Paper No. 55
Filed: December 17, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner

v.

UUSI, LLC d/b/a NARTRON,
Patent Owner.

Case IPR2016-00908
Patent No. 5,796,183

PATENT OWNER'S AMENDED NOTICE OF APPEAL PURSUANT TO 37 C.F.R. § 90.2(a)

Pursuant to 35 U.S.C. §§ 141(c) and 319, and 37 C.F.R. § 90.2(a), notice is hereby given that Patent Owner UUSI, LLC d/b/a Nartron ("Nartron") appeals to the United States Court of Appeals for the Federal Circuit in Case No. IPR2016-00908 from: (i) the Final Written Decision entered on September 17, 2020 (Paper 50) ("FWD") by the Patent Trial and Appeal Board ("the Board"); ***and*** (ii) the Order denying Nartron's Petition for Director Rehearing entered on October 15, 2021 (Paper 54); ***and*** (iii) all underlying orders, decisions, rulings, and opinions related thereto and included therein, to the extent that such were decided against Nartron.

I. THE AMENDED NOTICE OF APPEAL IS TIMELY

This Amended Notice of Appeal is timely under 35 U.S.C. § 142, 37 C.F.R. § 90.3, and Rule 15(a)(1) of the Federal Rules of Appellate Procedure. On October 16, 2020, Nartron filed a first Notice of Appeal from the FWD with the Director, the Board, and the Federal Circuit. That appeal was docketed as Federal Circuit Case No. 21-1060. On March 17, 2021, Nartron filed its Opening Brief at the Federal Circuit. Nartron's Opening Brief argued, *inter alia*, that the parts of the FWD that held patent claims unpatentable were void, because the administrative patent judges (APJs) who decided the case were unconstitutional principal officers under *Arthrex, Inc. v. Smith & Nephew, Inc*., 941 F.3d 1320 (Fed. Cir. 2019). Subsequently, on June 21, 2021, the Supreme Court decided *United States v. Arthrex, Inc*., 141 S. Ct. 1970 (2021), which held that APJs are unconstitutional principal officers, and ordered the

USPTO to institute a Director rehearing process to remedy the violation.

On June 23, 2021, the Federal Circuit *sua sponte* issued an order directing Nartron to file a brief indicating how the appeal should proceed in light of *Arthrex*. On July 7, 2021, Nartron filed that brief, stating that it believed the case should be remanded to the USPTO for Director Rehearing. On August 3, 2021, the Federal Circuit remanded the case to the USPTO to allow Nartron to file a Request for Director Rehearing. The remand order directed Nartron to file its Request for Director Rehearing within 30 days of the remand order. Nartron timely filed its Request for Director Rehearing (Paper 53) with the USPTO on September 2, 2021. In the Request, Nartron argued that the Director should rehear the case, because the panel never addressed whether there was a reasonable expectation of success in combining the two primary references, and Petitioner failed to prove a reasonable expectation of success in combining those references with a third reference.

On October 15, 2021, the USPTO issued an Order (Paper 54) denying Nartron's Request for Director Rehearing. The Order contains no analysis, and is not signed by the Director (or anyone else). On October 25, 2021, Nartron filed a Notice with the Federal Circuit, indicating that Nartron's Request for Director Review had been denied. On November 12, 2021, the Federal Circuit issued an Order directing Nartron to state, within seven days, whether it intended to file a new or amended notice of appeal, to challenge the denial of Director review. On

November 15, 2021, Nartron advised the Federal Circuit that it intended to file an amended notice of appeal, to challenge the denial of Director review.

Under 37 C.F.R. § 90.3(b)(1), "[a] timely request for rehearing will reset the time for appeal or civil action to no later than sixty-three (63) days after action on the request." Nartron's Request for Director Rehearing was timely, because it was filed within the 30 day period set by the Federal Circuit in its remand order. Accordingly, Nartron's deadline to file this Amended Notice of Appeal is sixty-three days from the October 15, 2021 Order (Paper 54) denying Nartron's request for Director review: that is, December 17, 2021. This Amended Notice of Appeal is being filed by that deadline. Therefore, it is timely.

II. ISSUES TO BE RAISED ON APPEAL

In accordance with 37 C.F.R. § 90.2(a)(3)(ii), the issues that Nartron may raise in this appeal include, but are not necessarily limited to:

A. On Appeal from the Final Written Decision:

(1) The Board's erroneous determination that a person of ordinary skill in the art ("POSITA") would have had a motivation to combine U.S. Pat. No. 5,087,825 to Ingraham ("Ingraham I") with U.S. Pat. No. 5,594,222 to Caldwell ("Caldwell") (*see, e.g.,* FWD at 32);

(2) The Board's failure to explain whether and why a POSITA would have had a reasonable expectation of success in combining Ingraham I with

Caldwell, where Nartron specifically challenged the asserted Ingraham I/Caldwell combination on that ground (*see* Paper 21 at 27-30);

(3) The Board's unexplained erroneous apparent determination that a POSITA would have had a reasonable expectation of success in combining Ingraham I with Caldwell;

(4) The Board's erroneous determination that a POSITA would have had a reasonable expectation of success in combining U.S. Pat. No. 5,565,658 to Gerpheide ("Gerpheide") with Ingraham I and Caldwell (FWD at 26-27);

(5) The Board's erroneous determination that Petitioner's asserted combination of Ingraham I, Caldwell and Gerpheide meets all the elements of claims 40, 41, 43, 45, 61, 64–67, 69, 83, 85, 86, 88, 90, 91, 94, 96, 97, 99, 101, and 102 (FWD at 28-53);

(6) The Board's erroneous determination that claims 40, 41, 43, 45, 61, 64–67, 69, 83, 85, 86, 88, 90, 91, 94, 96, 97, 99, 101, and 102 are obvious over Ingraham I, Caldwell and Gerpheide (FWD at 28-53);

(7) The Board's erroneous determinations that a POSITA would have had: (i) a motivation to combine Gerpheide, Ingraham I and Caldwell with U.S. Pat. No. 5,341,036 to Wheeler ("Wheeler"); and (ii) a reasonable expectation of success in making such a combination (FWD at 53-55);

(8) The Board's erroneous ruling that claims 47, 48, 62, 63, and 84 are

obvious over Ingraham I, Caldwell, Gerpheide and Wheeler (FWD at 53-58);

(9) The Board's erroneous claim constructions, whether explicit or implicit, to the extent that they led the Board to erroneously conclude that any challenged claim was obvious;

(10) The Board's erroneous interpretations of the '183 patent or the cited prior art, whether explicit or implicit, to the extent that they led the Board to erroneously conclude that any challenged claim was obvious; and

(11) All other issues decided adversely to Nartron in any orders, decisions, rulings, and opinions underlying or supporting the FWD.

B. <u>On Appeal from the Denial of Director Review:</u>

(1) The decision denying Director review violates *Arthrex* and the Appointments Clause because it is not signed by the USPTO Director, making it impossible to determine whether the Director had any involvement in the decision denying Review, and if so, how much involvement.

(2) The decision denying Director review violates *Arthrex* and the Appointments Clause because, even if it was decided by Andrew Hirshfeld (and there is no indication that it was), Mr. Hirshfeld is not a principal officer, because he was not appointed by the President and confirmed by the Senate.

(3) The decision denying Director review is invalid because it does not provide any explanation for why Director review was denied. This violates

Arthrex, which intended Director review to be a meaningful check on the discretion of APJs—not a mere rubber-stamp.

(4) The decision denying Director review is invalid because it violates 5 U.S.C. § 555(e), which provides that "[p]rompt notice shall be given of the denial in whole or in part of a written application, petition, or other request of an interested person made in connection with any agency proceeding. Except in affirming a prior denial or when the denial is self-explanatory, the notice shall be accompanied by a brief statement of the grounds for denial." The decision denying Director review did not give any "statement of the grounds for denial," and it does not simply "affirm a prior denial" of a prior petition.

(5) The decision denying Director review is invalid because the USPTO's rules and procedures for the Director rehearing process underlying the Order are invalid. The USPTO did not follow proper notice and approval procedures, including publishing the rules and procedures in the Federal Register. 5 U.S.C. §§ 552(a)(1), 553.

(6) The Denial was "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law," was "contrary to constitutional right, power, privilege, or immunity," was "in excess of statutory jurisdiction, authority, or limitations, or short of statutory right," and was "without observance of procedure required by law." 5 U.S.C. §§706(a)-(d).

III. ATTACHMENTS

To permit the USPTO to evaluate this Amended Notice of Appeal, including its timeliness, the following documents are attached to the Notice:

- **Exhibit A:** The Board's September 17, 2020 FWD (Paper 50);
- **Exhibit B:** The Federal Circuit's June 23, 2021 Order directing Nartron to state how the appeal should proceed in light of *Arthrex*;
- **Exhibit C:** The Federal Circuit's August 3, 2021 Order remanding the case so that Nartron could seek Director review (Case 21-1060, Dkt. 36);
- **Exhibit D:** The USPTO's October 15, 2021 Order denying Nartron's request for Director review (Paper 54); and
- **Exhibit E:** The Federal Circuit's November 12, 2021 Order approving Nartron's filing of an amended notice of appeal (Case 21-1060, Dkt. 38).

IV. FILING AND SERVICE

Per 35 U.S.C. § 142 and 37 C.F.R. § 90.2(a)(1), this amended notice of appeal is being filed with the Director, and a copy is also being filed with the Board. Per Federal Circuit Rule 15(a)(1) and 37 C.F.R. § 90.2(a)(2), Nartron is also filing this amended notice with the clerk of the Court of Appeals for the Federal Circuit.

WHEREFORE, for the foregoing reasons, Nartron respectfully requests that this amended notice of appeal be docketed, and that the USPTO send the certified list and copies of the decisions being appealed to the Federal Circuit within forty

days of the Federal Circuit docketing this amended notice of appeal, pursuant to Federal Circuit Rule 17(b)(1), 35 U.S.C. § 143, and 15 U.S.C. § 1071(a)(3).

Respectfully submitted,

Dated: December 17, 2021

By: */s/ Stephen Underwood*

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EXHIBIT A

Trials@uspto.gov
571-272-7822

Paper 50
Date: September 17, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD,
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v.

UUSI, LLC d/b/a NARTRON,
Patent Owner.

IPR2016-00908
Patent 5,796,183

Before THOMAS L. GIANNETTI, CARL M. DEFRANCO, and KAMRAN JIVANI, *Administrative Patent Judges.*

JIVANI, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision on Remand
Determining Some Challenged Claims Unpatentable
35 U.S.C. §§ 314, 318

I. INTRODUCTION

A. Background and Summary

Samsung Electronics Co., Ltd., ("Petitioner") sought *inter partes* review of claims 37–41, 43, 45, 47, 48, 61–67, 69, 83–86, 88, 90, 91, 94, 96, 97, 99, 101, and 102 of U.S. Patent No. 5,796,183 (Ex. 1001, "the '183

patent"), owned by UUSI, LLC d/b/a Nartron ("Patent Owner"). Paper 2 ("Petition" or "Pet."). Patent Owner filed a Preliminary Response. Paper 10 ("Prelim. Resp."). Upon consideration of the Petition and Preliminary Response, we instituted an *inter partes* review of claims 40, 41, 43, 45, 47, 48, 61–67, 69, 83–86, 88, 90, 91, 94, 96, 97, 99, 101, and 102 (the "Earlier Instituted Claims") pursuant to 35 U.S.C. § 314. Paper 12 ("Decision on Institution" or "Dec. on Inst."). We did not institute, however, an *inter partes* review of claims 37–39 at that time because we determined Petitioner had not established a reasonable likelihood that it would prevail with respect to those claims. *Id.*

Petitioner sought rehearing of our decision denying review of claims 37–39 because, according to Petitioner, we erred in our construction of the term "supply voltage," as recited in independent claim 37. Paper 14, 1. Having considered Petitioner's arguments for rehearing, we denied its request and maintained our preliminary construction of the term "supply voltage," as recited in claim 37. Paper 17, 5–7.

During the trial, Patent Owner filed a Patent Owner Response (Paper 21, "PO Resp."), and Petitioner filed a Reply thereto (Paper 24, "Reply"). An oral hearing was conducted on June 22, 2017. The record contains a transcript of the hearing (Paper 34). On December 13, 2017, we entered a Final Written Decision concluding that Petitioner had not shown by a preponderance of the evidence that the instituted claims were unpatentable. Paper 35, 24.

Petitioner appealed our Decision to the United States Court of Appeals for the Federal Circuit, which vacated our Decision and remanded the matter to us. *Samsung Elecs. Co. v. UUSI, LLC*, 775 F. App'x 692 (Fed. Cir. 2019). As to the earlier instituted claims, the Court instructed that we

should consider "whether Samsung has shown that there would have been a reasonable expectation of success in combining the teaching of Gerpheide with the teachings of Ingraham [I]/Caldwell to arrive at the claimed invention." *Id*. at 697. The Court further instructed us to "consider the patentability of claims 37, 38, and 39" (*id.*) because, on April 24, 2018, the Supreme Court of the United States held that a decision to institute under 35 U.S.C. § 314 may not institute on fewer than all claims challenged in the petition. *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348 (2018).

Pursuant to the Federal Circuit's instruction in this case and in light of *SAS Inst., Inc.*, we modified our Decision on Institution to institute review of claims 37–39 of the '183 patent as obvious over Ingraham I, Caldwell, and Gerpheide. Paper 40. We further held a teleconference on August 15, 2019, with respective counsel for the parties, to hear their proposals on how to proceed with this trial. Paper 41, 2. Having considered the parties' proposals, we authorized the parties to submit concurrent briefs and subsequent responses addressing the following issues (*id.* at 6):

(1) the Federal Circuit's determination in the context of the Earlier Instituted Claims that "the claims are not limited to situations in which different frequencies are provided to different rows" and that "[a] reasonable expectation of success thus only requires that different frequencies be provided to the entire pad;"

(2) whether Petitioner has shown that there would have been a reasonable expectation of success in combining the teaching of Gerpheide with the teachings of Ingraham I, Caldwell, and Wheeler (in certain instances) to arrive at the inventions of the Earlier Instituted Claims;

(3) our construction in our Decision on Institution of the term "supply voltage," as recited in independent claim 37; and

(4) whether Petitioner has shown by a preponderance of the evidence that claims 37–39 are rendered obvious over the asserted combination of Ingraham I, Caldwell, and Gerpheide.

On October 3, 2019, Petitioner submitted its Opening Brief on Remand (Paper 43, "Pet. Br.") and Patent Owner submitted its Opening Brief on Remand (Paper 44, "PO Br."). The parties filed cross responses on October 17, 2019. Paper 45 ("PO Remand Resp."); Paper 46 ("Pet. Remand Resp.").

On December 11, 2019, with our prior authorization, Petitioner filed a brief addressing Patent Owner's statements in co-pending proceeding IPR2019-00358, which reviews certain claims of the '183 patent. Paper 47. Patent Owner filed an opposition thereto on December 13, 2019. Paper 49.

We have jurisdiction under 35 U.S.C. § 6(b). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) as to the patentability of the challenged claims before us on remand. Based on the complete trial record, Petitioner has shown by a preponderance of the evidence that claims 40, 41, 43, 45, 47, 48, 61–67, 69, 83–86, 88, 90, 91, 94, 96, 97, 99, 101, and 102 are unpatentable. Petitioner has failed to show by a preponderance of the evidence that claims 37–39 are unpatentable.

B. Real Parties in Interest

Petitioner identifies Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc., as real parties in interest. Pet. 1. Patent Owner identifies only itself, namely UUSI, LLC d/b/a/ Nartron, as a real party interest. Paper 7, 1. Neither party contests these identifications.

C. Related Matters

The '183 patent has been subject to two reexaminations: *Ex Parte* Reexamination Control Nos. 90/012,439, certificate issued April 29, 2013

("Reexam 1") and 90/013,106, certificate issued June 27, 2014 ("Reexam 2"). Claims 37–39 were added during Reexam 1, where the Earlier Instituted Claims were added during Reexam 2. Ex. 1006, 2–3; Ex. 1007, 27–28.

Claims 37–39, 94, 96–99, 101–109, and 115–117 of the '183 patent are the subject of an *inter partes* review pending before this Board on grounds applying art not at issue in this proceeding. *Apple, Inc. v. UUSI, LLC d/b/a Nartron*, IPR2019-00358, Paper 12 at 11–12 (PTAB Aug. 5, 2019) (Decision on Institution). Further, claims 27, 28, 32, 36, 83–88, and 90–93 of the '183 patent are the subject of an *inter partes* review pending before this Board on grounds applying art not at issue in this proceeding. *Apple, Inc. v. UUSI, LLC d/b/a Nartron*, IPR2019-00359, Paper 12 at 12 (PTAB Aug. 5, 2019) (Decision on Institution).

The '183 patent is the subject of ongoing litigation between the parties in the Western District of Michigan: *UUSI, LLC d/b/a Nartron v. Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc*., Case No. 1:15-cv-00146-JTN, originally filed on February 13, 2015 (W.D. Mich.) (the "District Court litigation"). Pet. 1. The District Court litigation is stayed and administratively closed until resolution of this *inter partes* review. Order, Case No. 1:15-cv-00146-JTN, Dkt. No. 137 (filed Jan. 13, 2017).

D. The '183 Patent

The '183 patent, titled "CAPACITIVE RESPONSIVE ELECTRONIC SWITCHING CIRCUIT," was filed January 31, 1996, and issued August 18, 1998. Ex. 1001, codes [22], [45], [54]. The '183 patent has expired. Pet. 11; Prelim. Resp. 7.

The ’183 patent relates to a “capacitive responsive electronic switching circuit used to make possible a ‘zero force’ manual electronic switch.” Ex. 1001, 1:6–9. According to the ’183 patent, zero force touch switches have no moving parts and no contact surfaces that directly switch loads. *Id*. at 2:40–41. Instead, such switches detect an operator’s touch and use solid state electronics to switch loads or activate mechanical relays. *Id*. at 2:42–44. “A common solution used to achieve a zero force touch switch has been to make use of the capacitance of the human operator.” *Id*. at 3:12–14. As background, the ’183 patent describes three methods used by capacitive touch switches to detect an operator’s touch, one of which relies on the change in capacitive coupling between a touch terminal and ground. *Id*. at 3:13–15, 3:44–46. In this method, “[t]he touch of an operator then provides a capacitive short to ground via the operator’s own body capacitance.” *Id*. at 3:52–55. Figure 8, reproduced below, is an example that makes use of this method.

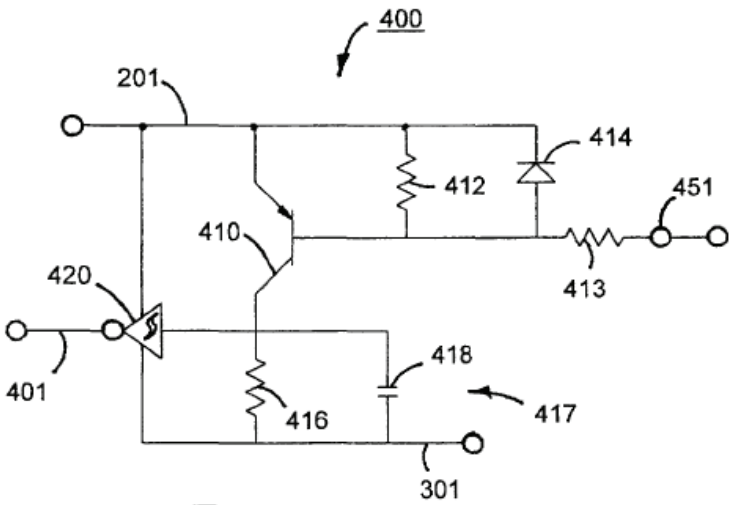

Fig. 8

Figure 8 depicts a “touch circuit” in which, when a pad (not shown) is touched to create a short to ground via terminal 451, transistor 410 turns on

and connects high frequency input at 201 to resistor/capacitor circuit 416/418, thus triggering Schmitt Trigger 420 to provide control output 401. *Id.* at 14:47–52, 15:17–47. Significantly, the operator of a capacitive touch switch using this method need not come in conductive contact with the touch terminal. *Id*. at 3:57–59. Rather, the operator needs only to come into close proximity of the switch. *Id*.

Figure 4 of the ’183 patent is reproduced below.

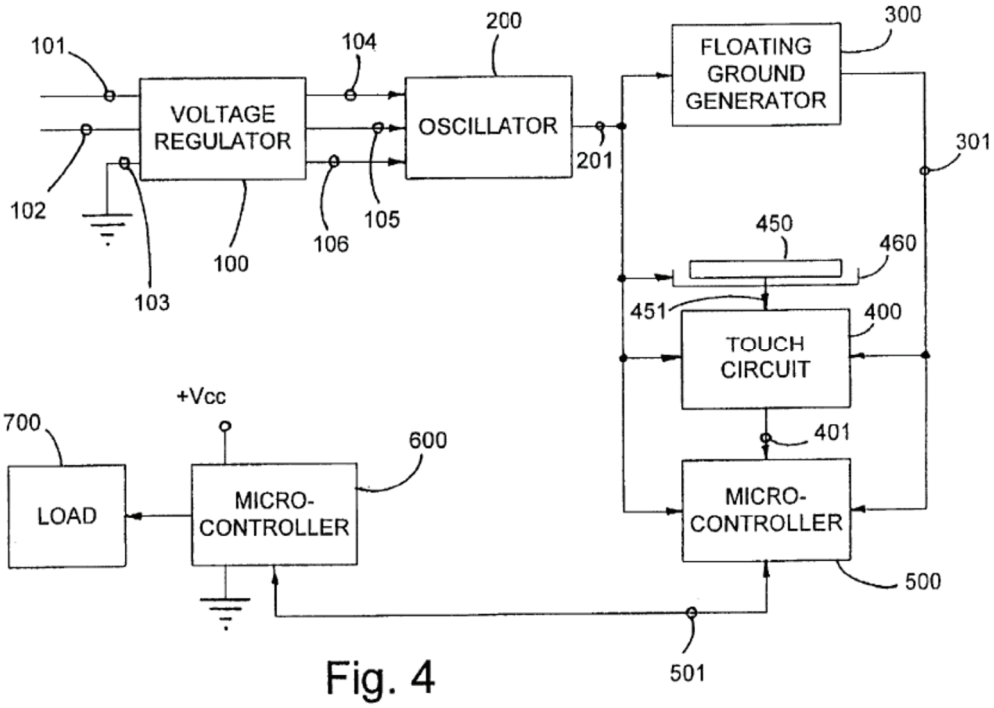

Fig. 4

Figure 4 is a block diagram of a capacitive responsive electronic switching circuit according to a first embodiment of the ’183 patent. *Id.* at 7:23–25. As depicted in Figure 4, the electronic switching circuit of the first embodiment comprises voltage regulator 100, oscillator 200, floating ground generator 300, touch circuit 400, touch pad 450, and microcontroller 500. *Id.* at 11:64–12:33.

Voltage regulator 100 converts a received AC voltage to a DC voltage and supplies a regulated 5 volts (V) DC power to oscillator 200 via lines 104

and 105. *Id.* at 11:67–12:2. Voltage regulator 100 also supplies oscillator 200 with 26 V DC power via line 106. *Id.* at 12:2–3.

Upon being powered by voltage regulator 100, oscillator 200 generates a square wave with a frequency of 50 kHz, or preferably greater than 800 kHz, and having an amplitude of 26 V peak. *Id.* at 12:6–9. Floating common generator 300 receives the 26 V peak square wave from oscillator 200, and outputs a regulated floating common that is 5 volts below the square wave output from oscillator 200 and has the same phase and frequency as the received square wave. *Id.* at 12:14–18. This floating common output is supplied to touch circuit 400 and microcontroller 500 via line 301 such that the output square wave from oscillator 200 and floating common output from floating common generator 300 provide power to touch circuit 400 and microcontroller 500. *Id.* at 12:18–23.

Touch circuit 400 senses capacitance from touch pad 450 via line 451 and outputs a signal to microcontroller 500 via line 401 upon detecting a capacitance to ground at touch pad 450 that exceeds a threshold value. *Id.* at 12:24–27. Figure 8 reproduced above describes touch circuit 400 in detail. *Id.* at 12:27–28.

Upon receiving an indication from touch circuit 400 that a sufficient capacitance to ground is present at touch pad 450, microcontroller 500 outputs a signal to load-controlling microcontroller 600 via line 501, which is preferably a two way optical coupling bus. *Id.* at 12:29–34. Microcontroller 600 then responds in a predetermined manner to control load 700. *Id.* at 12:33–35.

Figure 11 of the ’183 patent is reproduced below.

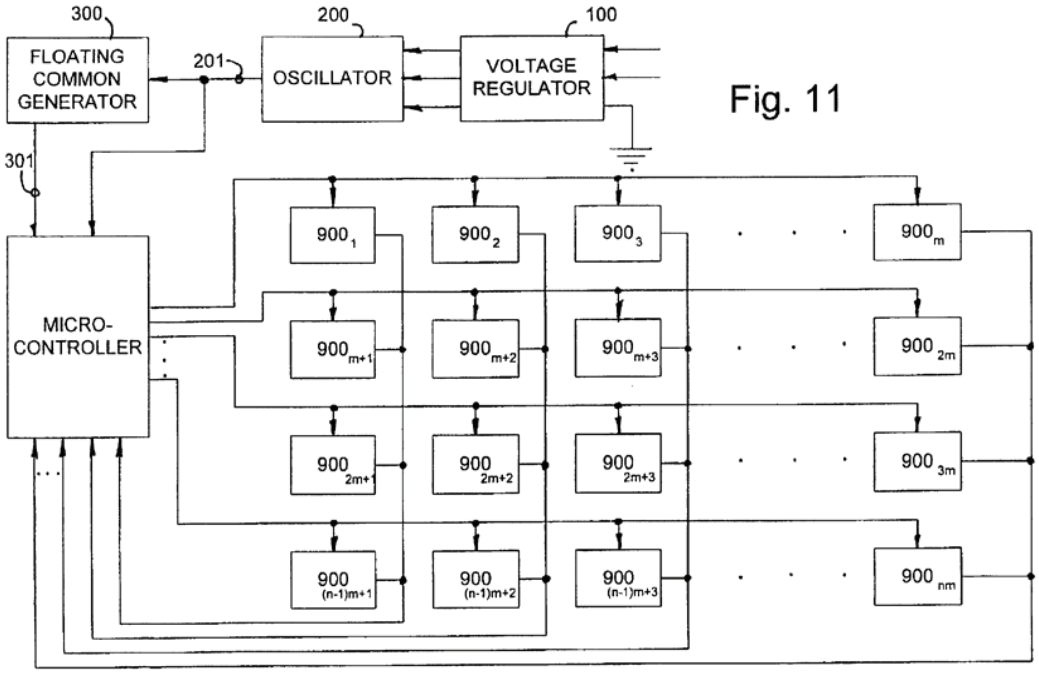

Fig. 11

Figure 11 is a block diagram of a capacitive responsive electronic switching circuit according to a second embodiment of the ’183 patent. *Id.* at 7:43–45. As depicted in Figure 11, the second embodiment discloses a “multiple touch pad circuit,” which is a variation of the electronic switching circuit of the first embodiment discussed above in that the multiple touch pad circuit includes “an array of touch circuits” 900_1 through 900_{nm}, where each element of the array includes touch circuit 400 described in Figures 4 and 8 above, as well as touch pad 450 depicted in Figure 4. *Id*. at 18:34–43.

In this “multiple touch pad circuit” embodiment, microcontroller 500 selects each row of touch circuits 900_1 to 900_{nm} by providing the signal from oscillator 200 to selected rows of touch circuits. *Id*. at 18:43–46. The ’183 patent describes that “[i]n this manner, microcontroller 500 can sequentially activate the touch circuit rows and associate the received inputs from the columns of the array with the activated touch circuit(s).” *Id*. at 18:46–49. In

other words, the microcontroller selects successive rows of the touch circuit array by providing the signal from oscillator 200 sequentially to each row, such that a particular activated touch circuit is detected by the microcontroller via association of an activated row with received input from a column line of the array. *Id*. at 18:43–49.

The '183 patent recognizes that placing capacitive touch switches in dense arrays, as in Figure 11, can result in unintended actuations. *Id*. at 3:65–4:3. One method of addressing this problem known in the art involves placing guard rings around each touch pad. *Id*. at 4:4–7. Another known method of addressing this problem is to adjust the sensitivity of the touch pad such that the operator's finger must entirely overlap a touch terminal. *Id*. at 4:8–14. "Although these methods (guard rings and sensitivity adjustment) have gone a considerable way in allowing touch switches to be spaced in comparatively close proximity, a susceptibility to surface contamination remains as a problem." *Id*. at 4:14–18.

The '183 patent uses the technique of Figure 11 to overcome the problem of unintended actuation of small capacitive touch switches "by using the method of sensing body capacitance to ground in conjunction with redundant detection circuits." *Id*. at 5:33–35. Specifically, the '183 patent's touch detection circuit operates at frequencies at or above 50 kHz, and preferably at or above 800 kHz, in order to minimize the effects of surface contamination on the touch pads. *Id.* at 11:19–29. Operating at these frequencies also improves sensitivity, allowing close control of the proximity required for actuation of small-sized touch terminals in a close array, such as a keyboard. *Id*. at 5:48–57.

E. Illustrative Claims

Claims 37 and 40 illustrate the claimed subject matter and are reproduced below with bracketed material added.

> 37. A capacitive responsive electronic switching circuit for a controlled device comprising:
>
> [37a] an oscillator providing a periodic output signal having a predefined frequency, wherein an oscillator voltage is greater than a supply voltage;
>
> [37b] a microcontroller using the periodic output signal from the oscillator, the microcontroller selectively providing signal output frequencies to a closely spaced array of input touch terminals of a keypad, the input touch terminals comprising first and second input touch terminals;
>
> [37c] the first and second touch terminals defining areas for an operator to provide an input by proximity and touch; and
>
> [37d] a detector circuit coupled to said oscillator for receiving said periodic output signal from said oscillator, and coupled to said first and second touch terminals, said detector circuit being responsive to signals from said oscillator via said microcontroller and a presence of an operator's body capacitance to ground coupled to said first and second touch terminals when proximal or touched by the operator to provide a control output signal for actuation of the controlled device, said detector circuit being configured to generate said control output signal when the operator is proximal or touches said second touch terminal after the operator is proximal or touches said first touch terminal.

> 40. A capacitive responsive electronic switching circuit comprising:
>
> [40a] an oscillator providing a periodic output signal having a predefined frequency;
>
> [40b] a microcontroller using the periodic output signal from the oscillator, the microcontroller selectively providing signal output frequencies to a plurality of small sized input touch terminals of a keypad, wherein the selectively providing comprises the microcontroller selectively providing a signal

output frequency to each row of the plurality of small sized input touch terminals of the keypad;

[40c] the plurality of small sized input touch terminals defining adjacent areas on a dielectric substrate for an operator to provide inputs by proximity and touch; and

[40d] a detector circuit coupled to said oscillator for receiving said periodic output signal from said oscillator, and coupled to said input touch terminals, said detector circuit being responsive to signals from said oscillator via said microcontroller and a presence of an operator's body capacitance to ground coupled to said touch terminals when proximal or touched by the operator to provide a control output signal,

[40e] wherein said predefined frequency of said oscillator and said signal output frequencies are selected to decrease a first impedance of said dielectric substrate relative to a second impedance of any contaminate that may create an electrical path on said dielectric substrate between said adjacent areas defined by the plurality of small sized input touch terminals, and wherein said detector circuit compares a sensed body capacitance change to ground proximate an input touch terminal to a threshold level to prevent inadvertent generation of the control output signal.

F. Prior Art and Asserted Grounds

Petitioner asserts the following grounds of unpatentability:

Claim(s) Challenged	35 U.S.C. §[1]	Reference(s)/Basis
37–41, 43, 45, 61, 64–67, 69, 83, 85, 86, 88, 90, 91, 94, 96, 97, 99, 101, and 102	103(a)	Ingraham I[2], Caldwell[3], Gerpheide[4]
47, 48, 62, 63, and 84	103(a)	Ingraham I, Caldwell, Gerpheide, Wheeler[5]

G. Testimony

Petitioner supports its challenges with a declaration of Dr. Vivek Subramanian (Ex. 1002), filed contemporaneously with the Petition, and a rebuttal declaration of Dr. Subramanian (Ex. 1017), filed contemporaneously with the Reply. Dr. Subramanian testified further by deposition on February 3, 2017, and a transcript of his testimony has been entered into evidence. Ex. 2009.

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[1] The Leahy-Smith America Invents Act ("AIA") included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Because the '183 patent issued from an application with an effective filing date earlier than March 16, 2013, we apply the pre-AIA version of the statutory basis for unpatentability.

[2] U.S. Patent No. 5,087,825, issued Feb. 11, 1992, (Ex. 1007, "Ingraham I") along with portions of U.S. Patent No. 4,731,548, issued Mar. 15, 1988 (Ex. 1008, "Ingraham II") incorporated by reference.

[3] U.S. Patent No. 5,594,222, issued Jan. 14, 1997 (Ex. 1009).

[4] U.S. Patent No. 5,565,658, issued Oct. 15, 1996 (Ex. 1012).

[5] U.S. Patent No. 5,341,036, issued Aug. 23, 1994 (Ex. 1015).

Patent Owner rebuts Petitioner's challenges with a declaration of Dr. Darran Cairns (Ex. 2002), filed contemporaneously with the Preliminary Response, and an additional declaration of Dr. Cairns (Ex. 2010), filed contemporaneously with the Patent Owner Response. Dr. Cairns testified further by deposition on April 21, 2017, and a transcript of his testimony has been entered into evidence. Ex. 1018.

Neither party seeks to introduce additional testimony after the Federal Circuit's decision remanding the case to us. Paper 41, 3–5.

H. Level of Ordinary Skill in the Art

Citing testimony of its declarant, Dr. Subramanian, Petitioner contends that a person having ordinary skill in the art at the time of the invention would have had a minimum of: (1) a bachelor's degree in electrical engineering, or equivalent thereof; and (2) "two to three years of experience in the relevant field, which includes touch systems technology." Pet. 3 (citing Ex. 1002 ¶ 19). Patent Owner's witness, Dr. Cairns, opines that a person of ordinary skill "in the art of capacitive touch sensors would have had at least a bachelor's degree in physics or electrical engineering or equivalent industry experience in the field." Ex. 2002 ¶ 14.

In our Final Written Decision, we noted that the levels of ordinary skill proposed by the parties do not differ significantly, but adopted Petitioner's proposed definition as more representative, indicating that our analysis would be the same under either definition. Paper 35, 9–10. On remand, neither party disputes the definition adopted in the Final Written Decision. Furthermore, no argument presented by the parties on remand would be affected by adopting one of the proposed definitions over the other. We maintain here the definition adopted in the Final Written Decision.

II. CLAIM CONSTRUCTION

A. Principles of Law

The '183 patent expired on January 31, 2016. Pet. 11; Prelim. Resp. 7. Our review of the claims of an expired patent is "similar to that of a district court's review," as set forth by the Court in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b)[6]; *see also Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–45 (2016). Under *Phillips*, the words of a claim are generally given their "ordinary and customary meaning," which is the meaning they would have to a person of ordinary skill in the art at the time of the invention, in light of the Specification and prosecution history. *See Phillips*, 415 F.3d at 1312–14. "Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." *Id*. at 1313. "In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17). Any special definition for a claim term must be set

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[6] The recent changes to this rule are inapplicable here because the Petition was filed before November 13, 2018, but if they were applicable here, they would also require that we construe the challenged claims by applying "the standard used in federal courts, in other words, the claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b), which is articulated in *Phillips*." *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,343–44 (Oct. 11, 2018) (codified at 37 C.F.R. § 42.100(b) (2019)).

forth in the specification with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

B. The supply voltage limitations

In our Decision on Institution, we addressed the scope of the limitations: "oscillator voltage is greater than a supply voltage," as recited in independent claim 37 and "peak voltage of the signal output frequencies is greater than a supply voltage" as recited in each of independent claims 61, 83, and 94 (collectively, the "supply voltage limitations"). Dec. on Inst. 8. We observed, "[i]ndependent claim 37 recites, in relevant part, 'an oscillator providing a periodic output signal having a predefined frequency, *wherein an oscillator voltage is greater than a supply voltage*.'" *Id.* at 9 (emphasis added). Based on the context of the supply voltage limitation in this claim, we determined that one of ordinary skill in the art would understand the term "oscillator voltage" as referring to the "periodic output signal" and the term "supply voltage" as referring to a supply voltage of the oscillator. *Id.*

We based our assessment of the scope of the supply voltage limitation recited in claim 37 on the Specification's disclosure that voltage regulator 100 provides supply voltages 104, 105, and 106 to oscillator 200. *Id*. (citing Ex 1001, 11:64–12:29, Figs. 4, 5). In so doing, we rejected Patent Owner's contention that the claim language restricts the supply voltage to exclude an external commercial power supply. *Id.* We found, contrary to Patent Owner's arguments, that the Specification discloses supply voltages of oscillator 200 including batteries and commercial power lines.

In its Opening Brief on Remand, Petitioner asserts that the plain and ordinary meaning of "supply voltage" is not limited to a particular device, such as an oscillator, and further argues that we have improperly limited claim 37 to an exemplary embodiment while excluding from the scope of

claim 37 other embodiments of the '183 patent. Pet. Br. 7–8. More specifically, Petitioner asserts that the presence of a "semicolon" after "supply voltage" and the use of the transition term "wherein" do not compel our construction. *Id.* at 9. Further, Petitioner asserts that because certain dependent claims include narrower recitations of "supply voltage," if the applicant wanted to be more specific regarding the scope of "supply voltage" in claim 37 it would have been more specific. *Id.*

Moreover, Petitioner asserts that because we looked to the Specification in our Decision on Institution to confirm our construction, we read in an added limitation limiting the claim to an exemplary embodiment. *Id.* at 10. Petitioner argues there is no clear indication, such as a definition, disavowal, or disclaimer, in the Specification or the prosecution history that would compel limiting "supply voltage" beyond its plain and ordinary meaning. *Id*. Petitioner goes on to describe embodiments allegedly supported by the Specification that it believes to be excluded by our construction of "supply voltage." *Id.* at 11–13 (citing *Oatey Co. v. IPS Corp*., 514 F.3d 1271, 1276 (Fed. Cir. 2008)).

In its Opening Brief on Remand, Patent Owner asserts that our construction as set forth in the Decision on Institution and further discussed in the Decision on the Request for Rehearing was properly supported by our discussion of the grammar of the claim, as well as the Specification. PO Br. 14–15.

As an initial matter, Petitioner's focus on allegedly undue limitation of the plain and ordinary meaning of "supply voltage" is misplaced. We do not, as Petitioner alleges, limit the plain and ordinary meaning of "supply voltage" to a particular device. Instead, the language of the claim itself

limits the claimed "supply voltage" to the supply voltage the claim identifies (i.e., that of the oscillator).

In its discussion of plain and ordinary meaning, Petitioner asserts that the presence of "a" before "supply voltage" suggests that the claimed "supply voltage" is not referring to a particular component. Pet. Br. 8. Petitioner does not explain why this would be so. *Id.* at 9. Indeed, the article "a" merely indicates the first use of the term in the claim as a matter of antecedent basis. Its usage is inapposite to whether the term refers to a particular component.

On the other hand, Petitioner acknowledges that "punctuation and transition term[s]" should be considered in determining the meaning of a claim term, but asserts without further support that the presence of a semicolon after "supply voltage" and the use of the transition term "wherein" do not compel the preliminary construction. *Id.* As we addressed in denying Petitioner's Request for Rehearing, claim 37 employs the open-ended transition term "comprising" followed by a colon to indicate that a list elements follows, and employs semicolons to separate the elements of that list. Paper 17, 5. The first element of the list, element 37a, describes an oscillator and includes the supply voltage limitation preceded by a comma and the transition term "wherein." *Id.* Element 37a then ends with a semicolon and the claim proceeds to element 37b, which recites a microcontroller. *Id.* Petitioner thus nominally acknowledges consideration of punctuation, but advances a construction that asks us to disregard punctuation affirmatively recited in the claim. To do so would be "inconsistent with the punctuation [patentee] chose for this claim." *In re Pelz*, 379 F. App'x 975, 978 (Fed. Cir. 2010).

Likewise, as to Petitioner's assertion that we read an additional limitation into the claim (Pet. Br. 10), we observe that, if the claim is limited to a particular exemplary embodiment, such a limitation results from the claim being drafted to cover only that embodiment. While we confirmed in the Decision on Institution that the use of the term supply voltage is consistent with its use in the Specification (Dec. on Inst. 9), the limitation of the claim to the oscillator is based on the language of the claim, not on definition or disavowal. Therefore, even accepting, for the sake of argument, that there is no disavowal or definition in the Specification of "supply voltage," the term refers in independent claim 37 to supply voltage of the oscillator.

As we have noted before, independent claims 61, 83, and 94, were drafted differently. These claims recite supply voltage limitations that we construed as referring to a supply voltage of the microcontroller, not to the oscillator. Paper 17, 5–6. With this in mind, Petitioner's emphasis on *Oatey* and Petitioner's discussion of other embodiments in which the claimed supply voltage is the supply voltage of other components is not persuasive. The Federal Circuit has made clear that "*Oatey* is not a panacea, requiring all claims to cover all embodiments." *PSN Ill., LLC v. Ivoclar Vivadent, Inc.*, 525 F.3d 1159, 1166 (Fed. Cir. 2008). Instead, "[i]t is often the case that different claims are directed to and cover different disclosed embodiments." *Helmsderfer v. Bobrick Washroom Equip., Inc.*, 527 F.3d 1379, 1383 (Fed. Cir. 2008); *see also Intamin Ltd. v. Magnetar Techs., Corp.*, 483 F.3d 1328, 1337 (Fed. Cir. 2007) ("A patentee may draft different claims to cover different embodiments."). Ultimately, "[t]he patentee chooses the language and accordingly the scope of his claims." *Id.* Here, while it may be the case that the Specification supports embodiments

that use "supply voltage" in a way that applies to any number of components, claim 37 need not be, and ultimately is not, drafted such that it reads on every embodiment disclosed in the Specification. As explained, the Applicant drafted and was issued *other* independent claims specific to such alternative embodiments.

In view of the above, we maintain our determination that one of ordinary skill in the art would understand the term "supply voltage" as it appears in claim 37—namely, "an oscillator providing a periodic output signal having a predefined frequency, wherein an oscillator voltage is greater than a supply voltage;"—as referring to a supply voltage of the oscillator.

C. "selectively providing"

In its decision, the Federal Circuit considered the limitation "the microcontroller selectively providing signal output frequencies to a plurality of small sized input touch terminals of a keypad, wherein the selectively providing comprises the microcontroller selectively providing a signal output frequency to each row of the plurality of small sized input touch terminals of the keypad," recited in independent claim 40. *Samsung*, 775 F. App'x at 696–97. The court pointed out that "[g]iven that the dependent claim recites sending the same frequency to all of the rows of the device, we interpret the necessarily broader independent claim 40 as also covering such a situation (even though it may also cover a situation where different frequencies are provided to different rows)." *Id.* at 697. The court therefore held that "the claims are not limited to situations in which different frequencies are provided to different rows." *Id.* We apply the Federal Circuit's interpretation here.

III. ANALYSIS

Petitioner contends claims 37–41, 43, 45, 61, 64–67, 69, 83, 85, 86, 88, 90, 91, 94, 96, 97, 99, 101, and 102 would have been obvious over the combination of Ingraham I, Caldwell, and Gerpheide. Pet. 3. Petitioner also contends that claims 47, 48, 62, 63, and 84 would have been obvious over Ingraham I, Caldwell, Gerpheide, and Wheeler. *Id.* For the reasons that follow, we are persuaded that Petitioner has shown by a preponderance of the evidence that claims 40, 41, 43, 45, 47, 48, 61–67, 69, 83–86, 88, 90, 91, 94, 96, 97, 99, 101, and 102 are unpatentable. We further determine, as discussed below, that Petitioner has not shown by a preponderance of the evidence that claims 37–39 are unpatentable.

A. Overview of Cited References

1. Ingraham I (Ex. 1007) and Ingraham II (Ex. 1008)

Ingraham I discloses a capacity response keyboard that includes switches that respond to the change in capacity from a user touching the switch. Ex. 1007 at 1:5–9. Each switch includes a touch plate assembly and a control circuit. *Id.* at 2:28–35, Figs. 2, 3. Each touch plate assembly includes a guard band that reduces interference between the switches. *Id.* at 2:46–49, Abstract. When a keyboard user touches the outer surface of the switch, the capacity-to-ground for the switch's touch plate increases. *Id.* at 3:1–6, 3:21–47. This increase is detected by the switch's touch sensing circuit, which sends an output signal to a microcomputer. *Id.*

The '183 patent Specification makes several references to Ingraham I, including describing Ingraham I as operating at relatively lower frequencies than the invention of the '183 patent. Ex. 1001, 8:11–14; *see also id.* at 3:44–50, 4:3–8, 6:6–16, 18:1–10. According to the '183 patent:

> The specific touch detection method of the present invention has similarities to the devices of U.S. Pat. No. 4,758,735 and U.S. Pat. No. 5,087,825 [Ingraham I]. However, significant improvements are offered in the means of detection and in the development of an overall system to employ the touch switches in a dense array and in an improved zero force palm button. The touch detection circuit of the present invention features operation at frequencies at or above 50 kHz and preferably at or above 800 kHz to minimize the effects of surface contamination from materials such a skin oils and water.

Id. at 5:43–53.

Ingraham I incorporates by reference certain portions of prior art patent Ingraham II, upon which Petitioner relies as meeting certain limitations of the challenged claims. Pet. 9 (citing Ex. 1007, 3:21–24 as incorporating Ingraham II's control circuit 14 ("A detailed description of control circuit 14 is provided in U.S. Pat. No. 4,731,548, issued Mar. 15, 1988 to Ronald Ingraham, the disclosure of which is hereby incorporated herein by reference.")).

2. Caldwell (Ex. 1009)

Caldwell discloses a touch pad system, including a touch sensor that detects user contact, for use in kitchens. Ex. 1009, 1:6–9, 1:42–44, 2:45–48. Caldwell's touch pad includes "an active, low impedance touch sensor attached to only one side of a dielectric substrate." *Id.* at 2:22–23. Figure 6 of Caldwell shows a matrix of touch pads comprising a touch panel. *Id.* at 5:60–61. To monitor the touch pads, Caldwell's system sequentially provides an oscillating square wave signal to a row or column of touch pads and then sequentially selects columns or rows of sense electrodes 24 to sense the signal output from the touch pad. *Id.* at 4:39–51, 6:40–63.

3. Gerpheide (Ex. 1012)

Gerpheide discloses a capacitive touch responsive system that detects the location of a touch. Ex. 1012, 1:10–14, 2:61–3:12. To reduce electrical interference regardless of its frequency, Gerpheide varies the oscillator signal frequency provided to an array of input touch terminals. *Id.* at Figs. 4, 7, 6:5–8, 6:19–26, 8:22–9:33.

4. Wheeler (Ex. 1015)

Wheeler describes a two-hand industrial machine operator control station having capacitive proximity switches. Ex. 1015, 4:40–42. According to Wheeler, safety considerations in certain environments require a machine operator to activate two switches in sequence in order to operate an industrial machine. *Id.* at 1:7–18. Wheeler replaces the palm button switches of such industrial machines with capacitive proximity switches, so that the operator must activate two capacitive proximity switches in sequence within a certain time interval to operate an industrial machine. *Id.* at 1:63–2:5, 6:10–46.

B. Motivation to Combine Gerpheide with Ingraham I and Caldwell

In its decision, the Federal Circuit determined that "Gerpheide, Ingraham, Caldwell, and the '183 patent claims are all generally directed to capacitive touch devices, even if they are to different permutations of such devices (i.e., single versus multi point touch input)." *Samsung*, 775 F. App'x at 695. The court rejected, therefore, Patent Owner's argument that Gerpheide is not analogous art based on the court's observation that the record evidence indicates the reference is directed to the same field of endeavor as the '183 patent, namely capacitive touch device design. *Id.*

The court went on to reject Patent Owner's argument that differences in the problems solved by Gerpheide, the '183 patent, and the Ingraham

I/Caldwell references, preclude a motivation to combine Gerpheide's teachings with the other references. The court relied on Samsung's evidence that the combination of Ingraham I and Caldwell would experience electrical interference, and that Gerpheide taught a way to address electrical interference in capacitive touch devices. *Id.* at 696. Although the court acknowledged that Gerpheide and Ingraham I-Caldwell involve different types of capacitive touch devices, the court determined that both can experience electrical interference and, therefore, the court found that the differences between single input and multi input capacitive touch devices do not undermine the motivation to combine the teachings of Gerpheide with Ingraham I-Caldwell. *Id.* The court thus looked to Gerpheide for its recognition of electrical interference as a problem and its disclosed solution to reduce such interference. *Id.* The court concluded, "a person of skill in the art would have been motivated to include such a feature from analogous prior art in a multi input capacitive touch pad device (i.e., the device of the Ingraham/Caldwell combination)." *Id.*

In view of the above, we find that a person of skill in the art would have been motivated to combine Gerpheide with Ingraham-Caldwell.

C. Reasonable Expectation of Success in Combining Gerpheide with Ingraham I and Caldwell

In its discussion of reasonable expectation of success, the Federal Circuit emphasized that "[i]n order to establish a reasonable expectation of success, the challenger must show 'a reasonable expectation of achieving what is claimed in the patent-at-issue.'" *Samsung*, 775 F. App'x at 696 (quoting *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2016)). The court set forth the claim construction addressed in Section II.C. above, stating that, with respect to the "selectively

providing" limitation, reasonable expectation of success only requires that different frequencies be provided to the entire pad. *Id.* at 697. Based on this construction, the court remanded the case to us to determine "whether there would have been a reasonable expectation of success in modifying the Ingraham/Caldwell combination to 'provide frequencies' to the touch pad in light of the teachings of Gerpheide (i.e., whether there was a reasonable expectation that the combination could have been modified to 'provide' a frequency, selected from multiple possible frequencies, to the entire touch pad)." *Id.*

Petitioner asserts that, applying the Federal Circuit's construction, Petitioner has adduced sufficient evidence uncontroverted in the record that a person of skill in the art would have expected reasonable success in its proposed combination of Ingraham I, Caldwell, and Gerpheide. Pet. Br. 2. Specifically, Petitioner asserts that in the combination of Ingraham I and Caldwell, a microcontroller selectively provides an oscillator frequency to touch input terminals. *Id.* Relying on its declarant, Petitioner asserts that given Gerpheide's teaching of frequency selection for interference negation, a person of skill in the art would be motivated and capable of configuring the Ingraham I-Caldwell combination such that an oscillator frequency would be selected from a plurality of frequencies and provided to the touch pad array. *Id.* (citing Ex. 1002 ¶¶ 69–72). Petitioner further notes that Dr. Subramanian testified the selection of the frequency would be performed by the microcontroller and that modification of the Ingraham I-Caldwell combination based on Gerpheide was predictable and within the capability of a skilled artisan. *Id.* (citing Ex. 1002 ¶¶ 69, 72; Ex. 1017 ¶ 14).

Petitioner further asserts that instead of rebutting its proposed incorporation of this teaching from Gerpheide, Patent Owner focused on

alleged issues in physical differences between the Ingraham I-Caldwell combination and Gerpheide. *Id.* at 4–5. Petitioner asserts that despite discussing these differences, Patent Owner never addressed Gerpheide's teaching that a microcontroller could select an oscillator frequency from among multiple frequencies. *Id.* at 5.

Patent Owner urges that we should maintain our "prior finding of no reasonable expectation of success" "[b]ecause the Federal Circuit's construction of 'selectively providing signal output frequencies' is fully consistent with how the Board applied this term in its [earlier final written decision]." PO Br. 6–7. Patent Owner continues, "under the Federal Circuit's construction of 'selectively providing,' a [person of ordinary skill in the art] would not have reasonably expected to combine the frequency selection technique of this disclosed embodiment with an Ingraham-Caldwell multi-touchpad array, 'to achieve the claimed invention.'" *Id.* at 10 (citation omitted). According to Patent Owner, "Gerpheide's interference algorithm 'would not work' in the proposed Ingraham-Caldwell multi-touchpad array." *Id.* at 10–11 (citing Ex. 2010 ¶ 117). This is because, "[u]nlike the continuous 'mesh' of electrodes in Gerpheide (Ex. 1012, Fig. 2a), which combines all X- and Y-axis electrodes into a 'single' set of 'virtual' electrodes (*id*., 6:1–62), the proposed Ingraham-Caldwell system consists of an array of *discrete* electrodes." *Id.* at 11. Patent Owner further contends that "[t]o function properly, Gerpheide specifies that its frequency-changing method must be used with a *frequency-selective* detector, tied to the drive frequency[; b]ut Caldwell and Ingraham I use *frequency-agnostic* detectors." *Id.* at 13 (citing Ex. 1012, 4:1–20).

We disagree with Patent Owner's arguments because they are not responsive to the combination of teachings at issue in the references before

us. Patent Owner focuses on particular features of Gerpheide that it alleges either "would not work . . . in the proposed Caldwell-Ingraham system" or "can only work" in the presence of a component Patent Owner argues that "neither Ingraham nor Caldwell uses." PO Br. 1–2, 12–13. These arguments are based on a mistaken premise that one or more components or physical configurations of Gerpheide must be incorporated into the combination of Ingraham I and Caldwell in order to show a reasonable likelihood of success. Under the Federal Circuit's construction of the "selectively providing" limitation, the combination of Ingraham I, Caldwell, and Gerpheide need not incorporate the specific features of Gerpheide identified by Patent Owner. Petitioner asserts, supported by evidence from Dr. Subramanian, that the Ingraham I-Caldwell combination would have been modified based on Gerpheide "to provide features that adjust[] the oscillator signal frequency provided to the input portions 13 to negate the effect of interference on the input portions 13 and touch sensing circuits." Pet. 26–27. This modification would not require any of the particular components or configurations of Gerpheide highlighted by Patent Owner. Thus, even if one or more of Patent Owner's arguments as to the infeasibility of incorporating particular aspects of Gerpheide were correct, Patent Owner's arguments do not address Gerpheide's particular teaching of adjusting oscillator signal frequency to negate the effect of interference, and therefore, Patent Owner's arguments are not responsive to the proposed combination and evidence relied upon by Petitioner.

In view of the above, we find that Petitioner has shown that the skilled artisan would have combined Gerpheide with Ingraham/Caldwell as proposed with a reasonable expectation of success in achieving the claimed subject matter.

D. Ground I: Ingraham I, Caldwell, and Gerpheide

Petitioner, relying on Dr. Subramanian, asserts that each of claims 37–41, 43, 45, 61, 64–67, 69, 83, 85, 86, 88, 90, 91, 94, 96, 97, 99, 101, and 102 would have been obvious over the combined teachings of Ingraham I, Caldwell, and Gerpheide. Pet. 15–63. For the reasons described below, Petitioner has demonstrated by a preponderance of the evidence that claims 40, 41, 43, 45, 61, 64–67, 69, 83, 85, 86, 88, 90, 91, 94, 96, 97, 99, 101, and 102 would have been obvious over Ingraham I, Caldwell, and Gerpheide, but has not demonstrated by a preponderance of the evidence that claims 37–39 would have been obvious over the same references.

1. Claims 37–39

As discussed above, we construed independent claim 37's limitation "oscillator voltage is greater than a supply voltage" in our Decision on Institution to require an oscillator voltage is greater than a supply voltage of the oscillator, and maintained this construction in our order on rehearing. *See supra* Section II.B. Based on the record before us at that stage of the proceeding, we determined Petitioner's cited evidence failed to meet the supply voltage limitation, as properly construed, because the supply voltage Petitioner identified (Ingraham I's 15 supply voltage generated by power supply 70) is the supply voltage of the microcontroller (Ingraham I's microcomputer 80), not the supply voltage of the oscillator, as required, and Petitioner does not identify a supply voltage of the oscillator. Dec. on Inst. 15–16 (citing Pet. 19; Ex. 1002 ¶ 50).

In our September 5, 2019, order pursuant to the Federal Circuit's instruction in this proceeding, we instituted review of claims 37–39 based on Petitioner's asserted ground of obviousness over Ingraham I, Caldwell, and Gerpheide. Paper 40, 3. Petitioner focuses its arguments post-institution on

whether our construction is correct. *See, e.g.*, Pet. Br. 14 ("when given its proper breadth, *Ingraham I* in combination with *Caldwell* discloses 'an oscillator voltage [that] is greater than a supply voltage' as claimed"). As discussed above, we have again considered the issue, but maintain in this Decision our construction requiring the claimed oscillator voltage to be greater than a supply voltage of the oscillator.

Petitioner's post-institution briefing does not provide new evidence or arguments showing how the asserted references meet the limitation at issue, as construed (Pet. Br. 14), nor did Petitioner seek an opportunity to submit such additional evidence. Paper 41, 3–5. Thus, for the same reasons set forth in our in Decision on Institution and our Decision denying Petitioner's Request for Rehearing, we find Petitioner has failed to demonstrate, based on the complete trial record, that the asserted oscillator voltage (Ingraham I's 15 supply voltage generated by power supply 70) is greater than a supply voltage of the oscillator, as required. Paper 12, 15–16; Paper 17, 4–7.

Accordingly, Petitioner has not demonstrated by a preponderance of the evidence that claims 37–39 would have been obvious.

2. Independent Claim 40

Petitioner's analysis, as supported by the Subramanian Declaration, demonstrates where each element of claim 40 is taught or suggested in Ingraham I, Caldwell, and Gerpheide. Pet. 39–49.

a) A capacitive responsive electronic switching circuit

Claim 40 recites, "[a] capacitive responsive electronic switching circuit comprising." For this subject matter, Petitioner relies on its discussion of "[a] capacitive responsive electronic switching circuit for a controlled device comprising," as recited in independent claim 37. Pet. 15, 39. Petitioner contends that Ingraham I discloses a keyboard made up of a

plurality of capacity responsive switches (citing Ex. 1007, 1:5–9). Patent Owner does not dispute Petitioner's contentions on this limitation. *See generally* PO Resp.

Based on the foregoing, we find Ingraham I meets this subject matter.

b) [40a] "an oscillator providing a periodic output signal having a predefined frequency"

Claim 40 further recites "an oscillator providing a periodic output signal having a predefined frequency." For this element, Petitioner refers to its analysis of element 37a and contends that Ingraham I and Caldwell teach or suggest the oscillator of element 40a. Pet. 15–18, 39. Specifically, Petitioner asserts that Ingraham I discloses a 115V AC power source. *Id.* at 15 (citing Ex. 1007, Fig. 3). Relying on its declarant, Petitioner contends that one of ordinary skill in the art would have understood that an oscillator circuit is necessary to generate the 60 Hz AC signal. *Id.* at 16 (citing Ex. 1002 ¶ 44). Furthermore, Petitioner points out that one of ordinary skill in the art would have been motivated to modify Ingraham I based on Caldwell in order to allow the system of Ingraham I to function in a portable system, noting that one of ordinary skill in the art would have recognized that in such a portable system, due to the absence of an AC power source (e.g., a 115 V AC 60 Hz source), an oscillator would be required to generate the AC signal for the touch sensing circuits and input portions 13 of the touch pad assembly 10 in Ingraham I. *Id.* at 17 (citing Ex. 1002 ¶¶ 46–47). Petitioner asserts, relying on its declarant, that another patent, US 4,758,735, discussed in the background section of Ingraham I, confirms that a skilled artisan would have been able to accomplish such a modification with predictable success. *Id.* at 17–18 (citing Ex. 1002 ¶ 48; Ex. 1010, 1:32–44).

Petitioner further asserts that Caldwell discloses an oscillator 30 that provides an oscillating signal (a periodic square wave) having a predefined frequency (e.g., 100 kHz, 200 kHz) to a matrix of touch pads. *Id.* at 16 (citing Ex. 1009, Fig. 12, 4:39–46, 6:40–52). Petitioner asserts, relying on its declarant, that it would have been obvious to one of ordinary skill in the art at the time of the alleged invention of the '183 patent to modify the system of Ingraham I, based on Caldwell, to provide an oscillator that generates a periodic signal (e.g., 115V 60 Hz AC signal) for the circuitry of the touch sensing system in Ingraham I. *Id.* at 16–17 (citing Ex. 1002 ¶¶ 45–47).

Patent Owner asserts that Petitioner admits that Ingraham I does not disclose an oscillator circuit and that Caldwell cannot cure this deficiency. PO Resp. 33. Patent Owner alleges there is no motivation to combine the references and, even if they were to be combined in the manner advanced by Petitioner, the system would be inoperable and not true to its intended purpose. PO Resp. 33. On the issue of motivation to combine, Patent Owner asserts that a person of ordinary skill in the art would not have turned to *Ingraham I*, as its "large, spaced apart touchpads" would make it an unsuitable starting point. *Id.* at 20. Patent Owner also points to differences in the approaches of *Caldwell* and *Ingraham I* as to sensitivity to touch and density of touch terminals. *Id.* at 21.

Based on the foregoing evidence cited by Petitioner, we agree with Petitioner that the cited references meet the claimed subject matter. We disagree with Patent Owner's arguments for the following reasons. First, unlike element 37a, element 40a does not recite a supply voltage limitation, and thus Petitioner's analysis of element 40a does not suffer the deficiency described above with regard to element 37a. *See supra* Section III.D.1.

Next, as to motivation to combine, Patent Owner does not explain or present evidence why the features differentiating *Ingraham I* and *Caldwell* would have prevented or dissuaded a person of ordinary skill in the art from modifying the device in Ingraham I based on the teachings of Caldwell. Indeed, the Federal Circuit recognized in its decision, "Gerpheide, Ingraham [I], Caldwell, and the '183 patent claims are all generally directed to capacitive touch devices." *Samsung*, 775 F. App'x at 695. Based on this commonality, as well as the motivation to allow the system of Ingraham I to function as a portable system, we are persuaded that Petitioner sufficiently articulates why one of ordinary skill would have been motivated to combine the teachings of Ingraham I and Caldwell.

Based on the foregoing, we find Ingraham I meets this subject matter with or without the combination with Caldwell.

> c) *[40b] "a microcontroller using the periodic output signal from the oscillator, the microcontroller selectively providing signal output frequencies to a plurality of small sized input touch terminals of a keypad wherein the selectively providing comprises the microcontroller selectively providing a signal output frequency to each row of the plurality of small sized input touch terminals of the keypad"*

Claim 40 further recites "a microcontroller using the periodic output signal from the oscillator, the microcontroller selectively providing signal output frequencies to a plurality of small sized input touch terminals of a keypad wherein the selectively providing comprises the microcontroller selectively providing a signal output frequency to each row of the plurality of small sized input touch terminals of the keypad." For this element, Petitioner refers to its analysis of element 37b and contends that Ingraham I's microcomputer 80 meets the claimed microcontroller and input

portions 13 meet the claimed "small sized input touch terminals of a keypad." Pet. 39 (citing *id.* at 19–20).

Relying on Dr. Subramanian's testimony, Petitioner contends that it would have been apparent to one of ordinary skill to modify the microcomputer and input portions of Ingraham I given the teachings of Caldwell such that "rows of input portions 13 would be selected sequentially and the oscillator signal provided to the selected row." *Id.* at 24 (citing Ex. 1002 ¶ 64; Ex. 1009, 6:40–63). According to Petitioner, a system so modified would selectively provide the oscillator signal frequency to the input touch terminals of a keypad, thereby meeting the claim language requiring "selectively providing a signal output frequency to each row of the plurality of small sized input touch terminals of the keypad." *Id.* at 26, 39. The same oscillator signal would be sequentially provided to each row of Ingraham I's input portions 13 until all rows are scanned. *Id.* at 55 (citing Ex. 1009, 6:40–63, 8:20–23; Ex. 1002 ¶ 132).

Petitioner further asserts that Gerpheide teaches varying the oscillator signal frequency provided to an electrode array in order to account for electrical interference. *Id.* at 28 (citing Ex. 1012, 6:5–8, 6:19–26, 8:22–9:33, Figs. 4, 7; Ex. 1006, 329–30, 333–34). Again relying on Dr. Subramanian, Petitioner alleges, "one of ordinary skill in the art would have been motivated to incorporate interference negating functionality similar to that described by *Gerpheide* in the above discussed *Ingraham I-Caldwell* system." *Id.* at 28 (citing Ex. 1002 ¶ 72). Thus, Petitioner contends the system of Ingraham I-Caldwell-Gerpheide selectively provides signal output frequencies, as opposed to only a single frequency. *Id.* at 29, 40.

Patent Owner argues that the cited references fail to teach or suggest the "selectively providing signal output frequencies" limitation of

element 40b, because "Caldwell does not and cannot ***selectively*** activate rows with a signal output from the oscillator, as in the '183 patent." PO Resp. 34–35. Instead, according to Patent Owner, Caldwell sequentially detects touch by sending a signal to a single strobe line and a signal to a single sense line to address a pad and to detect whether the electrostatic field has been interrupted on that pad. *Id.* at 35. Patent Owner further asserts that Gerpheide's signal output frequencies are sent to every row of the electrode array via one of the inverter and noninverting buffer, and therefore Gerpheide may have varying frequencies, but it can only send one frequency to the entire touch pad. *Id.* at 37. Patent Owner asserts that Gerpheide therefore does not teach that a microcontroller selects from a variety of frequencies and then provides the selected frequency selectively to each row of input touch terminal(s). *Id.* Patent Owner compares this to the '183 patent, asserting that "[b]y contrast, the '183 patent allows for a different frequency to be sent selectively to each row, which allows for enhanced differentiation between neighboring touch pads." *Id.* at 38 (citing Ex. 1001, 10:60–11:27).

Petitioner, in its Reply, reiterates the particular extent of its application of Gerpheide, asserting that a person of ordinary skill in the art would have looked to Gerpheide for interference negation features that can be applied to capacitive touch responsive systems such as those disclosed in Ingraham I and Caldwell. Reply 15. The Federal Circuit confirmed this in the appeal. *Samsung*, 775 F. App'x at 696; *see supra* Section III.B. The court recognized that Petitioner "presented uncontested evidence that the combination of Ingraham and Caldwell would experience electrical interference, and Gerpheide taught a way to address electrical interference in capacitive touch devices." *Samsung*, 775 F. App'x at 696.

Petitioner further asserts that to the extent Patent Owner argues that each row of the touch pad must receive a different frequency during a single scan operation, such a limitation is not recited in claim 40(b) and Patent Owner did pursue a construction requiring such features. Reply 15. The Federal Circuit confirmed this point on appeal, holding that "the claims are not limited to situations in which different frequencies are provided to different rows." *Samsung*, 775 F. App'x at 697; s*ee supra* Section II.C.

Neither party addresses this claim limitation in its post-remand briefing. *See generally* Pet. Br., PO Br., PO Remand Resp., Pet. Remand Resp. Based on the foregoing, we find that the combination of Ingraham I, Caldwell, and Gerpheide meets this subject matter.

d) [40c] "the plurality of small sized input touch terminals defining adjacent areas on a dielectric substrate for an operator to provide inputs by proximity and touch"

Claim 40 further recites "the plurality of small sized input touch terminals defining adjacent areas on a dielectric substrate for an operator to provide inputs by proximity and touch." For this element, Petitioner refers to its analysis of element 37c and contends that Ingraham I's input portions 13 meet the input touch terminals of element 40c because each input portion 13 defines an area of dielectric member 26 where the user can provide an input by proximity and touch. Pet. 30 (citing Ex. 1007 at 2:64–67, 3:1–6, 3:30–36), 41.

Patent Owner asserts that Ingraham I merely discloses a keypad having only 16 input touch points and, even supposing Ingraham I discloses any touch terminals, they are not small or in a close array because they require the use of guard rings in order to function properly. PO Resp. 39 (citing Ex. 2010 ¶¶ 138–144). Patent Owner argues that Petitioner therefore

provides no analysis or reasoning as to how a person of ordinary skill in the art might consider Ingraham I's touch terminals to be in a "closely spaced array." *Id.* (citing Pet. 20–21; Ex. 1002 ¶ 55). Patent Owner then points to the multi touch pad embodiment of Figure 11 of the '183 patent for comparison. *Id.* at 40. According to Patent Owner, this embodiment teaches using any number of input touch terminals without specifying a fixed or permanent location for the touch terminals to be placed, and that the '183 patent achieves compactness without the need for any structure to isolate the touch terminals such as guard rings because it employs, among other things, a high frequency. *Id.* (citing Ex. 1001, Fig. 11; 18:34–43).

We are not persuaded by Patent Owner's arguments as to the alleged lack of "small sized input touch terminals." In its Reply, Petitioner correctly looks to the requirements of the claims themselves, and asserts that input touch terminals having guard bands can still meet the claimed limitation of "closely spaced array of input touch terminals of a keyboard." Reply 18. Further, Petitioner persuasively asserts that nothing in the claims excludes touch terminals having guard bands or rings nor does the '183 patent Specification provide a definition of a "closely spaced array" that excludes terminals with guard rings. *Id.* Petitioner further asserts that, as noted in the Petition, the '183 patent confirms that touch terminals that are the size of a user's finger are "small sized." *Id.* at 19 (citing Pet. 21; Ex. 1001, 6:1–3).

Neither party addresses this claim limitation in its post-remand briefing. *See generally* Pet. Br., PO Br., PO Remand Resp., Pet. Remand Resp. Based on the foregoing, we find that Ingraham I meets this subject matter.

e) *[40d] "a detector circuit coupled to said oscillator for receiving said periodic output signal from said oscillator, and*

> *coupled to said input touch terminals, said detector circuit being responsive to signals from said oscillator via said microcontroller and a presence of an operator's body capacitance to ground coupled to said touch terminals when proximal or touched by the operator to provide a control output signal"*

Claim 40 further recites "a detector circuit coupled to said oscillator for receiving said periodic output signal from said oscillator, and coupled to said input touch terminals, said detector circuit being responsive to signals from said oscillator via said microcontroller and a presence of an operator's body capacitance to ground coupled to said touch terminals when proximal or touched by the operator to provide a control output signal." For this element, Petitioner refers to its analysis of element 37d and contends that each of Ingraham I's touch sensing circuits within input portions 13—as modified in light of Caldwell to the oscillator signal via the microcontroller—meets this limitation. Pet. 31–36, 41–42. Petitioner contends that Ingraham I discloses that each of the input portions 13 is coupled to a touch sensing circuit that detects whether that input portion has been touched by a user based on a change in capacitance. Pet. 32–33. Relying on its declarant, Petitioner asserts that when a user touches one of Ingraham I's input portions 13, the capacitance is increased substantially, and that there is also a change in capacitance to ground when the user's finger is proximal to (but not touching) the user-facing surface of input portion 13. Pet. 31–33 (citing Ex. 1007, 3:1–6, Fig. 3; Ex. 1002 ¶¶ 76, 80).

Patent Owner asserts that Ingraham I's detector circuit is substantially different than the detector circuit of the '183 patent and would be inoperable in combination with Caldwell. PO Resp. 42. Relying on its declarant, Patent Owner further asserts that Ingraham I cannot discriminate between

intentional and unintentional touches or generate the claimed "control output signal" only "when the operator is proximal or touches said second touch terminal after the operator is proximal or touches said first touch terminal." *Id.* at 43. More specifically, Patent Owner asserts that the incorporated disclosure of Ingraham II discloses a touch circuit that includes a voltage divider that merely provides a low level signal when the touch plate is not touched and a high level signal when the touch plate is touched. *Id.* (citing Ex. 1008, 3:2–8). Patent Owner further asserts that "Ingraham I is not able to detect when an operator is proximal and, at the same time, have the touch pads be small-sized or closely spaced." *Id.* at 43 (citing Ex. 2010 ¶¶ 147–148). Patent Owner asserts that Caldwell cannot cure this alleged deficiency of Ingraham I, alleging that Caldwell requires that a user physically touch the substrate and cannot detect proximal touch. *Id.* at 43–44 (citing Ex. 1009 at 3:34–36).

Finally, Patent Owner asserts that when the '183 patent was in original prosecution, certain of the earlier claims were rejected based on prior art, including Ingraham I, that showed an oscillator, input touch terminal, a detector circuit, and microcontroller where the detector circuit was responsive to an increase in capacitance when a user touched the input touch terminal. *Id.* at 44 (citing Ex. 1004 at 211–214). Petitioner asserts that the Applicant overcame the claim rejections and points out that the Applicant explained that the prior art failed to disclose any way of discriminating between a partial touch and a full touch of the touch terminal and amended the claims accordingly. *Id.* at 44–45 (citing Ex. 1004 at 189–191; Ex. 2010 ¶ 150).

We are unpersuaded by Patent Owner's argument that Ingraham I cannot be combined with Caldwell. In its Reply, Petitioner reiterates that it

has set forth in its petition how Ingraham I may be modified by Caldwell and what would motivate a person of ordinary skill in the art to do so. Reply 4. For example, relying on its declarant, Petitioner asserts that one of ordinary skill in the art would have been motivated to modify Ingraham I based on Caldwell in order to allow the system of Ingraham I to function in a portable system. Pet. 17 (citing Ex. 1002 ¶ 47). Petitioner further asserts that one of ordinary skill in the art would have recognized that in a portable system, due to the absence of an AC power source (e.g., a 115 VAC 60 Hz source), an oscillator would be required to generate the AC signal for the touch sensing circuits and input portions 13 of the touch pad assembly 10 in Ingraham I. *Id.* Petitioner correctly points out that it has explained that a person of ordinary skill in the art would have been motivated to modify Ingraham I based on Caldwell in order to provide an oscillator to generate a periodic signal to allow the system of Ingraham I to function in a portable system. Reply 4.

We are further unpersuaded by Patent Owner's argument that Ingraham I cannot discriminate between intentional and unintentional touches or generate the claimed "control output signal" only "when the operator is proximal or touches said second touch terminal after the operator is proximal or touches said first touch terminal." In its Reply, Petitioner correctly asserts that we have already found that Ingraham I can discriminate between intentional and unintentional touches based on the use of a threshold voltage value. *Id.* at 19. Even accepting for the sake of argument Patent Owner's assertion that Ingraham II discloses a touch circuit includes a voltage divider that merely provides a low level signal when the touch plate is not touched and a high level signal when the touch plate is touched, as Patent Owner asserts, such a disclosure does not require a configuration in

which "the signal indicative of touch is always either on or off." PO Resp. 43 (citing Ex. 1008 at 3:2–8). The cited disclosure of Ingraham II may teach such an "always either on or off" configuration, but Patent Owner provides no evidence that a person of skill in the art would understand that such a configuration must be employed in the combination proposed by Petitioner.

Patent Owner's argument that Ingraham I is not able to detect when an operator is proximal and, at the same time, have the touch pads be small-sized or closely spaced is similarly misplaced. Even taking into account the alleged technical constraints of Ingraham I, Patent Owner provides no evidence that a person of skill in the art would understand that such a configuration must be employed in the combination proposed by Petitioner. Further, as Petitioner persuasively asserts, Patent Owner's argument that Caldwell does not disclose a means to discriminate between intentional and unintentional touches is unavailing, as Petitioner relies on Ingraham I for this subject matter. *Id.* at 21. Finally, that the Applicant overcame rejections based on a different combination of references than the combination at issue here, even if that combination included Ingraham I, does not undermine Petitioner's proposed combination and evidence in support—including substantial evidence that was not before the examiner during prosecution.

Neither party addressed this claim limitation in its post-remand briefing. *See generally* Pet. Br., PO Br., PO Remand Resp., Pet. Remand Resp. Based on the foregoing, we find that the combination of Ingraham I, Caldwell and Gerpheide meets this subject matter.

f) [40e] "wherein said predefined frequency of said oscillator and said signal output frequencies are selected to decrease a

> *first impedance of said dielectric substrate relative to a second impedance of any contaminate that may create an electrical path on said dielectric substrate between said adjacent areas defined by the plurality of small sized input touch terminals, and wherein said detector circuit compares a sensed body capacitance change to ground proximate an input touch terminal to a threshold level to prevent inadvertent generation of the control output signal"*

Claim 40 further recites "wherein said predefined frequency of said oscillator and said signal output frequencies are selected to decrease a first impedance of said dielectric substrate relative to a second impedance of any contaminate that may create an electrical path on said dielectric substrate between said adjacent areas defined by the plurality of small sized input touch terminals, and wherein said detector circuit compares a sensed body capacitance change to ground proximate an input touch terminal to a threshold level to prevent inadvertent generation of the control output signal." Petitioner contends the following limitations of element 40e constitute statements of intended use and, therefore, "should not be given any patentable weight given that claim 40 is an apparatus claim": "to decrease a first impedance of said dielectric substrate relative to a second impedance of any contaminate that may create an electrical path on said dielectric substrate between said adjacent areas defined by the plurality of small sized input touch terminals" and "to prevent inadvertent generation of the control output signal." *Id.* at 43, 48. Nevertheless, Petitioner asserts that the microcontroller of a combined Ingraham I-Caldwell-Gerpheide system selectively varies the oscillator signal frequency provided to the input portions 13. *Id.* at 42–43. Relying on Dr. Subramanian's testimony, Petitioner further contends that:

> [O]ne of ordinary skill in the art would have been motivated to configure the oscillator of the combined *Ingraham I-Caldwell-Gerpheide* system to provide a frequency between 100 kHz and 200 kHz, or a frequency greater than 200 kHz because such a high frequency range would have provided a low impedance touch sensor.

Id. at 43–44 (citing Ex. 1002 ¶¶ 96–97; Ex. 1009, 4:39–50, 6:41–43). Thus, according to Petitioner, it would have been obvious to one of ordinary skill to optimize and select an oscillator frequency to "decrease a first impedance of said dielectric substrate relative to a second impedance of any contaminate that may create an electrical path." *Id.* at 44–47. Again relying on Dr. Subramanian's testimony, Petitioner also contends that Ingraham I teaches or suggests the claimed "detector circuit compares a sensed body capacitance change to ground proximate an input touch terminal to a threshold level" because "when a user touches or is proximal to the input portion 13, the user's body capacitance to ground 42 decreases the voltage level on base 52 of transistor 50, which translates into an increase in the voltage difference between the emitter and base (V_{EB})." *Id.* at 47 (citing Ex. 1007, 3:34–39; Ex. 1002 ¶ 100). Thus, according to Petitioner and Dr. Subramanian:

> [O]ne of ordinary skill in the art would have found it obvious to configure the circuitry used in the combined *Ingraham I-Caldwell-Gerpheide* system as discussed above to take into account inadvertent touch detections, including any caused by contaminates, position of a user's finger, etc., by using threshold values that refine the sensitivity of the touch detections for particular applications and environments.

Id. at 48–49 (citing Ex. 1002 ¶ 101).

Patent Owner contends that none of the prior art discusses the design tradeoff regarding the high frequencies to be employed to counteract the

effect of surface contaminants. PO Resp. 46. For example, Patent Owner argues that Ingraham I teaches an elementary 150 V, 60 kHz circuit designed for an appliance such as a lamp that can turn on or off by touch and does not discuss additional problems caused by contaminants. *Id.* Patent Owner further contends that Caldwell also does not discuss the problem of surface contamination and the detector circuit of Caldwell is designed to work in the opposite manner compared to what is claimed in element 40(e) because the voltage in Caldwell increases when a user contacts a touch pad instead of decreasing upon contact. *Id.* at 46–47. Patent Owner also contends that the frequencies used in Gerpheide are only in the range of 61 to 80 kHz (Ex. 1012, 8:31–36), unlike those disclosed in the '183 patent, which are preferably at or above 800 kHz. *Id.* at 47 (citing Ex. 1001, 5:49–53). Patent Owner argues that Gerpheide does not address sensitivity to contaminants, but instead that Gerpheide expressly discloses that any frequency modification is only targeted at electrical interference. *Id.*

Patent Owner argues that claim element 40(e) requires the comparing of a sensed body capacitance change proximate an input touch terminal to a threshold level, and does not require that the input touch terminal be fully or properly touched. *Id.* at 47–48. Patent Owner further argues that there is no teaching in Ingraham I that sets the detection threshold voltage of a touch pad responding to proximate touch by a user. *Id.* at 48. Patent Owner further points out once again that Applicant made certain statements during prosecution. *Id*. Finally, Patent Owner asserts that the Board previously agreed that the terms Petitioner alleges are statements of intended use are, according to Patent Owner, entitled to patentable weight. *Id.* at 48–49.

We are not persuaded by Patent Owner's arguments. As to Patent Owner's argument that the prior art does not discuss the design tradeoff

regarding the high frequencies employed to counteract the effect of surface contaminants, Petitioner persuasively asserts that Patent Owner's arguments attack the Petition's references individually rather than address the combination proposed. Reply 21–22. As outlined above, the Petition presents the proposed combination of references in a way that addresses both frequency and its relation to surface contaminants. Furthermore, Patent Owner's arguments related to application of particular frequencies appear to import limitations into the claims restricting the claims to particular frequencies or ranges of frequencies. PO Resp. 45–47. The Federal Circuit "has repeatedly cautioned against limiting the claimed invention to preferred embodiments or specific examples in the specification." *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1346−47 (Fed. Cir. 2015). The claims themselves do not recite these limitations, and we do not import them into the requirements of the claims. "[I]t is the *claims*, not the written description, which define the scope of the patent right." *Id*. at 1346 (emphasis in the original).

Petitioner also asserts that Patent Owner's contention that Ingraham I does not disclose the claimed comparing of a sensed body capacitance change proximate an input touch terminal to a threshold level is incorrect and that Ingraham I's threshold value is not set to respond to proximate touch is also incorrect. Reply 22–23. Specifically, relying on its declarant, Petitioner asserts that when a user touches or is proximal to the input portion 13 in Ingraham I, the user's body capacitance to ground 42 decreases the voltage level on base 52 of transistor 50, which translates into an increase in the voltage difference between the emitter and base. Reply 22 (citing Pet. 47–49; Ex. 1007 at 3:34–39; Ex. 1002 ¶ 100). Petitioner asserts that this change in voltage is compared to a threshold value. Reply 22–23 (citing

Pet. 47–49; Ex. 1007, 3:34–39; Ex. 1002 ¶ 100). As above, that the Applicant overcame rejections based on a different combination of references than the combination at issue here, even if that combination included Ingraham I, does not undermine Petitioner's proposed combination and evidence in support—including substantial evidence that was not before the examiner during prosecution.

Based on the foregoing, we find that the combination of Ingraham I, Caldwell and Gerpheide meets this subject matter. We need not determine whether to give patentable weight to any limitation Petitioner has alleged as statements of intended use, as Petitioner has accounted for each of these limitations in its combination of Ingraham I, Caldwell, and Gerpheide.

In view of the above, we determine Petitioner has shown by a preponderance of the evidence that Ingraham I, Caldwell, and Gerpheide render obvious claim 40 of the '183 patent.

3. Independent Claims 61, 83, and 94

Petitioner asserts independent claims 61, 83, and 94 are obvious over Ingraham I, Caldwell, and Gerpheide. Pet. 49–54. Petitioner sets forth its analysis of each claim element by referring to arguments made in the context of corresponding elements of either claims 37 or 40. *Id.* Petitioner's analysis, as supported by the Subramanian Declaration, demonstrates where Petitioner contends each element of independent claims 61, 83, and 94 is taught or suggested by Ingraham I, Caldwell, and Gerpheide. *Id.* (citing Ex. 1002 ¶¶ 102–27). Similarly, Patent Owner sets forth its analysis of each claim element by referring to arguments made in the context of corresponding elements of claim 40, without additional analysis specific to claims 61, 83, or 94 beyond identification of how the elements of each of

claims 61, 83, and 94 map to arguments addressing claim 40. PO Resp. 49–51.

As discussed above, we have reviewed the information provided by Petitioner in the context of claims 37 and 40, including the relevant portions of the supporting Subramanian Declaration. For purposes of our analysis, we determine that claims 61, 83, and 94 recite elements sufficiently similar to elements of claims 37 and 40 "(aside from the supply voltage limitations discussed in the following paragraph)," such that we agree with the parties that these claims do not present issues in dispute beyond those discussed above already for claims 37 and 40. Accordingly, we adopt our analysis above on claims 37 and 40.

Consistent with our discussion above, however, we observe that the supply voltage limitations of claims 61, 83, and 94 refer to the supply voltage of the claimed microcontroller, not the claimed oscillator, as in claim 37. *See supra* Section II.B. Accordingly, we agree with Petitioner that Ingraham I's power supply 70 generates a 15V supply voltage for microcomputer 80 (the claimed "microcontroller"), which meets the supply voltage limitation of claims 61, 83, and 94. *See* Pet. 19; Ex. 1002 ¶ 50.

Thus, we determine Petitioner has shown by a preponderance of the evidence that Ingraham I, Caldwell, and Gerpheide render obvious claims 61, 83, and 94 of the '183 patent.

4. Dependent Claims 41, 43, 45, 64–67, 69, 85, 86, 88, 90, 91, 96, 97, 99, 101, and 102

a) Claims 41, 67, 86, and 97

Claims 41, 67, 86, and 97 depend from independent claims 40, 61, 83, and 94, respectively. Claims 41 and 67 both further recite: "each signal output frequency selectively provided to each row of the plurality of small

sized input touch terminals of the keypad is selected from a plurality of Hertz values." Similarly, claim 86 further recites "each signal output frequency is selected from a plurality of Hertz values," and claim 97 further recites "each signal output frequency selectively provided to each row of the closely spaced array of input touch terminals of the keypad is selected from a plurality of Hertz values."

Petitioner contends that the combined Ingraham I-Caldwell-Gerpheide system would include functionality for the oscillator frequency to be selected from a plurality of frequency values depending on the interference measured by the microcontroller. Pet. 54. Relying on its declarant, Petitioner asserts that therefore the combined Ingraham I-Caldwell-Gerpheide system discloses this subject matter. *Id.* (citing Ex. 1002 ¶¶ 128–30).

Patent Owner argues that claims 40, 61, and 83, from which the dependent claims at issue here depend, specify that the microcontroller uses the periodic output signal from the oscillator to provide signal output frequencies. PO Resp. 52. According to Patent Owner, when outputting multiple output frequencies, the microcontroller uses the oscillator voltage as a reference to output frequencies that are different from the oscillator. *Id.* Patent Owner further argues, relying on its declarant, that while Dr. Subramanian proposes a combined Ingraham I-Caldwell system that has a microcontroller that comprises a demultiplexer, a multiplexer, and a microprocessor, the only portion of this microcontroller that the oscillator signal passes through is the demultiplexer, which is incapable of modifying the oscillator frequency to generate multiple output frequencies. *Id.* at 52 (citing Ex. 1002 ¶ 64). According to Patent Owner, a demultiplexer may

route signals from its input, but cannot generate output signals with multiple frequencies. *Id.* (citing Ex. 2010 ¶¶ 169–170).

Patent Owner asserts that Caldwell uses only a single frequency and that therefore Petitioner appears to rely on Gerpheide for the proposition that it teaches providing more than one frequency to the touch pads. *Id.* at 53 (citing Ex. 1002 ¶ 69). Patent Owner further asserts that Gerpheide uses the same single frequency across the entire touchpad, and further that Gerpheide sends the same frequency to the entire touchpad 32 times in succession prior to any possible change in frequency. *Id.* at 53 (citing Ex. 1012, 9:18–23). Patent Owner argues that in the '183 patent, frequencies may be changed each time they are sent. *Id.* Furthermore, Patent Owner asserts that Gerpheide does not teach supplying output signals to the touch pads with each row having a different frequency, as alleged by Patent Owner to be claimed in the dependent claims at issue here. *Id.* at 54.

Patent Owner's arguments are unpersuasive. Petitioner persuasively asserts that, as explained by Dr. Subramanian, the microcontroller (not the demultiplexer) would vary the oscillator signal frequency in the combined *Ingraham I-Caldwell-Gerpheide* system depending on the sensed interference. Reply 23–24 (citing Pet. 27–29; Ex. 1002 ¶ 69). Further, Petitioner correctly asserts that there is no requirement in the claims that the frequency provided to "each row" be different, because the claims only require that the signal output frequency be "selected from a plurality of Hertz values." Reply 24.

In view of the above, we determine Petitioner has shown by a preponderance of the evidence that Ingraham I, Caldwell, and Gerpheide render obvious claims 41, 67, 86, and 97 of the '183 patent.

b) Claims 43, 69, 88, and 99

Claim 43 depends from dependent claim 41 and indirectly depends from independent claim 40. Claim 69 depends from dependent claim 67 and indirectly depends from independent claim 61. Claim 88 depends from dependent claim 86 and indirectly depends from independent claim 83. Claim 99 depends from dependent claim 97 and indirectly depends from independent claim 94. Each of claims 43, 69, 88, and 99 further recites: "the plurality of Hertz values comprises Hertz values greater than 100 kHz." Petitioner and Dr. Subramanian assert, and we agree, that one of ordinary skill in the art would have found through routine experimentation that frequencies above 100 kHz result in a certain desired impedance, and therefore would have selected the oscillator frequency from frequencies greater than 100 kHz. Pet. 54–551 (citing Ex. 1002 ¶ 131). Petitioner further asserts that Caldwell discloses that one of ordinary skill in the art would have had to select from a frequency greater than 200 kHz, or a frequency between 100 kHz–200 kHz depending on the detection circuitry used. Pet. 55 (citing Ex. 1009, 4:39–46).

Patent Owner argues that to the extent the Board considers Ingraham I's power supply to constitute the claimed oscillator as advanced by Petitioner at pages 17–19 of the Petition, the prior art combination does not render these claims obvious because Ingraham I's power supply is only 60 Hz. PO Resp. 54.

Petitioner persuasively responds that, rather than relying strictly on Ingraham I's power supply, the Petition relies on the combined Ingraham I-Caldwell-Gerpheide system for this feature. Reply 24–25 (citing Pet. 54–55 (asserting that routine experimentation would indicate that frequencies above 100 kHz result in a certain desired impedance for touch portions, and

that Caldwell discloses that one of ordinary skill in the art would have had to select from a frequency greater than 200 kHz, or a frequency between 100 kHz–200 kHz depending on the detection circuitry used)).

In view of the above, we determine Petitioner has shown by a preponderance of the evidence that Ingraham I, Caldwell, and Gerpheide render obvious claims 43, 69, 88, and 99 of the '183 patent.

c) Claims 45, 66, and 96

Claims 45, 66, and 96 depend from independent claims 40, 61, and 94, respectively. Claims 45 and 66 both further recite: "each signal output frequency selectively provided to each row of the plurality of small sized input touch terminals of the keypad has a same Hertz value." Similarly, claim 96 further recites: "each signal output frequency selectively provided to each row of the closely spaced array of input touch terminals of the keypad has a same Hertz value."

Petitioner and Dr. Subramanian assert, and we agree, that in the Ingraham I-Caldwell-Gerpheide system, the same oscillator signal is sequentially provided to each row of the input portions 13 until all input portions 13 have been scanned. Pet. 55 (citing Ex. 1002 ¶ 132; Ex. 1009, 6:40–63, 8:20–23). According to Petitioner, the frequency provided to each row has the same Hertz value. *Id.* (citing Ex. 1002 ¶¶ 132–33.)

Patent Owner does not set forth arguments for these claims beyond those discussed above in the context of the independent claims from which they depend. *See generally* PO Resp. In view of the above, we determine Petitioner has shown by a preponderance of the evidence that Ingraham I, Caldwell, and Gerpheide render obvious claims 45, 66, and 96 of the '183 patent.

d) Claims 64, 90, and 101

Claims 64, 90, and 101 depend directly from independent claims 61, 83, and 94, respectively. Each of claims 64, 90, and 101 further recites: "the supply voltage is a battery supply voltage."

Petitioner asserts that Ingraham I discloses through the incorporated disclosure of Ingraham II a power supply 70 that generates a 15V supply voltage for microcomputer 80. Pet. 55. Petitioner notes that the power supply 70 is a voltage regulator circuit that generates a DC voltage of 15V from a 115V AC signal. *Id.* at 55–56 (citing Ex. 1007 at Fig. 3; Ex. 1008 at 3:29–34, Fig. 1). Petitioner asserts that Ingraham I, through incorporated subject matter, provides for modification that would have been desirable in order to adapt the touch circuit configuration of the combined Ingraham I-Caldwell-Gerpheide system for a portable system where a DC battery provides the power supply for the entire circuit configuration. *Id.* at 56. Relying on its declarant, Petitioner asserts that in such a portable system, it would have been a common sense implementation to eliminate extra circuit components by providing the microcomputer 80 supply voltage from the DC battery instead of converting the DC battery voltage into an AC signal, and then reconverting the AC signal to a DC voltage via a voltage regulator circuit. *Id.* (citing Ex. 1002 ¶ 134.)

Patent Owner does not set forth arguments for these claims beyond those discussed above in the context of the independent claims from which they depend. *See generally* PO Resp. In view of the above, we determine Petitioner has shown by a preponderance of the evidence that Ingraham I, Caldwell, and Gerpheide render obvious claims 64, 90, and 101 of the '183 patent.

e) Claims 65, 91, and 102

Claims 65, 91, and 102 depend directly from independent claims 61, 83, and 94, respectively. Each of claims 65, 91, and 102 further recites: "the supply voltage is a voltage regulator supply voltage."

Petitioner asserts that Ingraham II clarifies that power supply 70 has "a voltage regulator circuit including a 15V zener diode coupled in parallel with a resistor 74 and capacitor 76." Pet. 56–57 (citing Ex. 1008 at 3:29–34). Relying on its declarant, Petitioner asserts that the supply voltage of 15V output by power supply 70 disclosed by Ingraham I is therefore "a voltage regulator supply voltage." Pet. 57 (citing Ex. 1002 ¶ 135).

Patent Owner does not set forth arguments for these claims beyond those discussed above in the context of the independent claims from which they depend. *See generally* PO Resp. In view of the above, we determine Petitioner has shown by a preponderance of the evidence that Ingraham I, Caldwell, and Gerpheide render obvious claims 65, 91, and 102 of the '183 patent.

f) Claim 85

Claim 85 depends directly from independent claims 83, and further recites: "the signal output frequencies have a same Hertz value."

Petitioner asserts that the microcontroller "selectively" provides the received oscillator signal frequency to each row of the input portions 13 in the combined Ingraham I-Caldwell-Gerpheide system. Pet. 57. Therefore, relying on its declarant, Petitioner asserts that the signal output frequency provided to each row has the same Hertz value and the "the signal output frequencies have a same Hertz value." *Id.* (citing Ex. 1002 ¶ 136).

Patent Owner does not set forth arguments for claim 85 beyond those discussed above in the context of independent claim 85 from which it

depends. *See generally* PO Resp. In view of the above, we determine Petitioner has shown by a preponderance of the evidence that Ingraham I, Caldwell, and Gerpheide render obvious claim 85 of the '183 patent.

E. Ground 2: Ingraham I, Caldwell, Gerpheide, and Wheeler

Petitioner, relying on Dr. Subramanian, asserts each of claims 47, 48, 62, 63, and 84 would have been obvious over the combined teachings of Ingraham I, Caldwell, Gerpheide, and Wheeler. Pet. 57–60. For the reasons described below, Petitioner has demonstrated by a preponderance of the evidence that claims 47, 48, 62, 63, and 84 would have been obvious over Ingraham I, Caldwell, Gerpheide, and Wheeler.

1. Motivation to Combine Wheeler with Ingraham, Caldwell, and Gerpheide

Relying on Dr. Subramanian, Petitioner asserts that one of skill in the art would have been motivated to modify the combined system of Ingraham, Caldwell, and Gerpheide to require actuation of two switches in a sequence to actuate a controlled device, such as a machine disclosed in Wheeler, to address safety concerns and/or application requirements. Pet. 58–59 (citing Ex. 1002 ¶¶ 141–142). Petitioner asserts that

> [g]iven that *Caldwell, Gerpheide, and Ingraham I* relate to capacitive touch responsive switches in touch systems that provide control output signals . . . and *Wheeler* discloses similar types of capacitive touch responsive switches for also providing control signals, one of ordinary skill in the art would have been motivated to look to *Wheeler* to compliment the functionality of the combined system for providing a touch system in different environments, such as those disclosed by *Wheeler*.

Pet 58 (citing Ex. 1002 ¶ 140).

Relying on Dr. Cairns, Patent Owner asserts that "[a] person of skill in the art would not look to *Wheeler* in the context of designing closely spaced

touch terminals," given Wheeler's "extremely large separation" and lack of likelihood of crosstalk or interference. PO Resp. 54–56 (citing Ex. 2010 ¶¶ 174–177). Further Patent Owner asserts that "Wheeler is in a widely different field of industrial machines with concerns about occupational hazards and worker safety, and there is no reason or teaching that Petitioner can point to that is in any way indicative of any level of success in realizing the inventions of the '183 patent, which involve closely spaced arrays of terminals on a keypad, through this combined system." PO Resp. 56 (citing Ex. 2010 ¶ 178).

Patent Owner's arguments are unpersuasive. First, Patent Owner's reference to extremely large separation and lack of likelihood of crosstalk or interference is inapposite. Petitioner looks to Wheeler for its principle of actuation of two switches in a sequence to actuate a controlled device (Pet. 58–59), which does not require the large separation referenced by Patent Owner. In its Reply, Petitioner correctly asserts that the Petition's analysis does not require a bodily incorporation of Wheeler's device. Reply 26. Further, on appeal, the Federal Circuit's found that Gerpheide is analogous art to Ingraham I and Caldwell, because all three were directed to the same field of endeavor: capacitive touch device design. *Samsung*, 775 F. App'x at 695. Petitioner's recognition that Wheeler discloses capacitive touch responsive switches of similar type to those of Caldwell, Gerpheide, and Ingraham I, and thus is also analogous art, is consistent with the court's reasoning. Likewise, as to expectation of success, Patent Owner's arguments relate to features not relied upon by Petitioner, which need not be bodily incorporated to achieve the combination proposed by Petitioner.

Accordingly, based on the complete trial record and for the foregoing reasons, we determine one of ordinary skill in the art would have been

motivated to combine the teachings of Ingraham I, Caldwell, Gerpheide, and Wheeler, as Petitioner proposes, with a reasonable expectation of success.

2. Claims 47 and 62

Claims 47 and 62 depend directly from independent claims 40 and 61, respectively. Claims 47 and 62 both further recite: "wherein the sensed body capacitance change to ground proximate the input touch terminal is caused by the operator's body capacitance decreasing an input touch terminal signal on the detector circuit, and wherein the sensed body capacitance change to ground is compared to a second threshold level to generate the control output signal."

Petitioner acknowledges that Ingraham I does not explicitly disclose comparing the change in V_{EB} ("sensed body capacitance change to ground") to a second threshold value to generate the control output signal, but asserts that Wheeler discloses a system where the operator must activate two capacitive proximity switches in sequence within a certain time interval to activate an industrial machine. Pet. 57–58 (citing Ex. 1002 ¶ 139; Ex. 1015, 6:10–46). Petitioner further asserts that a skilled artisan would have been motivated to modify the combined system to include logic to prevent the generation of the control output signal on line 57 until two touch sensing circuits corresponding to two input portions 13 are activated in sequence. *Id.* at 59 (citing Ex. 1002 ¶¶ 141–142). Petitioner asserts that, in such a modified system, the control output signal on line 57 to microcomputer 80 would only be generated if the V_{EB} of transistor 50 in each of the two touch sensing circuits crosses a threshold value, and accordingly, the "sensed body capacitance change to ground" (V_{EB}) would be compared to a "second threshold level to generate the control output signal." *Id.*

Relying on its declarant, Patent Owner asserts that claims 47, 48, 62, and 63 require much more than the logical activation of two touch sensing circuits that would prevent the generation of an output control signal, and that Wheeler does not remedy the alleged deficiencies in Ingraham I as to the use of a second threshold (voltage) level to generate a control output signal and the use of a first threshold (voltage) level to prevent the inadvertent generation of the control output signal. PO Resp. 57–58 (citing Ex. 2010 ¶¶ 179–183).

We are not persuaded by Patent Owner's argument. As Petitioner persuasively asserts in its Reply, the Petition's analysis does not require a bodily incorporation of Wheeler's device into the combined Ingraham I-Caldwell-Gerpheide system. Reply 26. The Petition explains that a person of ordinary skill in the art looking to adapt the combined Ingraham I-Caldwell-Gerpheide system for applications similar to Wheeler's would have been motivated to modify the combined Ingraham I-Caldwell-Gerpheide system to require actuation of two switches in a sequence to actuate a controlled device to address safety concerns and/or application requirements. Pet. 58–59 (citing Ex. 1002 ¶¶ 141–142). Despite Patent Owner's assertion that the claims "require much more than the logical activation of two touch sensing circuits that would prevent the generation of an output control signal," Petitioner persuades us that the proposed modification meets the limitations of the claim because the sensed body capacitance change to ground would be compared to a second threshold level to generate the control output signal.

In view of the above, we determine Petitioner has shown by a preponderance of the evidence that Ingraham I, Caldwell, Gerpheide, and Wheeler render obvious claims 47 and 62 of the '183 patent.

3. Claims 48 and 63

Claims 48 and 63 depend directly from independent claims 40 and 61, respectively. Claims 48 and 63 both further recite: "wherein the sensed body capacitance change to ground proximate the input touch terminal is caused by the operator's body capacitance decreasing an input touch terminal signal amplitude on the detector circuit, and wherein the sensed body capacitance change to ground is compared to a second threshold level to generate the control output signal." That is, in relevant part, the limitations of claims 48 and 63 are similar to those of claims 47 and 62, with the primary difference being that claims 48 and 63 further require "decreasing an input touch terminal signal amplitude," rather than merely "decreasing an input touch terminal signal."

Petitioner asserts that the combined Ingraham I-Caldwell-Gerpheide-Wheeler system also discloses the limitations of claims 48 and 63 for at least the same reasons as discussed above for claim 47. Pet. 59. Petitioner further asserts that one of ordinary skill in the art would have recognized that the decrease in the base terminal voltage of transistor 50 in Ingraham I constitutes a decrease in "amplitude" of an input touch terminal signal. Pet. 59–60

Patent Owner does not set forth arguments for these claims beyond those discussed above in the context of claims 47 and 62. *See* PO Resp. 57–58.

In view of the above, we determine Petitioner has shown by a preponderance of the evidence that Ingraham I, Caldwell, Gerpheide, and Wheeler render obvious claims 48 and 63 of the '183 patent.

4. Claim 84

Claim 84 depends directly from independent claim 83, and further recites: "wherein the detector circuit is configured to inhibit the control output signal unless the operator is proximal or touches said second touch terminal after the operator is proximal or touches said first touch terminal."

Relying on its declarant, Petitioner asserts that a skilled artisan would have been motivated to modify the combined Ingraham I-Caldwell-Gerpheide system based on Wheeler to include logic that would prevent the generation of the control output signal on line 57 until two input portions 13 are touched in sequence. Pet. 60 (citing Ex. 1002 ¶ 144).

Patent Owner does not set forth arguments for claim 84 beyond those discussed above in the context of independent claim 83 from which it depends, aside from a conclusory assertion that Wheeler does not remedy any deficiencies in Ingraham I-Caldwell-Gerpheide with respect to the limitations in claim 84. PO Resp. 58 (citing Ex. 2010 ¶ 184).

In view of the above, we determine Petitioner has shown by a preponderance of the evidence that Ingraham I, Caldwell, and Gerpheide render obvious claim 85 of the '183 patent.

IV. CONCLUSION

Based on the complete trial record, we determine that Petitioner has shown by a preponderance of the evidence that claims 40, 41, 43, 45, 47, 48, 61–67, 69, 83–86, 88, 90, 91, 94, 96, 97, 99, 101, and 102 of the '183 patent would have been obvious. We further determine that Petitioner failed to carry its burden on its challenge to claims 37–39.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has proved by a preponderance of the evidence that claims 40, 41, 43, 45, 47, 48, 61–67, 69, 83–86, 88, 90, 91, 94, 96, 97, 99, 101, and 102 of the '183 patent are unpatentable;

FURTHER ORDERED that Petitioner has not proved by a preponderance of the evidence that claims 37–39 are unpatentable; and

FURTHER ORDERED that, because this is a final written decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

In summary:

Claims	**35 U.S.C. §**	**Reference(s)/Basis**	**Claims Shown Unpatentable**	**Claims Not shown Unpatentable**
37–41, 43, 45, 61, 64–67, 69, 83, 85, 86, 88, 90, 91, 94, 96, 97, 99, 101, 102	103(a)	Ingraham I, Caldwell, Gerpheide	40, 41, 43, 45, 61, 64–67, 69, 83, 85, 86, 88, 90, 91, 94, 96, 97, 99, 101, 102	37–39
47, 48, 62, 63, 84	103(a)	Ingraham I, Caldwell, Gerpheide, Wheeler	47, 48, 62, 63, 84	
Overall Outcome			40, 41, 43, 45, 47, 48, 61–67, 69, 83–85, 86, 88, 90, 91, 94, 96, 97, 99, 101, 102	37–39

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EXHIBIT B

NOTE: This order is nonprecedential.

United States Court of Appeals for the Federal Circuit

2018-2093, 2019-2137, 2019-2159, 2019-2160, 2019-2162, 2019-2277, 2019-2307, 2019-2389, 2019-2414, 2020-1038, 2020-1058, 2020-1059, 2020-1146, 2020-1196, 2020-1228, 2020-1229, 2020-1289, 2020-1290, 2020-1306, 2020-1317, 2020-1326, 2020-1346, 2020-1348, 2020-1383, 2020-1399, 2020-1400, 2020-1406, 2020-1424, 2020-1425, 2020-1441, 2020-1547, 2020-1558, 2020-1559, 2020-1587, 2020-1588, 2020-1589, 2020-1590, 2020-1591, 2020-1592, 2020-1593, 2020-1594, 2020-1654, 2020-1747, 2020-1748, 2020-1749, 2020-1750, 2020-1751, 2020-1752, 2020-1871, 2020-1874, 2020-1886, 2020-1890, 2020-1927, 2020-1930, 2020-1946, 2020-1947, 2020-1948, 2020-1961, 2020-1992, 2020-1994, 2020-2001, 2020-2029, 2020-2032, 2020-2033, 2020-2034, 2020-2059, 2020-2066, 2020-2068, 2020-2069, 2020-2071, 2020-2102, 2020-2111, 2020-2159, 2020-2202, 2020-2206, 2020-2207, 2020-2208, 2020-2209, 2020-2214, 2020-2215, 2020-2216, 2020-2217, 2020-2251, 2020-2262, 2020-2263, 2020-2264, 2020-2271, 2020-2272, 2020-2288, 2020-2301, 2020-2302, 2020-2314, 2020-2331, 2020-2334, 2020-2335, 2020-2337, 2020-2338, 2020-2339, 2020-2340, 2020-2348, 2021-1039, 2021-1040, 2021-1060, 2021-1115, 2021-1122, 2021-1166, 2021-1229, 2021-1438, 2021-1439, 2021-1473, 2021-1561, 2021-1601, 2021-1603, 2021-1605, 2021-1606, 2021-1607, 2021-1612, 2021-1826, 2021-1827, 2021-1828

SUA SPONTE

O R D E R

Upon consideration of the recent decision of the Supreme Court in *United States v. Arthrex, Inc.*, Nos. 19-1434 et al., 2021 WL 2519433 (U.S. June 21, 2021),

IT IS ORDERED THAT:

(1) Within 14 days from the date of this order, the parties that raised an Appointments Clause challenge shall file a brief, not to exceed 10 pages double-spaced, explaining how they believe their cases should proceed in light of *Arthrex*. Responses from the other parties, including the United States Patent and Trademark Office, subject to the same length restrictions, are due within 14 days thereafter.

(2) All deadlines and proceedings are stayed.

FOR THE COURT

June 23, 2021
Date

/s/ Peter R. Marksteiner
Peter R. Marksteiner
Clerk of Court

EXHIBIT C

NOTE: This order is nonprecedential.

United States Court of Appeals for the Federal Circuit

UUSI, LLC, dba Nartron,
Appellant

v.

SAMSUNG ELECTRONICS CO., LTD.,
Cross-Appellant

ANDREW HIRSHFELD, Performing the Functions and Duties of the Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office,
Intervenor

2021-1060, -1122

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2016-00908.

SUA SPONTE

Before O'MALLEY, REYNA, and CHEN, *Circuit Judges*.

PER CURIAM.

O R D E R

Upon consideration of the responses to the court's June 23, 2021 order indicating how the parties believe these appeals should proceed in light of *United States v. Arthrex, Inc.*, 141 S. Ct. 1970 (2021),

IT IS ORDERED THAT:

(1) This case is remanded for the limited purpose of allowing appellant the opportunity to request Director rehearing of the final written decision.

(2) Appellant must file the request for rehearing within 30 days from the date of this order.

(3) This court retains jurisdiction over these appeals.

(4) Appellant shall inform this court within 14 days of any decision denying rehearing. The Clerk of Court shall reactivate these appeals upon receipt of that notice.

(5) Within 14 days of a decision granting rehearing, intervenor shall inform the court of that decision and make any request to remand the case in full or continue the stay of proceedings. The intervenor's request shall include a statement of consent or opposition.

FOR THE COURT

August 03, 2021
Date

/s/ Peter R. Marksteiner
Peter R. Marksteiner
Clerk of Court

s31

EXHIBIT D

Trials@uspto.gov
571.272.7822

Paper 54
Entered: October 15, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE OFFICE OF THE UNDERSECRETARY AND DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

UUSI, LLC d/b/a NATRON,
Patent Owner.

IPR2016-00908
Patent 5,796,183

Before ANDREW HIRSHFELD, *Commissioner for Patents, Performing the Functions and Duties of the Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office.*

ORDER

The Office has received a request for Director review of the Final Written Decision in this case. Ex. 3100. The request was referred to Mr. Hirshfeld, Commissioner for Patents, Performing the Functions and Duties of the Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office.

It is ORDERED that the request for Director review is denied; and

FURTHER ORDERED that the Patent Trial and Appeal Board's Final Written Decision is the final decision of the agency.

For PETITIONER:

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lhadley@glaserweil.com

EXHIBIT E

NOTE: This order is nonprecedential.

United States Court of Appeals for the Federal Circuit

UUSI, LLC, dba Nartron,
Appellant

v.

SAMSUNG ELECTRONICS CO., LTD.,
Cross-Appellant

ANDREW HIRSHFELD, Performing the Functions and Duties of the Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office,
Intervenor

2021-1060, -1122

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2016-00908.

SUA SPONTE

PER CURIAM.

O R D E R

Upon consideration of UUSI LLC's notice that its request for Director review was denied,

IT IS ORDERED THAT:

(1) UUSI shall inform this court by letter within seven days of the date of this order whether it intends to file any new or amended notice of appeal. UUSI should also inform the court whether it seeks to challenge the denial of Director review along with the Patent Trial and Appeal Board's decision in this matter or instead seeks a decision from this court only on the Board's decision now that Director review has been denied. If the former, UUSI should include a proposed schedule for the filing of a replacement opening brief, and any opposition to that schedule is due within seven days thereafter.

(2) Proceedings shall remain stayed.

FOR THE COURT

November 12, 2021
Date

/s/ Peter R. Marksteiner
Peter R. Marksteiner
Clerk of Court

s31

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that on the date indicated below, a complete and entire copy of this submission is being provided by email to Petitioner's counsel, at the addresses of record set forth below:

Naveen Modi: naveenmodi@paulhastings.com
Joseph Palys: josephpalys@paulhastings.com
Chetan Bansal: chetanbansal@paulhastings.com
Paul Hastings LLP
875 15th St N.W.
Washington, DC 20005

The undersigned further certifies that, in addition to being filed electronically through the Board's E2E System, a copy of the foregoing amended notice is being mailed to the United States Patent and Trademark Office, at the following address:

Office of the General Counsel
United States Patent and Trademark Office
Post Office Box 1450, Alexandria, Virginia 22313-1450.

The undersigned further certifies that, on the date below, a copy of the foregoing amended notice is being filed electronically with the Clerk's Office of the United States Court of Appeals for the Federal Circuit, at the following address:

United States Court of Appeals for the Federal Circuit
717 Madison Place, N.W., Suite 401
Washington, DC 20005.

Dated: December 17, 2021

By: */s/ Stephen Underwood*
Stephen Underwood
Reg. No. 77,977
Counsel for Patent Owner