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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MASIMO CORPORATION,
Petitioner

v.

APPLE, INC.,
Patent Owner

Case No. 2023-00734
Patent No. 10,942,491

**PETITIONER'S REPLY IN SUPPORT OF PETITION FOR INTER PARTES
REVIEW OF U.S. PATENT NO. 10,942,491**

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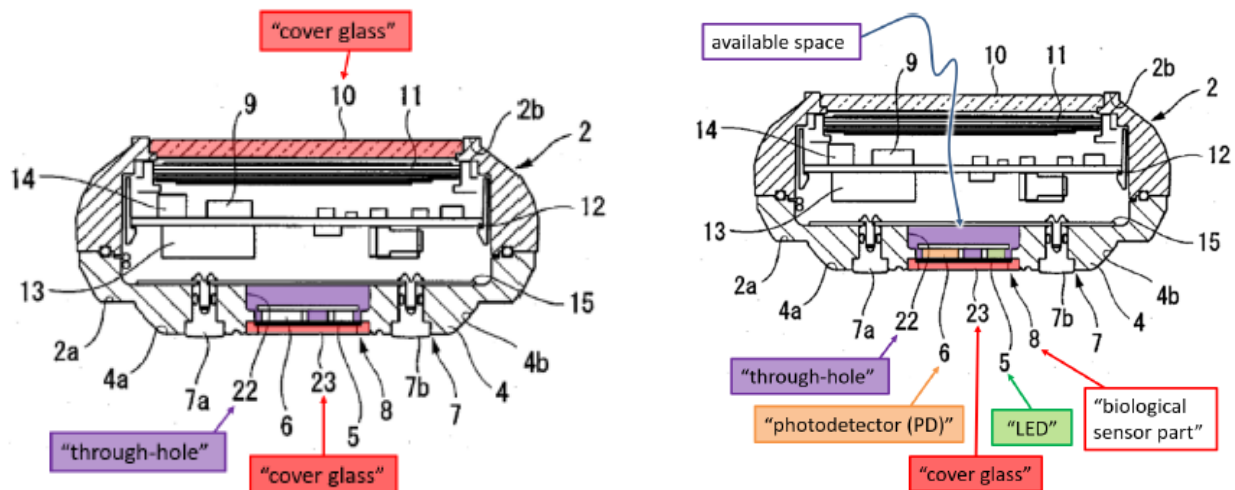
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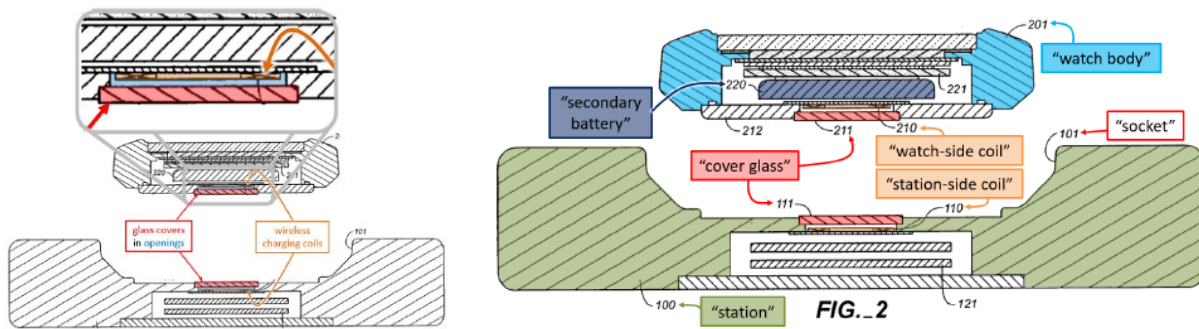
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I. INTRODUCTION

Apple's POR identifies no missing elements in the Petition's claim analysis and instead alleges distinguishing features that are not claimed. Such features include touch input, force input, and a compact, interchangeable attachment. POR, 1–2. Apple also argues that the coil in Masimo's combination would be in the wrong place, be too small, have too few turns, and lack “quick and efficient” charging. *See, e.g., id.*, 3–4. But the '491 patent does not disclose, let alone claim, sizing or other details Apple asserts are necessary for successful wireless charging.

Apple also argues the Petition does not demonstrate “how or why” a POSITA would have made the proposed obviousness combinations. But each ground explains what a POSITA would do, and how—often using detailed figures such as those shown below (e.g., Pet., 17, 21, 23–25):





The petition also provides detailed motivations (e.g., Pet., 27–30, 53–54, 65–66).¹

Apple argues that the Petition “ignores critical teachings” of Kotanagi and Honda that would “preclude” their combination. POR, 3, 34. But Apple fails to credit the references’ full combined teachings, which include, from Honda, basic wireless charging coils. A POSITA would have enlarged Kotanagi’s cover glass and considered various trade-offs to position and configure the charging coil. Apple’s expert, Dr. Anthony, admitted that a POSITA could have used these references to align the coils as claimed. EX1052, 210:6–11. And Apple’s own evidence shows that even coils smaller than 10 mm provide sufficient power. EX2028 at 1–2, 5. Where it was known that a variable (here, coil diameter) would achieve an effective result (providing sufficient power), it is reasonable to conclude a POSITA would have modified the variable to achieve the desired result. *Pfizer Inc. v. Sanofi Pasteur*

¹ Colored annotations have been provided to figures herein.

Inc., 94 F.4th 1341, 1347–49 (Fed. Cir. 2024). EX1060 ¶340.²

Apple admits that putting Honda’s charging coil in Kotanagi “could” function, but argues Fraser provides a “better alternative.” POR, 4–6, 61. Obviousness does not require the most desirable combination. Moreover, Apple contorts wireless charging physics. Correctly understood, Fraser helps show the ’491 patent is invalid. EX1060 ¶341.

Finally, Apple argues that because Kotanagi uses its electrodes to detect skin contact, a POSITA would not have applied Choi’s teachings to use Kotanagi’s electrodes for ECG measurement. But because ECG and skin-contact detection use electrodes with the same structure (Pet., 51–54), a POSITA would have considered these teachings complimentary and successfully combined them. EX1060 ¶342.

II. CLAIM CONSTRUCTION

Apple “does not take a position” on claim construction or rely on any construction to argue the claims are patentable. POR, 15. Thus, the Board need not construe any claim term. However, Masimo is providing herewith the parties’ claim-construction positions in the district court litigation involving the ’491 patent. EX1054; EX1059. The district court has not construed the claims.

² In general, a single citation to EX 1060 is provided after paragraphs supported by Dr. Duckworth’s testimony.

III. ARGUMENT

A. Apple’s arguments depend on an incorrect legal standard.

Apple’s POR repeatedly argues Masimo’s proposed combinations are inferior to allegedly faster-charging alternatives. POR 4, 35, 46, 54, 60, 62, 64. But that argument inherently admits that Masimo’s proposed combinations include all the claim limitations because the claims are not limited to any specific charging speed or efficiency.

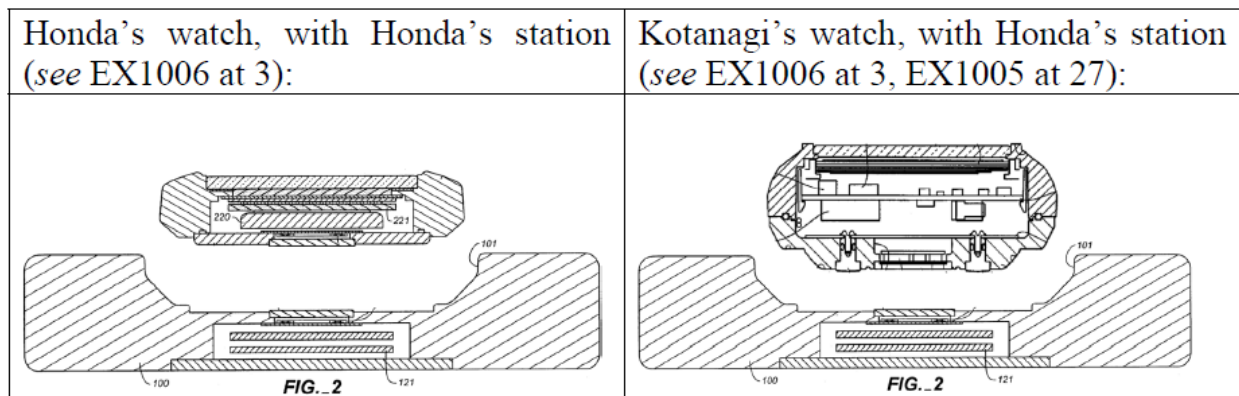
Moreover, Apple’s repeated arguments do not negate Masimo’s motivations to combine, because the combination need not be the best possible alternative. *In re Mouttet*, 686 F.3d 1322, 1334 (Fed. Cir. 2012) (existence of “better alternatives” “does not mean that an inferior combination is inapt for obviousness.”). Masimo met its burden by showing how and why to use Honda to add a coil to Kotanagi, achieving the claimed wireless charging function. Apple’s arguments regarding alternative, unclaimed locations for the coil and alleged undesirable outcomes (e.g., reduced efficiency) do not undermine Masimo’s contentions. *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021) (showing of “suitable option” sufficient); *In re Mouttet*, 1334. EX1060 ¶¶359–360.

B. Claim 7 Would Have Been Obvious Based On Kotanagi and Honda

1. Apple does not dispute the Petition’s motivations to combine.

Apple does not dispute that:

- (1) Kotonagi and Honda disclose all the limitations of Claim 7;
- (2) Kotonagi teaches “contactless” charging is desirable for biosensing watches (EX1005 ¶53);
- (3) wireless charging can be an improvement over Kotonagi’s wired charging (EX1052, 45:13–46:2, 169:16–171:7);
- (4) Honda provides details for wireless charging for biosensing watches (EX1006, abstract, 6:14–20; 8:40–42; EX1003 ¶130);
- (5) both references have glass-covered rear openings (EX1006, 4:44-58; EX1005 ¶48);
- (6) Honda positions a wireless receive coil behind its glass (EX1006 at 3);
- (7) Kotonagi’s watch profile fits intimately into Honda’s charging station (aligning glass cover with charging coil):

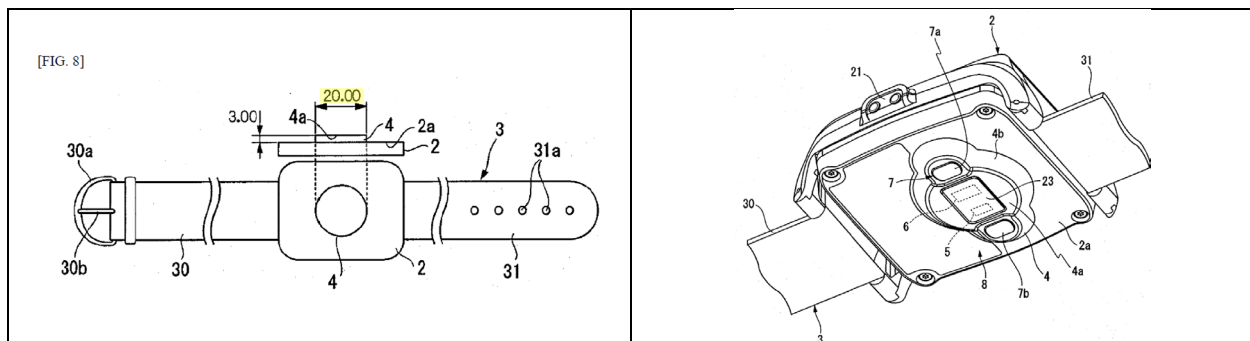


Pet., 86. Thus, Apple acquiesces to the motivations to combine. *E.g.*, Pet., 27–30, 53–54, 65–66. EX1060 ¶344.

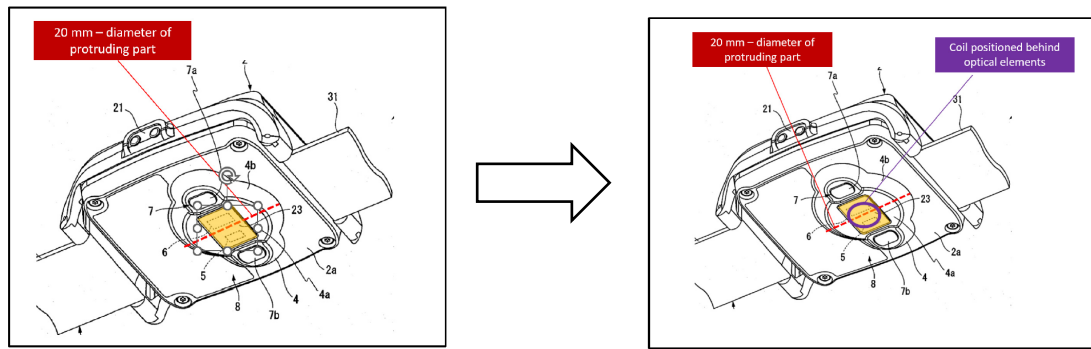
2. Kotanagi's dimensions would not have prevented the combination.

Apple argues a 20 mm “size restriction” on Kotanagi’s protruding part 4 limits coil size to 10 mm, thereby limiting charging speed. POR, 3, 34–35. As an initial matter, the ’491 patent claims no absolute size or charging speed, so these are not relevant to obviousness. *See Janssen Pharm., Inc. v. Teva Pharm., Inc.*, No. 2022-1258 (Fed. Cir. Apr. 1, 2024).

Apple’s size-restriction logic is speculative. Kotanagi provides a diameter for its Figure 8 embodiment, but not for its Figure 5 embodiment:



EX1005, 28, 26. Apple applies the 20 mm diameter at left to the non-circular protrusion in the embodiment at right. POR, 18. But a POSITA would not have imputed dimensions between embodiments. Moreover, Anthony admitted Figures 5 and 8 have different sizes and scaling factors. EX1052, 80:11–22. Apple’s 10 mm coil size assertion—“roughly half or less than half (~10 mm or less)” —is based on superimposing assumed dimensions on Figure 5’s oblique perspective:



POR at 37–38. EX1060, ¶¶347–348.

Even if Kotanagi’s coil were limited to 10 mm, a paper cited by Apple validates that 6.5 and 9.5 mm coils are “suitable to charge wearable and medical devices.” EX2028, 2, 5. For example, it shows that a 9-turn receiver coil of 9.5 mm diameter (RX7) can produce 8 Watts from a matching diameter transmitter coil, separated by 1 cm. EX2028, Table 3, Fig. 13. Anthony admitted that the wattages in Figure 13 “are a good power level.” EX1052, 112:8–113:4.

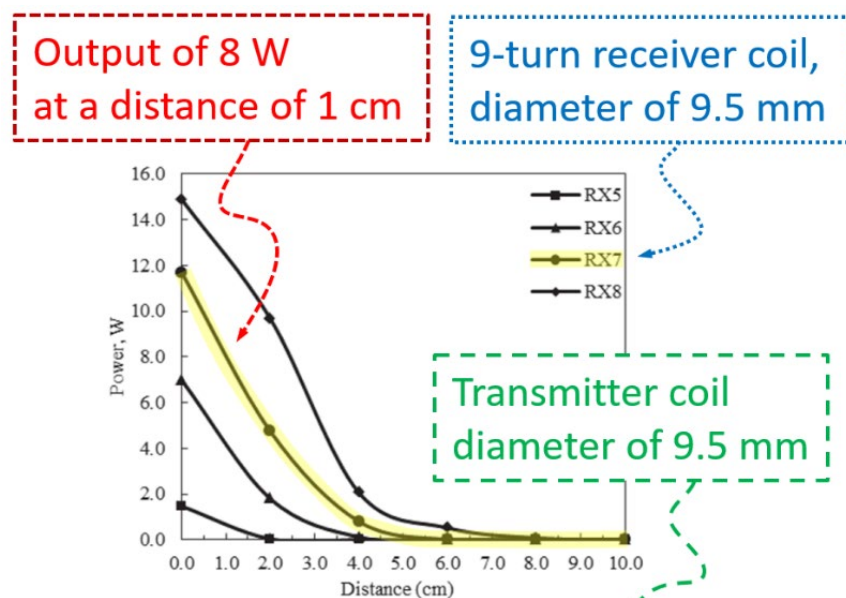


Figure 13: Output power over distance using TX3 ($D_{T2} = D_{R2} = 9.5$ mm).

EX2028, Fig. 13. Accordingly, Apple’s own evidence shows Masimo’s combination is a “suitable option.” *Intel Corp.*, 21 F.4th at 800. EX1060 ¶345.

Further, if a larger coil were needed for quicker or more efficient charging, a POSITA would have enlarged Kotanagi’s opening and cover glass to make room. Such modifications are consistent because, for example, Kotanagi explains its protrusion “may have any shape,” and its embodiments are non-limiting. EX1005 ¶¶ 74, 75; EX1060 ¶346.

Anthony admitted that: (1) engineers often optimize using trade-offs to address constraints (EX1052, 19:17–20:20); and (2) Honda includes no coil size constraints (EX1052, 177:2–178:15). Thus, a POSITA having “ordinary creativity” (*see KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007)) would have considered coil sizes and shapes, and adjustments to accommodate them. *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (“simultaneous advantages and disadvantages” do not necessarily “obviate motivation to combine.”). EX1060 ¶¶349–51.

3. Honda’s goals of “quick and efficient” charging is not an obstacle to the combination.

Apple argues that Kotanagi’s alleged 10-mm coil restriction and the combination’s coil placement frustrate Honda’s goal of “quick and efficient” wireless charging. POR, 3, 34, 42–44, 53, 57. As explained above, Kotanagi has no

“size restriction.” Moreover, Honda never states a threshold rate or amount for “quick” and “efficient.” In any event, the ’491 patent claims no absolute size restrictions or charging speed. As explained above, Kotanagi’s goal of contactless charging (EX1005 ¶53) would have led to Honda for wireless charging (EX1006, 1: 4–6).

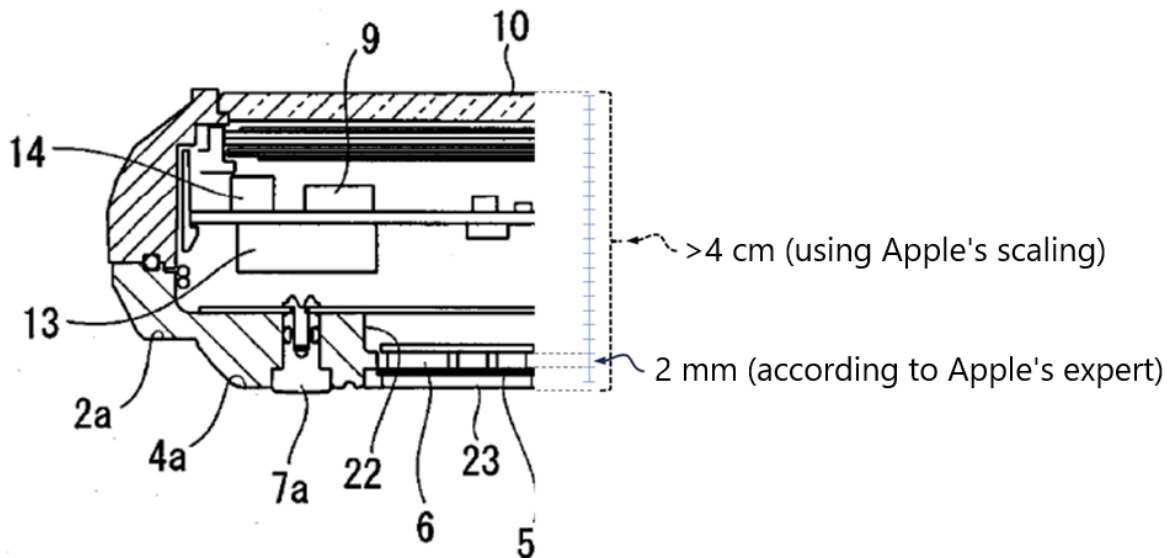
If Honda’s primary purpose was specific to “quick and efficient” wireless charging, it still would have motivated a POSITA to modify Kotanagi to include wireless charging generally. *KSR*, 550 U.S. at 420 (“familiar items may have obvious uses beyond their primary purposes”); *Intel Corp.*, 21 F.4th at 800 (a reference’s intended purpose does not control the obviousness inquiry); *In re Heck*, 699 F.2d 1331, 1333 (Fed. Cir. 1983) (prior-art patents not limited to described invention or problems solved, but “relevant for all they contain”); *see In re Urbanski*, 809 F.3d 1237, 1243 (Fed. Cir. 2016) (references combinable based on desirable properties of one, despite foregoing benefits of the other). EX1060 ¶¶353–54.

In any event, Anthony admitted that depending on intended use, devices “can benefit from either fast charge or trickle charge or a little bit of charge.” EX1052, 18:22–19:6. Thus, independent of any particular charging speed, Honda’s teachings about wireless charging (such as use of a coil) would have motivated the combination, including suggesting potential modifications to a POSITA. EX1060 ¶¶352–353.

Apple argues that the Kotanagi/Honda combination frustrates Honda's stated goal of quick and efficient charging by "demanding precisely the increased spacing that Honda expressly seeks to avoid." POR, 43. But Apple does not allege any particular separation distance precludes such charging. Instead, it merely cites the unremarkable proposition that charging efficiency decreases as distance increases. A POSITA would have considered coil spacing and adjustments to accommodate coils as part of ordinary engineering. *Medichem*, 437 F.3d at 1165. Likewise, Honda describes the relative effectiveness of coils with different gaps between them. EX1006, 2:38–43, 2:55–60 (as gap between coils increases, "the degree of magnetic coupling weakens"); *id.*, 13:14–16 (as the separation distance decreases, "transmission efficiency increases."); *see* POR, 42. Honda's teachings would have encouraged a POSITA to balance coil placement with the degree of coupling and would not have discouraged the combination. Indeed, Anthony admitted the engineering process involves trade-offs like this. EX1052, 19:17–20:20. EX1060 ¶¶355–56.

Anthony states that the thickness of Kotanagi's protrusion—*i.e.*, the distance between surfaces 2a and 4a—is "at least 2 mm." EX2038 ¶150. He then speculates without support that Kotanagi's optical elements "span ~2-4 mm (or more) in depth/vertical dimension." EX2038 ¶150. But that speculation is inconsistent with Kotanagi's disclosure of a 2-mm-thick protrusion. Optical elements spanning 2 mm

within a 2-mm-thick protrusion (EX1005 ¶28) would leave no space for Kotanagi's cover glass and circuit board. Additionally, Anthony's assumptions that the optical elements are 2 mm thick and the figures are drawn to scale would implausibly suggest the watch is more than four centimeters thick. EX1060 ¶¶355.



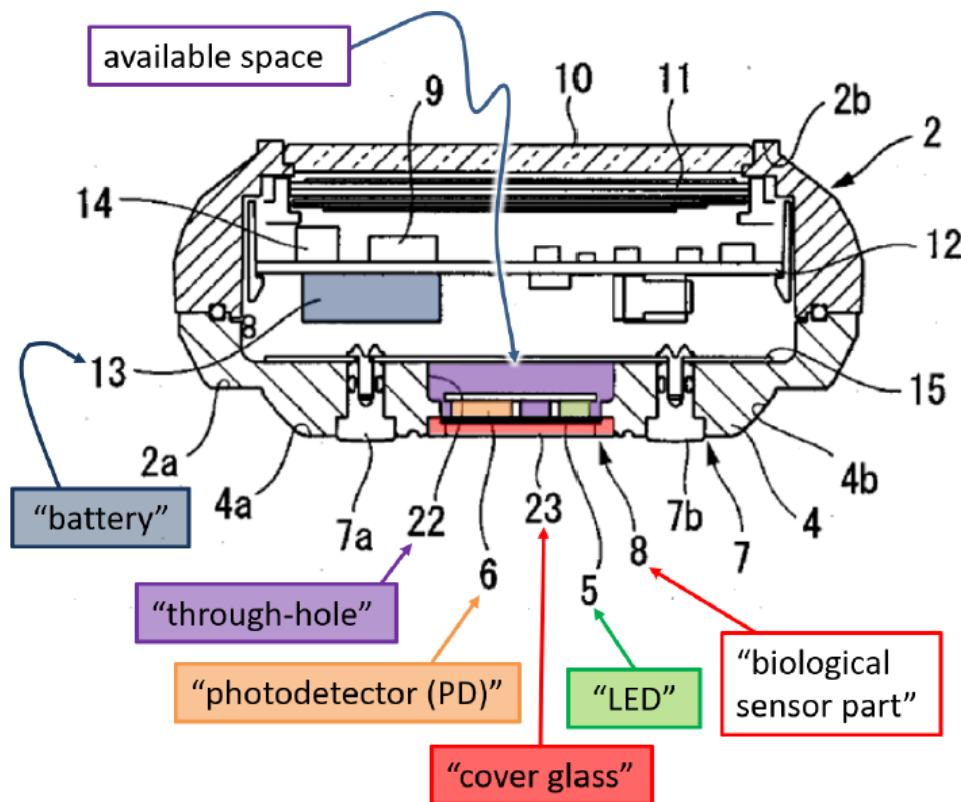
Apple's estimation of the 2 mm thick optical elements (photodiode and LED) misstates the state of the art in 2014. *See* EX2038 ¶150. In 2014 a POSITA would have known that such optical elements would have been configured as thin as 50 μm . EX1053, [0092] (LED 20 μm thick); [0093] (photodiode 20 μm thick); [0069] (substrate 10 μm thick). In Kotanagi, such elements "touch the inside of the glass cover 23" (EX1005, ¶55), so they would have added much less than 2 mm to the coil separation distance. EX1060 ¶¶355–56.

Apple next argues that positioning a coil "behind Kotanagi's optical elements" would cause undesirable "noise and interference." POR, 43–44.

However, Honda expressly discloses both wireless charging and heart rate sensors in the same device, without undue noise or interference. EX1006, 6:17–20. A POSITA would have evaluated and accepted some noise or interference in exchange for the benefit of achieving wireless charging. *See Medichem* 437 F.3d at 1165; *Urbanski*, 809 F.3d at 1243. Moreover, Masimo also proposed positioning the coil *around* the optical elements. EX1060 ¶¶357–58.

4. A POSITA would enlarge the cover and place a coil around the optical elements.

Masimo’s Petition annotates Kotanagi’s Figure 7 to show “available space” where a POSITA would have positioned a coil:

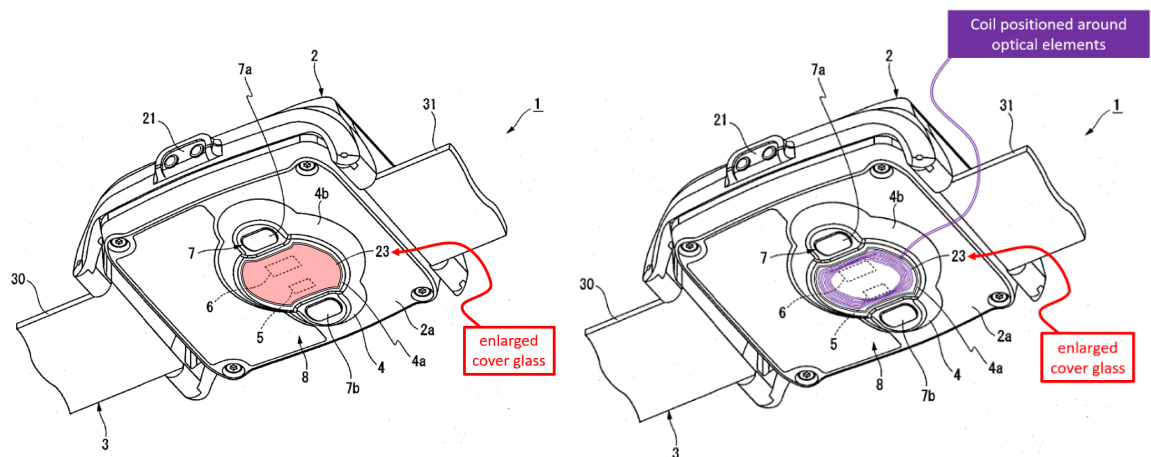


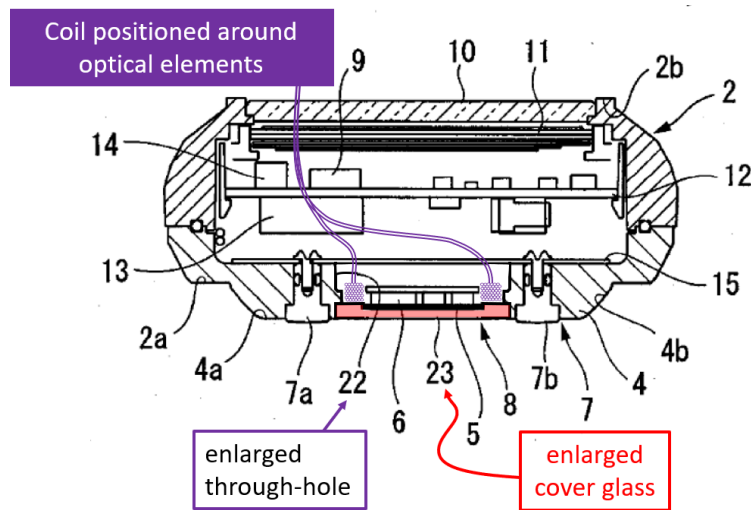
See Pet., 25, 37, 79; EX1005, 27. The available space, shaded in purple, is both behind and to the sides of the PD 6 and the LED 5. Accordingly, Masimo reasoned:

[A] POSITA would have used Honda's teachings to either: ... or 2) enlarge Kotanagi's opening and cover glass to make room for a coil behind the cover glass, surrounding the LED and PD. In either case, the resulting magnetic flux would pass through the biosensor module, including the cover glass, as taught by Honda.

Pet., 24–25.

Apple's size-restriction arguments discussed above (*see supra* § III(B)(2)) ignore the combination where the coil is placed around the optical elements. If the entire protruding part 4 could not be enlarged (*see* POR, 36–37, 58–59), a POSITA would have enlarged the cover glass within that protrusion and inserted a coil behind the enlarged glass.





See EX1005, 26, 27 (Figs. 5, 7); compare POR, 40, 59. EX1060 ¶362–63.

This modification moots Apple’s arguments (POR, 56) that the coil “would not fit.” A POSITA would have been capable and motivated to make these modifications. EX1060 ¶364.

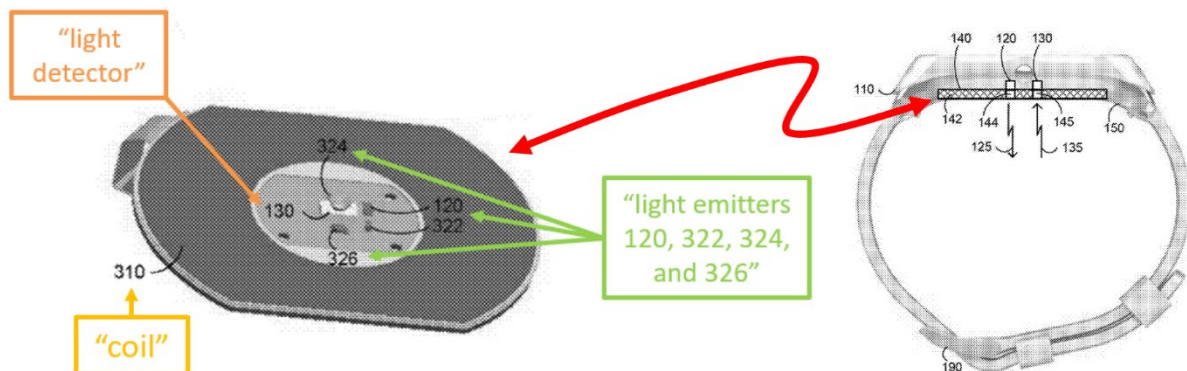
Apple also argues that the electrodes 7a and 7b limit any expansion (POR, 56), so a coil “would not fit” (*id.*, 57). But in the above example modification, the electrodes have not been moved. EX1060 ¶365.

Apple argues that Honda discourages putting a coil around the optical elements because air-core coils are superior (POR, 44–45, 57–58). But Honda explains that in some electronic devices “a coil having a core can be used.” EX1006 col. 6:45–47. And Fraser confirms that a coil can surround optical elements and still provide charging. See *infra* § III(B)(5). In any case, putting a Honda-style coil into

Kotanagi’s available space—whether enlarged or not—would have been desirable, and a POSITA would have expected success. EX1060 ¶369.

5. Fraser undermines Apple’s argument.

Apple points to Fraser³ as a “better alternative” than the Kotanagi/Honda combination. Fraser teaches a wide perimeter coil 310, that need not be circular, surrounding central optical elements (i.e., not an air core) while still performing effective charging. POR, 46, 56; EX1006 col. 6:47; see EX1041 ¶ [0026].



See EX1041, 4, 2 (Figs 3, 1). Apple argues that a larger, Fraser-type coil is better than a Kotanagi-Honda combination. POR, 46 (referencing figure at 40). But this attempt to dismiss an acceptable combination using an allegedly “better” one is legally flawed. *Supra* § III(A). EX1060 ¶370.

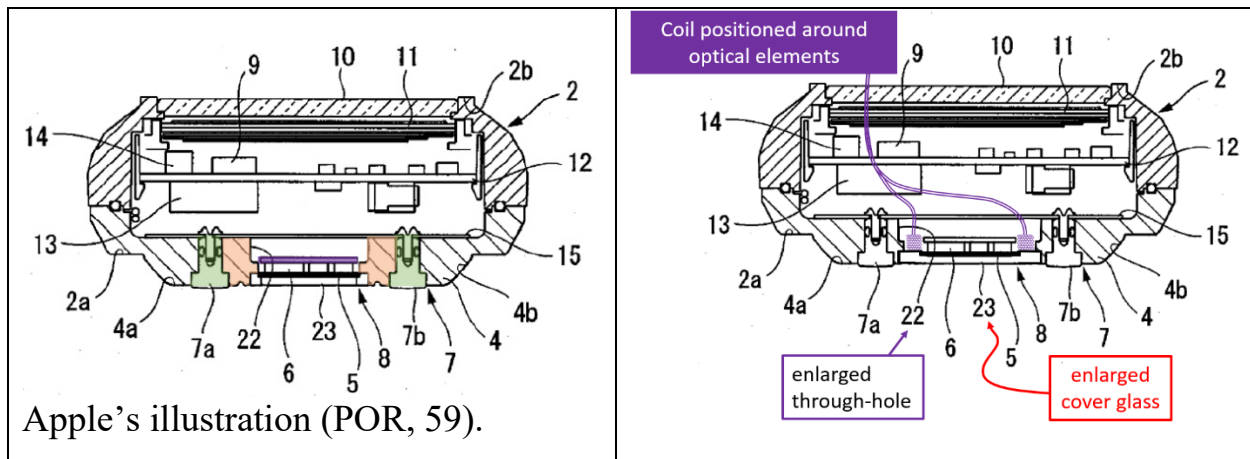
Apple argues that Fraser provides a superior coil because (1) it allegedly is larger than the coil in Masimo’s combination and (2) it surrounds the optical

3 The Petition used Fraser for Ground 3. Pet. at 61–70.

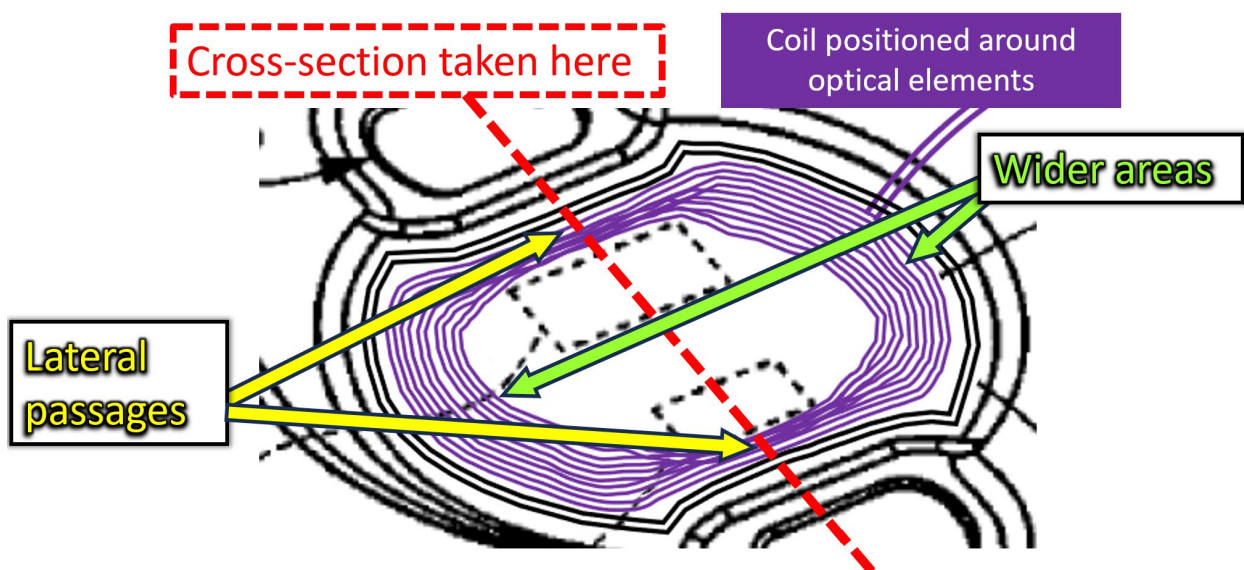
elements. POR 48. But as shown above, even 6.5–9.5 mm diameter coils provide sufficient current. Further, Masimo proposed a coil that surrounds the optical elements as one alternative in the combination, consistent with Fraser’s teachings. EX1060 ¶371.

Apple argues that if Kotanagi’s coil were configured in view of Fraser to extend beyond the cover, any wireless power transmission would pass through the rear housing surface and not the cover. POR, 54, 60–61. However, Masimo proposes enlarging the cover so that a larger coil would *not* extend beyond the cover. Pet., 29. Honda’s teaching that transmitting wireless power through glass is desirable would have motivated a POSITA to implement Masimo’s proposal. EX1060 ¶372.

Apple argues that a coil around Kotanagi’s optical elements would be limited in size and turns, constraining power transmission, due to lack of space between the optical elements and the housing as shown in the figure below, left. POR, 58–60. However, Masimo proposed to enlarge Kotanagi’s opening and cover glass to make room for the coil around the optical elements (Pet., 29), as shown in the figure below, right.



See EX1005, Fig 7. Indeed, Anthony admitted that the “orange-ish pink-ish area” could be used for the coil. EX1052, 191:21–192:17. Moreover, the cross section view does not show the much wider area available for most of the wireless charging coil on either side of these lateral passages. The wider area provides room for more coil loops to press up against the enlarged glass, reducing their separation distance from the charging coil:

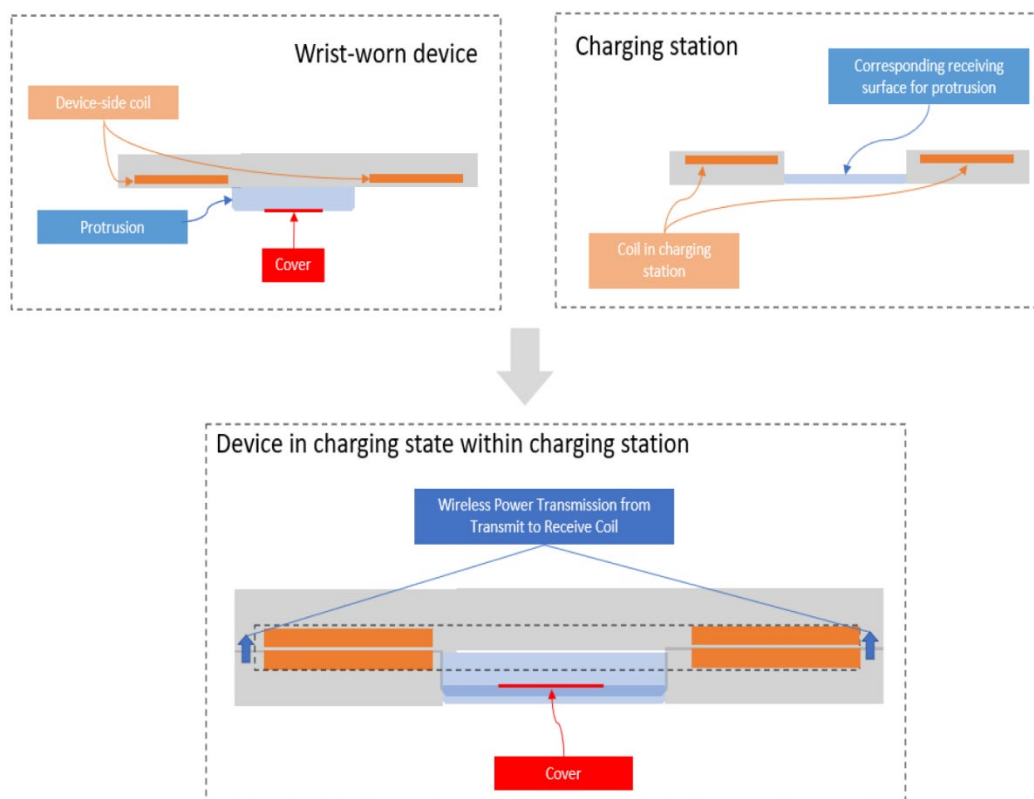


See *supra* § III(B)(4).

Thus, Fraser supports the motivation to combine and expectation of success.

6. Apple's argument based on Fraser contorts the physics of wireless charging.

Apple argues that a Kotanagi-Honda combination would not charge efficiently and provides Fraser as an allegedly “functioning” alternative. Apple argues that Fraser's larger coil, extending laterally beyond a central cover, would somehow transfer power that passes around, but not through, a central cover. POR, 46, 50. First, Apple's alternative Fraser argument does not address Masimo's combination; Masimo never proposed placing a coil that extends laterally beyond the cover. Second, even in Apple's combination depicted below, the cover would pass wireless power to the receive coil.



POR, 52. Apple places blue arrows outside the coils, purporting to show where wireless power is transmitted. Apple argues that because the cover glass 23 in the center of the figure above is “spaced away” from the coils, it “would not be the conduit for the wireless power transmission.” *Id.*

Apple’s statements fundamentally misrepresent how wireless charging works. Apple’s cited Mohamad paper explains that current through the transmitter coil produces a magnetic flux or field flowing through the center of two aligned coils, which produces current in the receive coil:

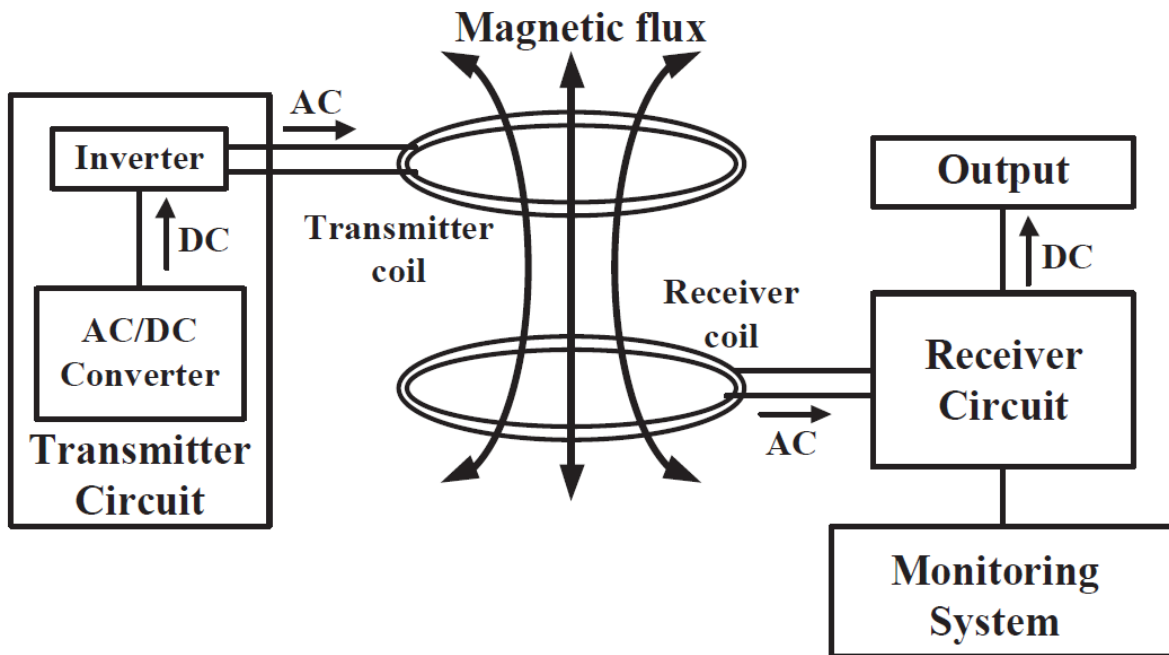
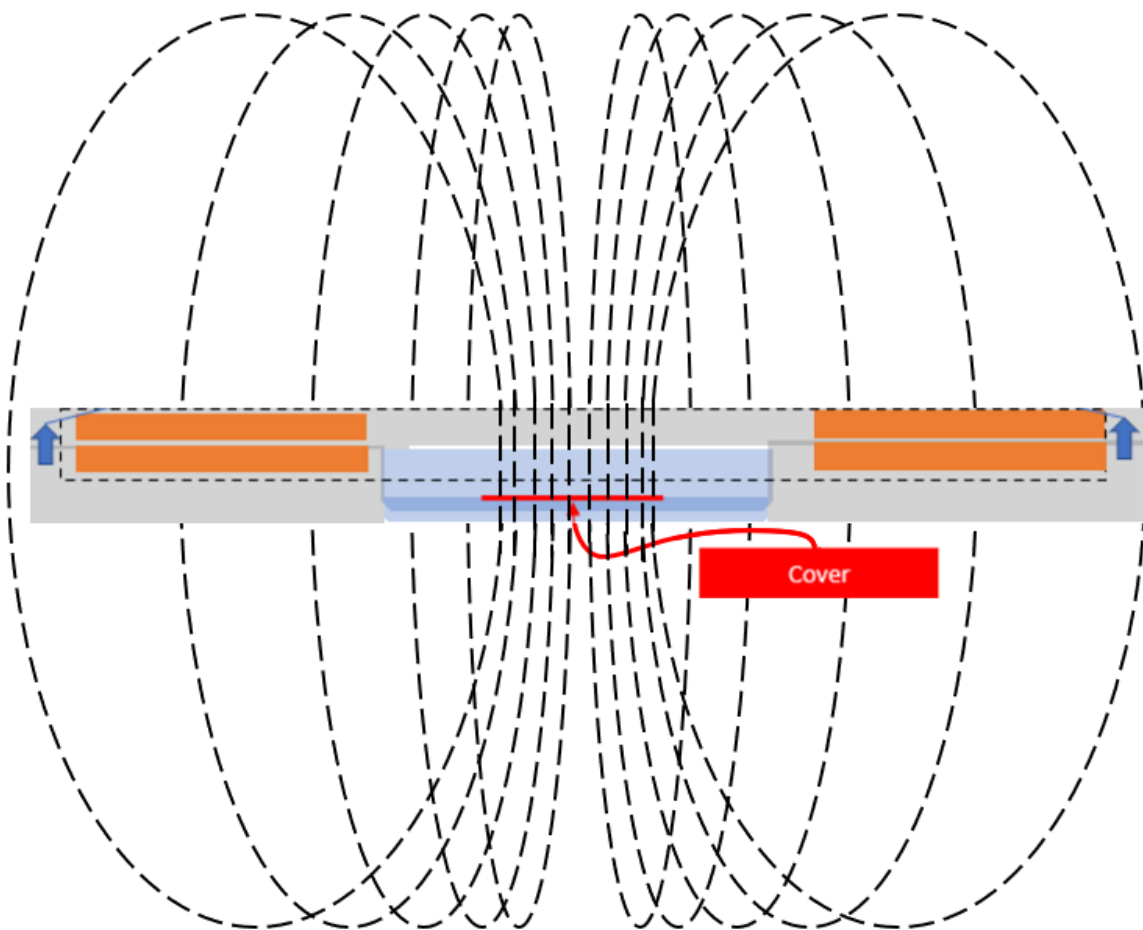


Figure 3: Block diagram of a wireless power transfer

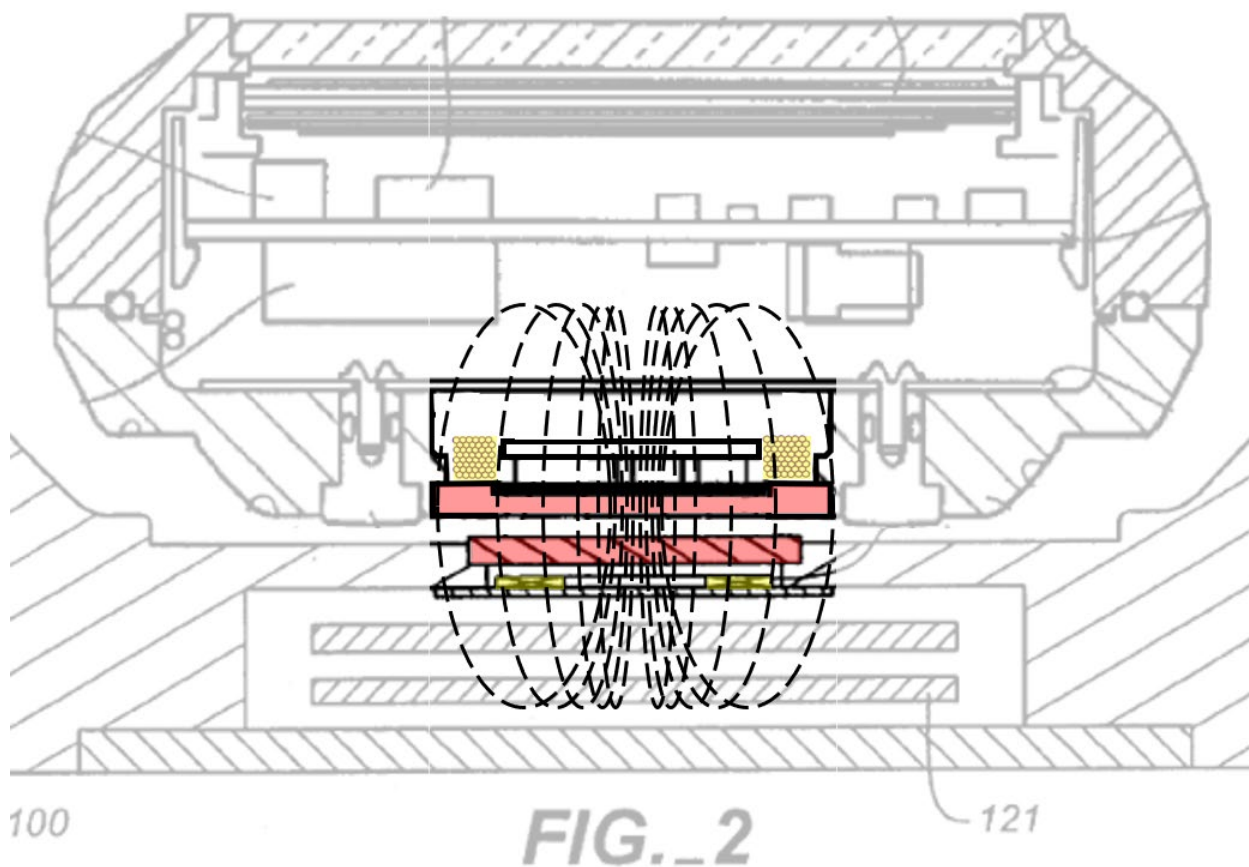
EX2028, 2. Anthony admitted that the magnetic field causes inductive power transfer. EX1052 180:5–10. In addition, other Apple articles show the magnetic field or flux going through the center of the coils. See EX2024 Fig. 5 (illustrating

high magnetic flux density (red) in the center, for configurations a and b); EX2023, 40 (showing central magnetic flux B). Thus, when wireless charging coils are aligned as shown in Apple's own figure (POR, 52), wireless power transmission occurs through the center (including through any glass cover that may be present there). EX1060, ¶¶374–79. Thus, even in Apple's Fraser-style example, wireless power would pass through a cover where the magnetic field lines are concentrated:



EX1060, ¶375.

This magnetic field results from the geometry and orientation of the two charging coils, so power traverses a centrally-positioned cover, independent of coil size, and *whether the cover has been enlarged or not*. A similar magnetic field (shown with the lines below) would transfer power in Masimo's combination of Kotanagi and Honda (enlarged cover glass approach):



Anthony admitted that the evidence shows a two-coil arrangement concentrates flux density in the center of the coils. EX1052 115:20–117:4; 117:21–118:8; 204:20–207:2. EX1060, ¶¶375–76.

Honda's Figure 10 corroborates that magnetic flux is highest in the center of paired coils:

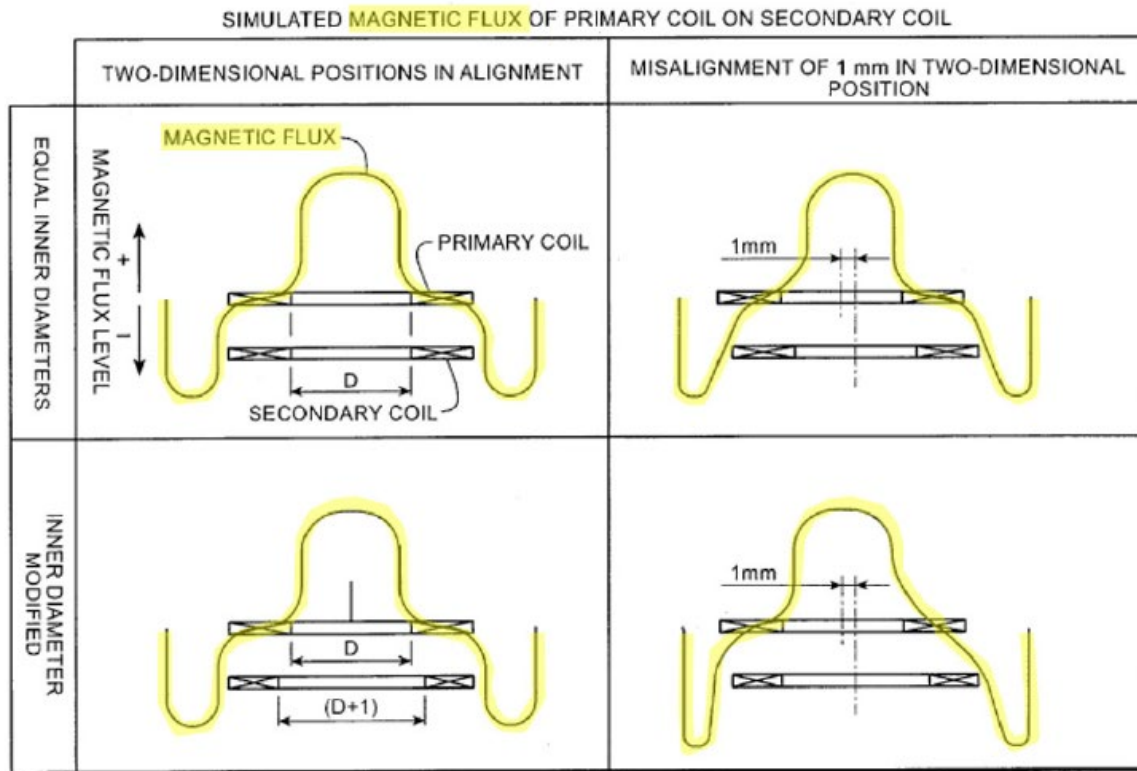


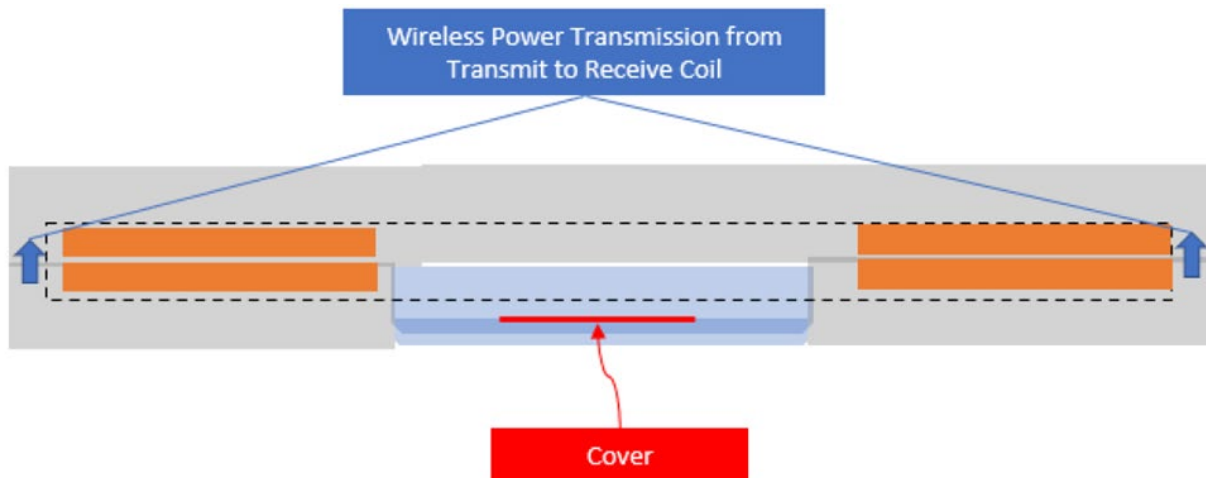
FIG. 10

EX1006, 9. EX1060 ¶377.

Nevertheless, Anthony argued that even though *magnetic flux* passes through the cover, *power* does *not* transfer through the cover. EX1052, 154:22–155:12. This is utterly incoherent, given that the magnetic field is the only physical thing passing between devices for wireless charging. As shown above, the magnetic field passes through the center of the coils, where the cover is located. EX1060 ¶379.

When confronted with the discrepancy between the above evidence and the blue arrows on Apple's figure (POR, 52), Anthony admitted that the blue arrows in

his diagram are “not showing the exact location of where the power is all transferred.” EX1052, 157:11–21.



Anthony then insisted that wireless power would only pass *within* the dashed box in the figure above. EX1052, 156:9–22, 157:22–158:21. Anthony thus denied the physical law that magnetic fields are continuous. The field here passes through the centrally located glass cover. EX1060, ¶379.

7. Apple’s modeling is flawed.

Apple modeled a Fraser-like device and a Kotanagi/Honda-like device to show that Fraser is a “better alternative.” POR, 49–50, 59–60; EX2038 ¶¶165–170. Apple’s modeling suffers from numerous errors, including that Fraser provides no dimensions for its coil (EX1052 146:17–149:19). Moreover, Apple’s modeling does not take into account the engineering tradeoffs a POSITA would have considered. (see § III(B)(2)–(4)). EX1060 ¶¶380–81.

The modeling concludes, unremarkably, that increasing coil width and providing more coil turns results in faster charging. Anthony admitted that the modeling's broad conclusions are unsurprising in view of basic principles of physics. EX1052, 138:15–139:10. EX1060 ¶382.

Even so, the modeling suffers from additional significant flaws.

No Absolute Numbers. The modeling results are expressed in comparative ranges (e.g., 1 versus 100 hours) (POR, 49) providing no real-world reference for comparison. Apple's EX2028 concludes that wireless charging with currents below sixteen watts is suitable for wearable and medical devices. EX2028, 5. EX1060 ¶383.

No Inputs or Equations. Anthony admitted he did not disclose the Z, V, I and R matrices (EX1052, 118:13–119:12), the discretization output (*id.*, 123:4–7, the basis functions (*id.*, 123:22–124:7), and the interaction matrix (*id.*, 125:4–125:7) needed for his modeling. EX1060 ¶384.

Improper Coil Assumptions. Apple assumes that space limitations in Kotanagi would “reduce” the number of possible coil to 10 to 20 loops. POR, 58; EX2038, ¶190. But Honda's three-meter coil at 10 mm diameter would have had about 95 loops. EX1006, 6:58–59; *see* EX1052, 189:16–191:5. EX1060, ¶385.

Thus, the pending claims, including Claim 7, are unpatentable.

C. Claim 14

For Claim 14, Apple again concedes that Kotanagi and Honda together provide all the claimed elements and that “a wireless charging coil *could* be provided in Kotanagi’s through hole 22.” POR, 63. Thus, a POSITA would have found the combination at least “suitable,” which is legally sufficient. *Intel Corp.*, 21 F.4th at 800. Moreover, Apple’s redundant arguments (POR, 61–63) are incorrect for the reasons explained above for Claim 7 in § II(A). EX1060, ¶¶389–391.

D. Claim 1

Apple repeats its arguments for limitation [1g] of Claim 1 (POR, 63–65). These are wrong as explained above for Claims 7 and 14.

Apple then argues that the combination does not render obvious: two rear electrodes on the rear surface “*configured to measure an electrocardiogram using the first and the second electrode.*” POR, 65–66 (emphasis added). Apple does not dispute that Kotanagi includes two rear-surface electrodes. Instead, Apple argues that Kotanagi lacks any ECG capability and that Kotanagi’s electrodes detect skin contact only. POR, 69–70.

Apple accuses Masimo of contending that Kotanagi’s electrodes are configured to measure heart pulses. *Id.*, 66–67. Not true. Masimo explained that Kotanagi uses the rear electrodes to detect skin contact (“contact detection means”) and then controls the optical sensor to take pulse measurements. *See* Pet., 50, 70.

Thus, it would have been obvious to use Kotanagi’s existing electrodes and Choi’s teachings to either:

- (1) use signals from Kotanagi’s existing electrodes to obtain an ECG;
- or (2) add one or more additional electrodes to Kotanagi (as taught by Choi) and use both it and the existing electrodes to obtain an ECG.

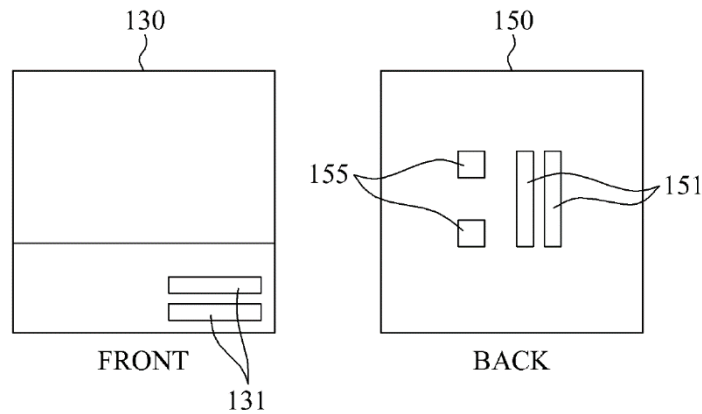
Pet., 52.

A POSITA would have known how to apply, and expected success in applying, well-known technology to obtain an ECG using Kotanagi’s electrodes. Pet., 51–54. Masimo’s analysis is supported by a final PTO rejection in a continuation application of the challenged patent: “*ECG collection may be implemented via electrodes 7a and 7B of Kotanagi.*” EX1062 (April 25, 2023) (emphasis added). EX1060, ¶394.

1. Kotanagi’s existing electrodes would obtain an ECG

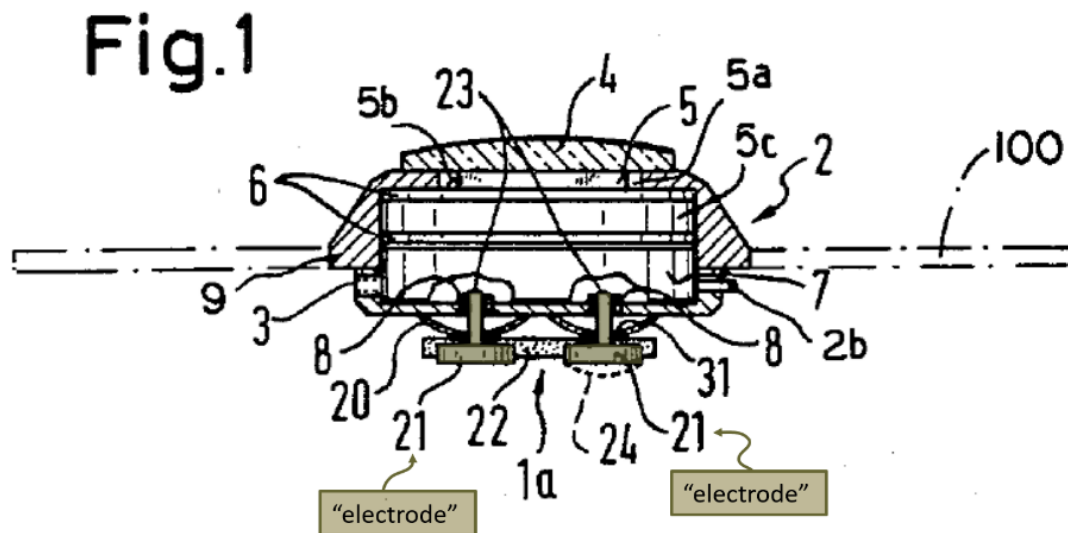
Apple argues Kotanagi’s electrodes would not obtain an ECG because Choi allegedly requires that ECG signals be obtained from sensors on two different surfaces. POR, 67–68 (citing EX1011, ¶52) . To the contrary, Choi merely states that two surfaces “*may*” be needed. EX1011, ¶52.

Further, Choi elsewhere suggests that watch rear sensors alone can measure ECG (an example of “a second biosignal.”) Choi detects the second biosignal “by the sensor 131 provided on the front 130 and/or the sensor 151 provided on the back 150.” *Id.*, ¶47.



EX1011, 24 (Fig. 1).

In addition, Apple admits that a 1983 reference discloses using two rear electrodes on a single surface to measure ECG. Schmid Figure 1 discloses:



E.g., EX1029 (Schmid), Fig. 1; EX1003, ¶233; Pet., 52. Indeed, *Apple admits that “Schmid’s electrodes are used to measure ECG.”* POR, 73. This and Lapetina directly refute that ECG signals must be obtained from sensors on two different surfaces. POR, 67–68. EX1055 (Lapetina) (2014) 5:52–62 (disclosing two rear

electrodes to sense an ECG). In view of Choi, and the state of the art, a POSITA would have expected success in using Kotanagi's two rear electrodes to measure ECG. EX1060, ¶¶397–98.

Apple argues that because Schmid suggests offloading signal processing to “the electronics of a conventional EKG machine,” Schmid's wrist-worn device *alone* cannot measure ECG. *Id.*, 73–74. But Schmid merely states that its signals can be sent to an “apparatus for evaluating and/or plotting such signals as, for example, in EKG.” Ex. 1029, 1:1–10. By 2014, any processing necessary for an ECG would have fit in a watch. Indeed, Choi, with a 2013 priority date, teaches ECG processing on a watch. Pet., 91. *See also* EX1055 5:52–62. Choi explains that “growing computing power of the mobile device” allows processing tasks “previously performed using a personal computer.” EX1011 ¶2. The '491 patent provides no details on how to process ECG signals, relying instead on generic processors. EX1001, 11:19–29. EX1060 ¶399.

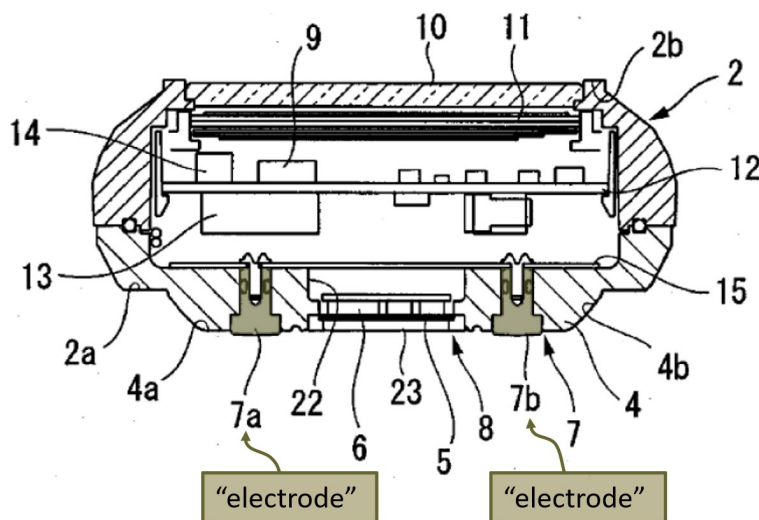
Apple next argues that Masimo has not shown Kotanagi's electrodes are “biosensors” as somehow evidence of no-ECG detection functionality. POR, 68. But that label is not indicative of the functionality of the electrodes. Moreover, Kotanagi repeatedly describes the electrodes as part of the “biological sensor.” EX1005 ¶¶7–8, 13, 46, 58, 86. Kotanagi detects skin contact through “a discharge” on the living body surface when its electrodes contact that surface. *Id.*, ¶64.

Similarly, Choi discloses a wearing detection sensor that is similar to Kotanagi's contact detection means. Choi's sensor detects an impedance signal when contacting the skin. EX1011 ¶69. Choi also discloses a "second biosensor" that can measure impedance. EX1011 ¶18. Therefore, Choi supports that a skin contact sensor, like Kotanagi's, is a biosensor. EX1060 ¶400.

Apple argues that structural similarities between Kotanagi and Choi are insufficient to provide motivation to combine. POR, 68. However, Masimo's motivation-to-combine arguments do not rely on structural similarities alone. A POSITA would have been motivated to add ECG to Kotanagi to improve biosensing (e.g., by expanding its capability to measure heart function beyond pulse rate). Pet., 53–54. Additional references contradict Apple's position and support the Petition's motivation to combine. EX1055 (disclosing a smartwatch that measures pulse rate, GSR, and ECG, among other physiological measurements); EX1056 (Lee Provisional) ¶2 (disclosing a smartwatch with a "PPG sensor ... in the center" and "two metal electrodes [that] can be used as ECG and/or GSR electrodes"); EX1057 (Lee Nonprovisional), Fig. 1C. Indeed, Choi discloses this very combination of PPG and ECG functionality in a single device. EX1011 ¶7 (disclosing a smartwatch that may sense "*an electrocardiogram (ECG) signal, a photoplethysmogram (PPG) signal, a voice of the user, and an impedance signal*") (emphasis added). EX1060, ¶401.

Apple further argues Masimo did not explain “why or how” measuring the electrical potential difference between electrodes in Kotanagi is “analogous” to ECG measurements in Choi. POR, 70. But Masimo did not assert that potential difference is analogous to ECG. Masimo explained that Choi’s “impedance signal ... is analogous to the electrical potential taught in Kotanagi.” Pet., 53. They are related by Ohm’s law, and both these measurements and ECG require metal electrodes to contact the skin surface for measurements. EX1003 ¶235. EX1060, ¶402.

Apple argues that Masimo failed to show how Kotanagi’s electrodes can be configured to both detect skin contact and measure ECG. POR, 70. This argument fails for two reasons. First, a POSITA would have known that no structural changes are needed to use Kotanagi’s electrodes to measure ECG. Electrodes, as disclosed by Kotanagi, are generic components used to detect electrical signals by contacting a wearer:



EX1005, 27 (Fig. 7). Moreover, a POSITA would have known that the same electrical contacts (i.e., electrodes) can be used to detect various physiological signals, such as GSR, ECG, GSP, EMG, etc. EX1055, 5:52–62. Any further configuration would have been known to a POSITA, including how to use standard ECG processing circuits or algorithms to measure ECG using Kotanagi’s electrodes alone. EX1003 ¶¶235–241; EX1060, ¶403.

For example, at least as of 2011, it was known to use the same electrodes to obtain both GSR and ECG measurements, contrary to Apple’s assertions. EX1061, §1¶4 (“the ECG and GSR share a common electrode”). This was done using a “baseline correction circuit.” *Id.* §3.2¶3 (circuit allows integration of GSR sensing “into the same electrode through applying a fixed, known differential between the electrodes”). GSR and skin contact sensing are both “potential difference” measurements. *Id.* §3.2¶3 (GSR measurements apply known “potential” across two electrodes and measure resistance; EX1005, ¶59 (body surface contact sensing “based on the potential difference between” electrodes 7a and 7b). Thus, EX1061 shows a POSITA would have expected success in using Kotanagi’s electrodes for the dual purposes of ECG and skin contact sensing. *See also* EX1056, ¶19 (ECG and GSR sensors having common electrodes can be used to “detect removal of the device from the wrist”); EX1057, ¶21, 39–41.

Further, a POSITA would have known to use the electrodes to detect skin

contact, and, once verified, to measure ECG. This process is consistent with Kotanagi's teaching of first detecting skin contact and then measuring pulse rate with its optical sensor. EX1005, ¶59; EX1060, ¶404.

Apple argues that Choi does not teach dual-purpose electrodes ("using the same electrodes for both skin contact detection and ECG measurements.") POR, 71. As discussed above, the same electrodes can be used for various purposes, including ECG and skin contact detection. Apple further argues that Choi does not teach dual-purpose electrodes because Choi's Figure 3 shows a "second sensor" to detect ECG and a separate "wearing detection sensor" using impedance. POR, 70. But Choi also discloses sensing an ECG and/or an impedance signal generated by body contact with a user using a single "second sensor." EX1011 ¶56; EX1060, ¶406.

Apple argues that Choi does not use **both** ECG and impedance for user authentication. POR, 71–72. This is incorrect. Choi teaches that its second sensor detects a "second signal," which may include an ECG signal and/or an impedance signal. EX1011 ¶56. This second signal is for user authentication. EX1011, Abstract, ¶27; EX1060, ¶407.

In any case, Masimo's combination need not implement Choi's user-authentication function to render the claims obvious. *Intel Corp.*, 21 F4th at 800 (reference's intended purpose does not control the obviousness inquiry); *In re Heck*, 699 F.2d 1331, 1333 (Fed. Cir. 1983) (prior-art patents are "relevant for all they

contain”). Masimo showed it would have been obvious to add ECG to Kotanagi to improve biosensing regardless of whether ECG authenticates a user.

Apple argues that reconfiguring Kotanagi’s electrodes to measure ECG rather than detect skin contact would frustrate Kotanagi’s purpose. POR, 72. But Masimo does not propose to measure ECG *rather than* detect skin contact. Masimo’s proposal to use Kotanagi’s electrodes to measure ECG does not prevent using the electrodes to also detect skin contact. *See* Pet., 52. EX1060, ¶408.

2. Kotanagi’s existing electrodes plus additional electrodes would obtain an ECG

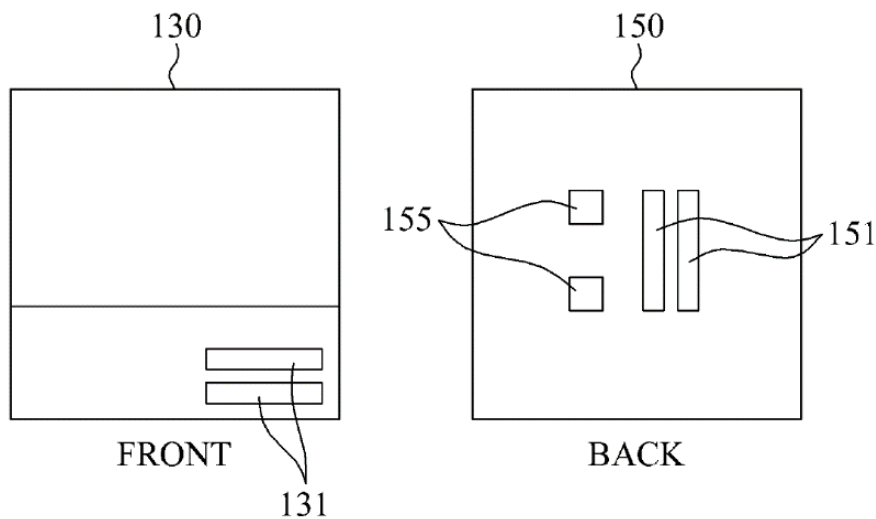
Alternatively, if a POSITA wanted to measure ECG on two surfaces, a POSITA would have used Choi’s teachings to add electrodes to Kotanagi. Pet., 52. Apple argues that *to detect skin contact*, new electrodes would need to be on the rear surface. POR, 69. But the Petition proposes adding electrodes for measuring *ECG*, not skin contact. Pet., 52. EX1060, ¶409.

Apple argues that moving Kotanagi’s rear electrodes to a different surface would frustrate Kotanagi’s purpose of detecting skin contact. POR, 69–70. But in view of Choi, Masimo proposes adding more, not moving existing, electrodes. Pet., 52. As discussed above, a POSITA would have known how to use Kotanagi’s electrodes for a dual purpose, potentially involving additional electrode(s) on a different surface to measure ECG. Indeed, Choi’s device uses electrodes for the

same dual purposes: to detect skin contact (through impedance) and measure ECG.

EX1011 ¶47; EX1060, ¶410.

In addition, Apple's allegation that Kotanagi's electrodes are only for skin-contact detection ignores that Masimo proposed combining Kotanagi and Choi to obtain an ECG. Pet., 52. A POSITA would have been motivated to improve Kotanagi's biosensing with ECG from Choi.



EX1011, 24 (Fig. 1).

Choi also discloses a wearing detection sensor to verify the device is on the wrist before detecting ECG. Similarly, Kotanagi uses electrodes to detect contact before detecting pulse rate. A POSITA would have known how to: use Kotanagi's existing electrodes to detect skin contact and trigger the ECG; and use added electrodes to perform the ECG. This would have merely combined familiar elements according to known methods to yield predictable results. *See KSR*, 550 U.S. at 416;

Pet. at 53–54. EX1060, ¶411.

E. Claims 13 and 17

Apple’s arguments for Claims 13 and 17 rely entirely on its arguments for Claim 1. POR at 75. These are wrong for the same reasons explained above for that claim.

F. Claims 2–6, 8–12, 15–16, and 18–19

Apple’s arguments for Claims 2–6, 8–12, 15–16, and 18–19 rely entirely on its arguments for the independent claims. POR, 76. These arguments are wrong for the same reasons explained above.

IV. CONCLUSION

Petitioner respectfully requests that the Board cancel claims 1–19 of the ’491 patent.

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: April 19, 2024

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. §42.24(d), Counsel for Petitioner Masimo Corporation hereby certifies that this document complies with the type-volume limitation of 37 C.F.R. §42.24(c)(4). This document contains approximately 5,560 words, including any statement of material facts to be admitted or denied in support, and excluding the table of contents, table of authorities, mandatory notices under §42.8, exhibit list, certificate of service or word count, or appendix of exhibits or claim listing.

Respectfully submitted,

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Dated: April 19, 2024

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CERTIFICATE OF SERVICE

I hereby certify that, pursuant to 37 C.F.R. § 42.6(e) and with the agreement of counsel for Patent Owner, a true and correct copy of **PETITIONER'S REPLY IN SUPPORT OF PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 10,942,491** is being served electronically on April 19, 2024, to the e-mail addresses shown below:

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