatentable.