

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZTE (USA) INC.,
Petitioner,

v.

FUNDAMENTAL INNOVATION SYSTEMS INTERNATIONAL LLC,
Patent Owner.

Case IPR2018-00425
Patent 7,893,655 B2

Before LYNNE E. PETTIGREW, JO-ANNE M. KOKOSKI, and
PAUL J. KORNICZKY, *Administrative Patent Judges*.

KORNICZKY, *Administrative Patent Judge*.

FINAL WRITTEN DECISION

Finding No Challenged Claims are Unpatentable
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

Dismissing Petitioner's Motion to Strike Evidence
37 C.F.R. §§ 42.53 and 42.64

I. INTRODUCTION

ZTE (USA) Inc. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–11 (all claims) of U.S. Patent No. 7,893,655 B2 (Ex. 1002, “the ’655 patent”). Paper 1 (“Pet.”); see 35 U.S.C. § 311. On July 6, 2018, we instituted an *inter partes* review of claims 1–11 based on our determination that the information presented in the Petition demonstrated a reasonable likelihood that Petitioner would prevail in challenging claims 1–11 as unpatentable under 35 U.S.C. § 103 as obvious over certain prior art references. Paper 9.

Fundamental Innovation Systems International LLC (“Patent Owner”) filed a Patent Owner Response. Paper 22 (“PO Resp.”). Petitioner filed a Reply. Paper 32 (“Reply”). Patent Owner filed a Sur-reply. Paper 41 (“Sur-reply”).

Petitioner supports its Petition and Reply with two declarations from Mr. James T. Geier (Exs. 1001 and 1016). Patent Owner relies on a declaration from Dr. Kenneth Fernald (Ex. 2010).

Petitioner filed a Motion to Strike certain testimony of Mr. Geier that allegedly exceeds the scope of his direct testimony. Paper 43. Patent Owner filed an Opposition (Paper 45), and Petitioner filed a Reply (Paper 49).

An oral hearing was held on April 11, 2019. A transcript of the hearing is included in the record. Paper 51 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed below, we determine that Petitioner has not established by a preponderance of the evidence that claims 1–11 of the ’655 patent are unpatentable. Petitioner’s motion to strike is dismissed.

II. BACKGROUND

A. *Related Proceedings*

The '655 patent is being asserted in the following district court proceedings:

(1) *Fundamental Innovation Systems International LLC v. Huawei Investment & Holding Co.*, Case No. 2:16-cv-01424-JRG-RSP (E.D. Tex.);

(2) *Fundamental Innovation Systems International LLC v. LG Electronics, Inc.*, Case No. 2-16-cv-01425 (E.D. Tex.);

(3) *Fundamental Innovation Systems International LLC v. Samsung Electronics Co.*, Case No. 2:17-cv-00145-JRG-RSP (E.D. Tex.);

(4) *Fundamental Innovation Systems International LLC v. ZTE Corp.*, Case No. 2-17-cv-00124 (E.D. Tex.); and

(5) *Fundamental Innovation Systems International LLC v. ZTE Corp.*, Case No. 3:17-cv-01827-N (N.D. Tex.). Pet. 1; Paper 21.

B. *The '655 Patent (Ex. 1002)*

The '655 patent is titled “Charging and Power Supply for Mobile Devices.” Ex. 1002, at [54]. The patent discloses, in part, a power management method that permits a mobile device to use power from a power supply and then use excess power, if any, to charge the device’s battery. *Id.* at [57]. In general, a USB-compliant charging and power supply circuit in the '655 patent includes switch-mode battery charging circuitry for receiving power from an external power source and for supplying output power through an output node to an electronic system of an electronic communication device and a battery. *Id.* The charging and power supply circuit also includes battery isolation circuitry having a semiconductor

switch connecting the output node to the battery. *Id.* The battery isolation circuitry senses voltage at the output node and variably restricts current to the battery when the voltage is below a minimum voltage value by operationally controlling the semiconductor switch as current passes through it. *Id.* During variable current restriction, the electronic system is supplied required power and the battery is supplied any additional available power. *Id.*

C. Illustrative Claims

Petitioner challenges claims 1–11 of the '655 patent. Claims 1, 3, and 8 are the challenged independent claims, and are reproduced below:¹

1. A power management method for allocating power between a rechargeable battery and an electronic system, said electronic system having a power input and a plurality of modes of operation, the method comprising:

[a] generating output power;

[b] receiving a reference voltage from said electronic system;

[c] determining, based on said reference voltage, a minimum voltage value needed at a node directly connected to said power input of said electronic system;

[d] sensing that a voltage at said node is below said minimum voltage value; and

[e] restricting, responsive to said sensing, current from said output power to said battery, thereby increasing power allocated to said electronic system.

¹ Petitioner's claim-numbering scheme (i.e., reference letters) is used for consistency.

3. A USB-compliant charging and power supply circuit comprising:

[a] switch-mode battery charging circuitry adapted to: receive external power from an external power source; and supply output power, through an output node, to: an electronic system of an electronic communication device; and a battery, via a switch;

[b] said switch-mode battery charging circuitry having an integrated circuit and an inductor, said integrated circuit arranged to cooperate with said inductor to supply said output power with a current of greater magnitude than current of said external power;

[c] battery isolation circuitry adapted to: receive a reference voltage from said electronic system;

[d] determine, based on said reference voltage, a minimum voltage value needed at said output node;

[e] sense that a voltage at said output node is below said minimum voltage value; and

[f] control, responsive to said sensing, said switch to restrict current of said output power to said battery, thereby increasing a power allocated to said electronic system.

8. An electronic communication device electrically connectable to an external power source, said device comprising:

[a] a device housing;

[b] a rechargeable battery contained within said housing;

[c] an electronic system contained within said housing; and

[d] a charging and power supply circuit contained within said housing, said charging and power supply circuit including:

[e] switch-mode battery charging circuitry adapted to: receive power from an external power source; and supply output power, through an output node, to: said electronic system; and said

rechargeable battery, via a switch;

[f] said switch-mode battery charging circuitry having an integrated circuit and an inductor, said integrated circuit arranged to cooperate with said inductor to supply said output power with a current of greater magnitude than current of said power received from said external power source;

[g] battery isolation circuitry adapted to: receive a reference voltage from said electronic system;

[h] determine, based on said reference voltage, a minimum voltage value needed at said output node;

[i] sense that a voltage at said output node is below said minimum voltage value; and

[j] control, responsive to said sensing, said switch to restrict current of said output power to said rechargeable battery, thereby increasing power allocated to said electronic system.

D. Prior Art References

Petitioner relies on the following references:

Reference	Description	Date	Exhibit
Veselic	US 2004/0164708 A1	Aug. 26, 2004	1004
Kranzen	US 7,570,020 B1	Aug. 4, 2009	1005
Vyssotski	US 2004/0019815 A1	Jan. 29, 2004	1006

E. The Asserted Grounds of Unpatentability

Petitioner challenges the patentability of claims 1–11 of the '655 patent on the following grounds (Pet. 13):

Claim(s)	Basis (35 U.S.C. §)²	References
1	103	Veselic and Vyssotski
2–11	103	Veselic, Vyssotski, and Kranzen

III. ANALYSIS

A. Legal Principles

To prevail on its challenge to the '655 patent, Petitioner must demonstrate by a preponderance of the evidence that the challenged claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in the record, objective evidence of

² The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), revised 35 U.S.C. § 103, effective March 16, 2013. Because the application from which the '655 patent issued was filed before this date, the pre-AIA version of § 103 applies.

nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Even if Petitioner’s prior art references disclose all of the limitations in the challenged claims when combined, there must be evidence to explain why a person of ordinary skill in the art would have combined the references to arrive at the claimed invention. *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1366–67 (Fed. Cir. 2012) (citing *Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1374 (Fed. Cir. 2008) (holding that post-KSR “some kind of motivation must be shown from some source, so that the [trier of fact] can understand why a person of ordinary skill would have thought of either combining two or more references or modifying one to achieve the patented [invention]”)).

B. Level of Ordinary Skill in the Art

The level of ordinary skill in the art is a factual determination that provides a primary guarantee of objectivity in an obviousness analysis. *Al-Site Corp. v. VSI Int’l Inc.*, 174 F.3d 1308, 1324 (Fed. Cir. 1999) (citing *Graham*, 383 U.S. at 17–18); *see also Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991). In determining the level of skill in the art, we consider the type of problems encountered in the art, the prior art solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level of active workers in the field. *See Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986); *see also Orthopedic Equip. Co. v. United States*, 702 F.2d 1005, 1011 (Fed. Cir. 1983). The level of ordinary skill in the art may be reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Petitioner asserts that a person of ordinary skill in the art at the time of the invention would have had “a bachelor’s degree in electrical engineering, computer science, or a related field, plus 2–3 years of experience with power supplies.” Pet. 6. Petitioner states that support for its position is found in the testimony of its declarant, Mr. Geier. *Id.* (citing Ex. 1001 ¶¶ 24–26).

Patent Owner asserts that a person of ordinary skill in the art at the time of the invention would have had “at least: (1) a Bachelor’s of Science degree in electrical engineering or similar discipline and an understanding of power supplies and battery charging circuitry, or (2) at least several years of experience working with power supplies and battery charging circuitry, or equivalents.” PO Resp. 16–17. Patent Owner states that support for its position is found in the testimony of its declarant, Dr. Fernald, and the educational level of the authors of the cited prior art, who do not have advanced degrees. *Id.* (citing Ex. 2010 ¶ 43).

Petitioner and Mr. Geier provide no reasoned justification for their identification of one of ordinary skill in the art. Pet. 6 (relying on paragraphs 24–25 of Mr. Geier’s declaration). Mr. Geier’s conclusory statement merely states that, “After considering such factors, it is my opinion that a person of ordinary skill in the art would have had a bachelor’s degree in electrical engineering, computer science, or a related field, plus 2–3 years of experience with power supplies.” Ex. 1001 ¶ 26. Conversely, Dr. Fernald supports his proposal with persuasive reasoning, explaining, for example, that based on the education level of the authors of the cited prior art, one of ordinary skill in the art would not have necessarily needed an advanced degree. *See* Ex. 2010 ¶¶ 43–44 (stating “Mr. Guthrie of the Veselic application, for example, has no advanced degrees”). Thus, we

adopt Patent Owner’s description of one of ordinary skill in the art, which is consistent with the level of ordinary skill in the art at the time of the invention, as reflected in the prior art in this proceeding. Our analysis and conclusions discussed below would be the same under either Petitioner’s or Patent Owner’s proposal.

C. Claim Construction

In an *inter partes* review filed before November 13, 2018, claim terms in an unexpired patent are interpreted according to the broadest reasonable construction in light of the specification of the patent in which they appear.³ 37 C.F.R. § 42.100(b) (2017); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016). Under this standard, absent any special definitions, the claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Only those terms in controversy need to be construed, and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))). Neither

³ A recent amendment to this rule does not apply here because the Petition was filed on January 5, 2018. *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 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) for all petitions for *inter partes* review filed on or after November 13, 2018).

Petitioner nor Patent Owner identifies any terms in the challenged claims that need to be construed. Because the dispositive issues in this case do not turn on the meaning of any claim term, we need not construe any terms.

D. Obviousness over the Combined Teachings of Veselic and Vyssotski

Petitioner asserts that independent claim 1 is unpatentable as being obvious over the combined teachings of Veselic and Vyssotski. Pet. 14–26. Petitioner provides supporting testimony from Mr. Geier. *See, e.g.*, Ex. 1001 ¶¶ 55–92; *see also id.* ¶¶ 33–53. Having now considered the evidence in the complete record established during trial, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claim 1 is unpatentable over Veselic and Vyssotski. We first describe the prior art that Petitioner seeks to combine to show that independent claim 1 would have been obvious, and then analyze the merits of the combination.

1. Overview of Veselic (Ex. 1004)

Veselic is titled “Circuit and Method of Operation for an Electrical Power Supply.” Ex. 1004, at [54]. Petitioner contends Veselic is prior art under 35 U.S.C. § 102(b). Pet. 12. Patent Owner does not dispute that Veselic is prior art.

Veselic discloses a device and method for powering a portable device and then using additional available power for charging the device’s battery. Ex. 1004, at [57]. Veselic asserts that there is “a need for a method and apparatus which allows standard computer data busses such as USB ports to simultaneously power portable devices 18 and their associated battery charge circuits 20.” *Id.* ¶ 31. Veselic’s Figure 4 is reproduced below:

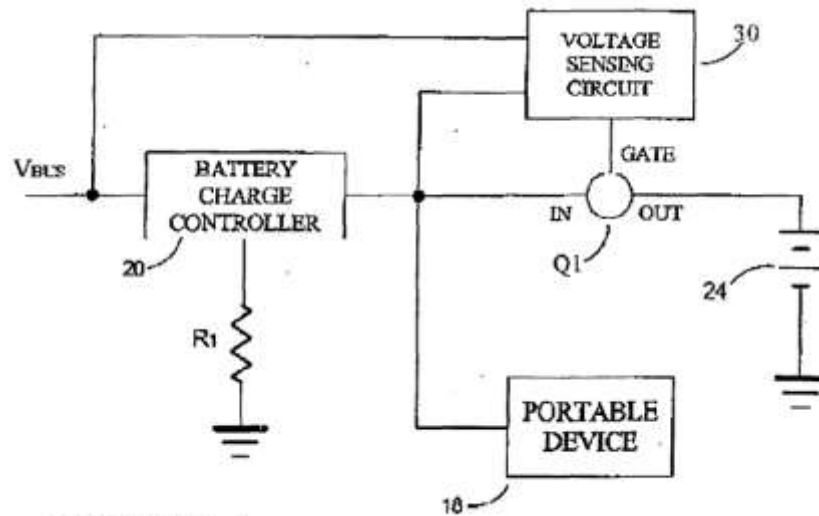


FIGURE 4

Figure 4 depicts an electrical schematic diagram of a battery charging circuit “which overcomes a number of the problems in the art.” *Id.* ¶ 47. Veselic explains that “the battery charge controller 20 receives power from an external source (V_{BUS}) and feeds a portable device 18 and rechargeable battery or batteries 24 in parallel.” *Id.* ¶ 47. However, “the feed to the battery 24 is made via a semiconductor switch Q1” and “[c]ontrol of the current flow through the semiconductor switch Q1 is modulated by a voltage sensing circuit 30.” *Id.* The voltage sensing circuit “measures the voltage drop across the battery charge controller 20 and reduces the current flow through the semiconductor switch Q1 to the battery 24 when the voltage drop is too great.” *Id.* In this way, Veselic’s circuit modulates the power consumed “to stay within the limits of the power available from the USB port.” *Id.* ¶ 52.

2. *Overview of Vyssotski (Ex. 1006)*

Vyssotski is titled “DC-DC Controller with Integrated SMBUS Registers for Dynamic Voltage Positioning.” Ex. 1006, at [54]. Petitioner contends Vyssotski is prior art under 35 U.S.C. § 102(b). Pet. 12. Patent Owner does not dispute that Vyssotski is prior art.

Vyssotski discloses a device and method for powering a portable device and then using additional available power for charging the device’s battery. Ex. 1006, at [57]. Vyssotski explains that electronic systems “typically include a DC-DC converter for providing DC power . . . within specified tolerances” and that “[t]ypical DC-DC converters incorporate a switching circuit, a controller circuit, resistors, and diodes, in combination with a single-stage LC filter.” *Id.* ¶¶ 7–8. Vyssotski further explains that modern computer systems “typically support a plurality of power operating states,” and that “manufacturers typically require that transitions between these power operating states take place very rapidly.” *Id.* ¶ 10. As a solution, Vyssotski provides “a method and a system thereof for selecting a voltage output reference required of a DC-DC converter” where “[t]he voltage output reference corresponds to an operating state of the power supply load.” *Id.* ¶ 14. Figure 2 of Vyssotski, which depicts this system, is reproduced below:

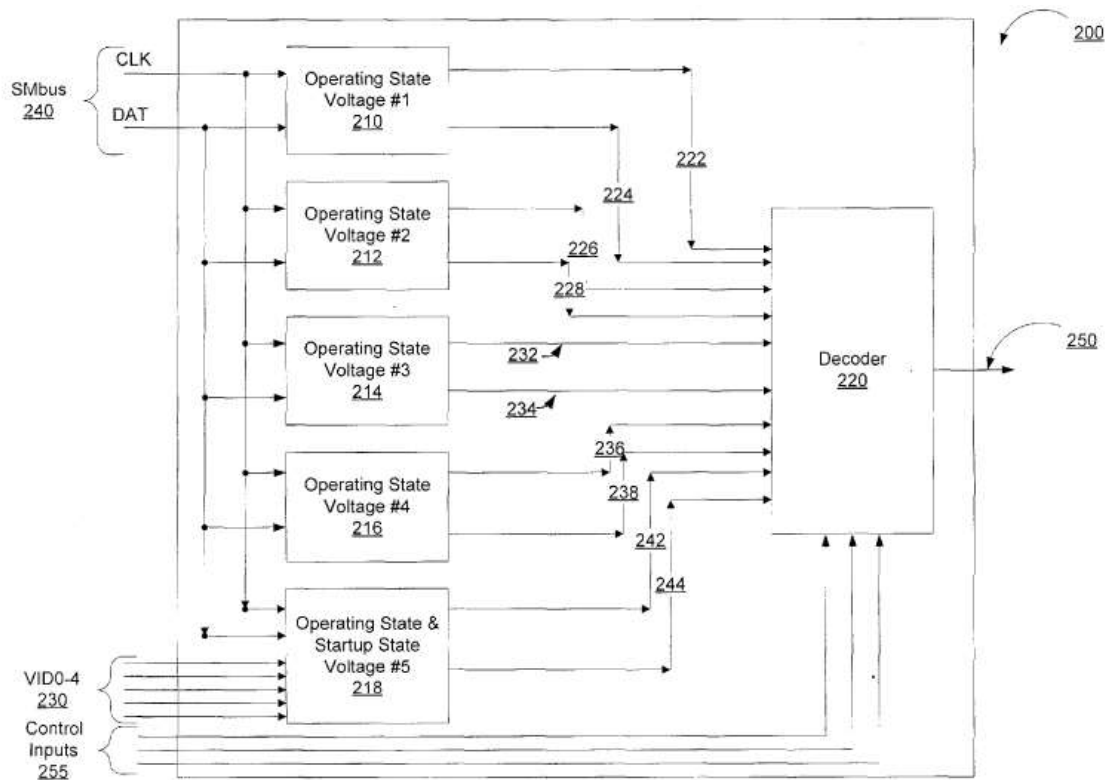


FIG. 2

Figure 2 “shows a block diagram of a DC-DC converter for selecting a voltage output reference required by the load.” *Id.* ¶ 22.

Vyssotski describes “stor[ing] data corresponding to a respective voltage required by the load . . . for each of the plurality of operating states.” *Id.* ¶ 59. Vyssotski also describes a “decoder” that receives control signals “correspond[ing] to each of the possible operating state[s]” and “is operable to generate . . . voltage output reference 250, required by the load in response to the load’s current operating state.” *Id.* ¶ 61; *see also id.* ¶¶ 66–67, 74, Figs. 2, 3, 4A, 4B.

3. *Analysis*

Petitioner contends that the subject matter of claim 1 is unpatentable under 35 U.S.C. § 103 as obvious over the combined teachings of Veselic and Vyssotski. Pet. 14–26; Reply 2–9. Petitioner asserts that Veselic and Vyssotski disclose all of the limitations in claim 1, and that a person of ordinary skill in that art would have been motivated to combine the disclosures of Veselic with those of Vyssotski to arrive at the claimed invention. *Id.* Patent Owner disagrees with Petitioner’s assertions. PO Resp. 27–58; Sur-reply 1–9, 18–28.

Reasons to Combine Veselic and Vyssotski

Petitioner asserts that Veselic “is concerned in large part with ‘ensur[ing] that the portable device 18 receives the power it requires for operation,’” and “purports to accomplish this goal by monitoring the voltage at the output of its battery charge controller and restricting the current delivered to the battery when this voltage is too low.” Pet. 14 (citing Ex. 1004 ¶¶ 47–49, 51, 86 (“[T]hrottling of power to the battery 24 is done so that the current always satisfies the needs of the portable device 18”); Ex. 1001 ¶ 69). Petitioner asserts that “Veselic further contemplates that a portable device may have different operational states, such as a ‘sleep’ state and a ‘wake’ state, requiring different levels of power.” *Id.* (citing Ex. 1004 ¶ 86). Petitioner explains that “[w]hile the minimum voltage could be fixed based on the maximum power needs of the portable device, a [person of ordinary skill in the art] would have understood that this would lead to unnecessary throttling of the current to the rechargeable battery (*e.g.*, when the output voltage is below the minimum required for the ‘wake’ state, but above that required for the ‘sleep’ state).”

Id. at 14–15 (Ex. 1001 ¶ 70). According to Petitioner, a person of ordinary skill in the art “would therefore have had a reason to provide a mechanism to adjust, based on the operating state of the device, the point at which the voltage sensing circuit of Veselic reduces the current flow through the semiconductor switch to the battery.” *Id.* at 15 (citing Ex. 1001 ¶ 71).

Petitioner asserts that a person skilled in the art specifically “would have been motivated to look to the teachings of Vyssotski on the implications of the various power states.” Pet. 15. Petitioner asserts that Vyssotski discloses that “each operating state of an electronic system may require a different voltage input for proper operation,” and discloses “a ‘decoder’ which receives control signals ‘correspond[ing] to each of the possible operating state[s]’ and ‘is operable to generate . . . [the] voltage output reference 250, required by the load in response to the load’s current operating state.’” *Id.* (citing Ex. 1006 ¶¶ 53, 59, 61; *see also id.* ¶¶ 66–67, 74, Figs. 2, 3, 4A, 4B).

Petitioner asserts that “Vyssotski’s decoder can be easily incorporated into Veselic’s system with little or no modification to the teachings of either reference.” *Id.* (citing Ex. 1001 ¶ 73). According to Petitioner, Veselic explains that “its voltage sensing circuit ‘measures the voltage drop across the battery charge controller 20 and reduces the current flow through the semiconductor switch Q1 to the battery 24 when the voltage drop is too great,’ that is, when the voltage at the output of the battery charge controller is too low.” *Id.* at 15–16 (citing Ex. 1004 ¶ 47; Ex. 1001 ¶ 73). Veselic also describes an alternative in which voltage at the output of the battery charge controller is compared with “some reference voltage V_{REF} .” *Id.* at 16 (citing Ex. 1004 ¶ 49; *see also id.* ¶ 78).

Petitioner further asserts that a person of ordinary skill in the art “would have found it obvious to set ‘reference voltage V_{REF} ’ in the voltage sensing circuitry of Veselic based on the ‘voltage output reference’ of Vyssotski’s decoder” and that the “reference voltage V_{REF} determines the minimum voltage that can be measured at the output of Veselic’s battery charge controller before current to the battery is throttled.” *Id.* (citing Ex. 1001 ¶ 73; Ex. 1004 ¶¶ 47–53, 77). Petitioner asserts that “the minimum voltage required by a given system can change depending on its operating state,” and “Vyssotski’s voltage output reference is the minimum voltage required by the electronic system given its current operating state.” *Id.* (citing Ex. 1006 ¶¶ 37, 53, 57, 61; Ex. 1001 ¶¶ 72–73). Petitioner concludes that “[b]y setting reference voltage V_{REF} based on the output of Vyssotski’s decoder, the minimum voltage can be dynamically aligned with the actual needs of the system and the current flow to the battery will not be constrained unnecessarily.” *Id.* at 16–17 (citing Ex. 1001 ¶ 74).

In response to Petitioner’s contentions, Patent Owner first argues that a skilled artisan would not have modified Veselic with the reference voltage from Vyssotski’s decoder because there would be little, if any, benefit to Veselic’s battery charging current as a result. PO Resp. 37–51; Sur-reply 18–21. According to Petitioner, “[b]y setting reference voltage V_{REF} based on the output of Vyssotski’s decoder, [Veselic’s] minimum voltage can be dynamically aligned with the actual needs of the system and the current flow to the battery will not be constrained unnecessarily.” Pet. 16. As Patent Owner notes, however, neither Petitioner nor Mr. Geier provides any persuasive analysis regarding the amount of increase in battery charging current that would result from modifying Veselic’s fixed reference voltage

with Vyssotski's adjustable reference voltage. PO Resp. 38, 41. Patent Owner, relying on Dr. Fernald's testimony, persuasively explains Veselic's "battery is already receiving 499.3–499.7 mA out of the 500mA available current in sleep mode," and the skilled artisan "would understand that the battery would at most gain 0.3–0.7mA in the charging current in sleep mode with an adjustable V_{REF} ." *Id.* at 38–39 (citing Ex. 2010 ¶¶ 166–167; Ex. 1004 ¶ 86). Dr. Fernald testifies that this 0.3–0.7mA increase in charging current "may save 20–45 seconds [in charging time] over a 4–9 hour charging period." Ex. 2010 ¶ 168; *see also* PO Resp. 39, 42. Dr. Fernald persuasively testifies that incorporating Vyssotski's decoder into Veselic would require one person-year of development time, and that achieving "a [0.14%] improvement[] in charging speed, translating to a saving of 20–45 seconds in charging time over a 4–9 hour period[,] would not have justified such an expense." Ex. 2010 ¶ 168. In this regard, Petitioner's declarant, Mr. Geier, testifies that he did not know the threshold improvement to battery charging that would have motivated a skilled artisan to implement Petitioner's proposed modification, but acknowledges that "1 percent greater speed in battery charging might not be beneficial to a great degree depending on what the cost is to implement [the improvement]." Ex. 2024, 207:17–208:4.

In response to Patent Owner's argument, Petitioner asserts that Patent Owner improperly limits its analysis to Veselic's sleep state. Reply 6. According to Petitioner, Veselic's "battery . . . receive[s] most of the available current when operating in its sleep mode," and Patent Owner's "analysis focuses improperly on one specific set of circumstances and misses the broader benefits of combining Veselic and Vyssotski." *Id.*

Petitioner asserts that, in the sleep mode, “it is easy to provide almost all available current to the battery because the electronic system and the battery are not competing for current,” and the “more challenging situation, which both Veselic and Vyssotski sought to address, is how much current to provide to the battery when the electronic system *is* competing for current.” *Id.* Petitioner contends that “Veselic provided a good solution that compared V_{BUS} to V_{REF} to make sure the electronic system was receiving the proper voltage for operation, but the Veselic system could not dynamically adjust to different operating states with different operating voltages.” *Id.* Petitioner continues that the skilled artisan “would have recognized that the solution could be made *even better* for devices with multiple operating states by incorporating Vyssotski’s dynamic reference voltage.” *Id.* Petitioner further argues that the “combined system would be able to tailor V_{REF} on a dynamic basis to provide as much current as possible to the battery, even when the electronic system is competing for current, all without denying the electronic system the power it requires for operation.” *Id.* at 7. Petitioner concludes that Patent Owner’s analysis “ignores the broader teaching of” Veselic and “ignores the benefits provided during other modes of operation.” *Id.* at 7–8.

We do not find Petitioner’s arguments to be persuasive. Petitioner does not explain adequately why a skilled artisan would modify Veselic when Veselic alone provides “as much current as possible to the battery, even when the electronic system is competing for current.” *Id.* at 7. Furthermore, neither Petitioner nor Mr. Geier (*see, e.g.*, Ex. 1001 ¶¶ 68–74) persuasively identifies the “other modes of operation” that it alleges would benefit from the combination, or how much charging speed would be

increased with Petitioner’s proposed modifications. For example, Mr. Geier testifies that he does not know how much improvement would result from modifying Veselic with Vyssotski’s decoder. *See, e.g.*, Ex. 2024, 140:16–17 (“I don’t think I pointed out examples that used a different level of current.”), 141:1–3 (“I don’t remember another example given in those references explicitly where it gives a specific value different than this.”), 143:18–20 (“I don’t recall stating that in my declaration specific numbers, . . . as far as savings [in charging time].”), 144:18–19 (“I didn’t specifically calculate how much gain there would be.”), 144:24–25 (“I don’t know specifically what the bounds of that range [of gain] would be.”). Similarly, neither Petitioner nor Mr. Geier addresses whether any purported current increase would justify the expense and complexity of incorporating Vyssotski’s decoder into Veselic. *See, e.g.*, Ex. 2024, 207:17–208:16. Based on the evidence of record, we are persuaded by Patent Owner’s evidence, including Dr. Fernald’s testimony, that a skilled artisan would not have believed that any potentially small benefits of Petitioner’s proposed modification would justify the expenses that would be incurred to include the extra hardware and software needed to incorporate Vyssotski’s decoder into Veselic. *See, e.g.*, Ex. 2010 ¶¶ 166–168.

Second, Patent Owner asserts that a person of ordinary skill in the art would not have been motivated to combine the teachings of Veselic and Vyssotski because, in the Veselic embodiments at issue, a dynamic reference voltage would not result in any meaningful increase in the current received by the battery, even with a switch-mode battery charging circuit. PO Resp. 44–51; Sur-reply 21–24. Patent Owner asserts that “Petitioner’s motivation to combine Veselic and Vyssotski presupposes that a fixed reference voltage

‘would lead to unnecessary throttling of the current to the rechargeable battery,’” and “[t]hat assumption is incorrect for the embodiment(s) relied on by Petitioner.” PO Resp. 44–45 (quoting Pet. 14–15). In that regard, Dr. Fernald testifies that, when a switch-mode battery charging circuit outputs a fixed current, “reducing the reference voltage from the electronic system would, at best, provide the same insignificant reduction in charging times demonstrated in ¶¶ 167–168 [i.e., a consumer may save 20–45 seconds over a 4–9 hour charging period when the phone is not being used (*i.e.*, in sleep mode)].” Ex. 2010 ¶ 176.

Petitioner responds that Patent Owner’s and Dr. Fernald’s arguments that “the use of [the] switch-mode voltage regulator still would not increase the current to the battery *during sleep mode* (Paper 22 at 49) . . . ignores the benefits provided during [the] other modes of operation.” Reply 7–8. As discussed above, this argument is not persuasive because neither Petitioner nor Mr. Geier (*see, e.g.*, Ex. 1001 ¶¶ 68–74) identifies the “other modes of operation” or the amount the charging speed would be increased with Petitioner’s proposed modifications. We again credit Dr. Fernald’s testimony that a skilled artisan would not have believed that a 0.14% decrease in charging time — less than one minute over 4–9 hours — would justify the expenses to include the extra hardware and software needed to incorporate Vyssotski’s decoder into Veselic. Ex. 2010 ¶ 168.

Finally, Patent Owner argues that a person of ordinary skill in the art would not have combined the teachings of Veselic and Vyssotski because varying the reference voltage would lead to increased component size and heat dissipation, and a person of ordinary skill in the art “would not have incurred costs for . . . increased component sizes and higher heat dissipation

budget when the benefits were in the best-case miniscule and in the most likely actual cases either non-existent or negative.” PO Resp. 2; *see id.* at 51–54; Sur-reply 24–25. Patent Owner argues that, contrary to Veselic’s stated desire that the battery charge controller “be kept physically small” (Ex. 1004 ¶ 52), “[t]he increase in component size would be significant when designing for the worst-case scenario as taught in Veselic.” PO Resp. 51. In particular, Dr. Fernald testifies that Petitioner’s proposed modification of Veselic would result in a 45% increase in the worst-case power heat dissipation of the battery charge controller, and such heat dissipation would more than double the surface area required of the battery charge controller. Ex. 2010 ¶¶ 192–195; *see* PO Resp. 52. Patent Owner argues that “Petitioner’s proposed modification would actually lead to no increase (or even a decrease) in battery charging speed while more than doubling the component sizes, contrary to certain stated objectives of Veselic.” PO Resp. 39.

Petitioner responds that “[a]s Mr. Geier has explained, there are circumstances in which the benefits would be significant,” and “the tradeoffs of increased heat dissipation would be much lower when using switch-mode power circuitry, further favoring the net benefits of the combination.” Reply 8 (citing Ex. 1001 ¶¶ 68–74, 99–100). Petitioner, however, does not provide sufficient evidence comparing the heat dissipation before and after its proposed modifications to Veselic. And, as discussed above, Petitioner’s arguments about “significant” benefits are not persuasive. We credit Dr. Fernald’s explanation that a skilled artisan “attempting to improve Veselic would have avoided drastically increas[ing] the component sizes needed to make the modification work” (Ex. 2010 ¶ 194; *see id.* ¶¶ 192–193, 195–

203), and “would not have would not have gone down the path proposed by the Petition, namely, adjusting down Veselic’s reference voltage V_{REF} , because of the drawbacks of increasing heat dissipation and component sizes but without any or with very little increase in battery charging current” (*id.* at ¶ 201).

After considering the parties’ arguments and evidence, and for the reasons discussed above, we determine that Petitioner has not made a sufficient showing that a person having ordinary skill in the art would have combined the teachings in the manner contended by Petitioner. Accordingly, we find that Petitioner has not shown by a preponderance of the evidence that independent claim 1 of the ’655 patent is unpatentable under 35 U.S.C. § 103 as obvious over the combined teachings of Veselic and Vyssotski.

E. Obviousness over Veselic, Vyssotski, and Kranzen

Petitioner asserts that claims 2–11 would have been obvious in view of the combined teachings of Veselic, Vyssotski, and Kranzen. Pet. 31–56. Having now considered the evidence in the complete record established during trial, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 2–11 are unpatentable over Veselic, Vyssotski, and Kranzen. We first describe Kranzen, and then analyze the merits of the combination.

1. Kranzen (Ex. 1005)

Kranzen is titled “Apparatus and Method for Magnetic Charger IC for Batteries with Recycling of the LC Filter for Re-Use as a Battery Step-Down Converter.” Ex. 1005, at [54]. Kranzen discloses a voltage regulation and

battery charging system. *Id.* at [57]. Figure 1 of Kranzen is presented below:

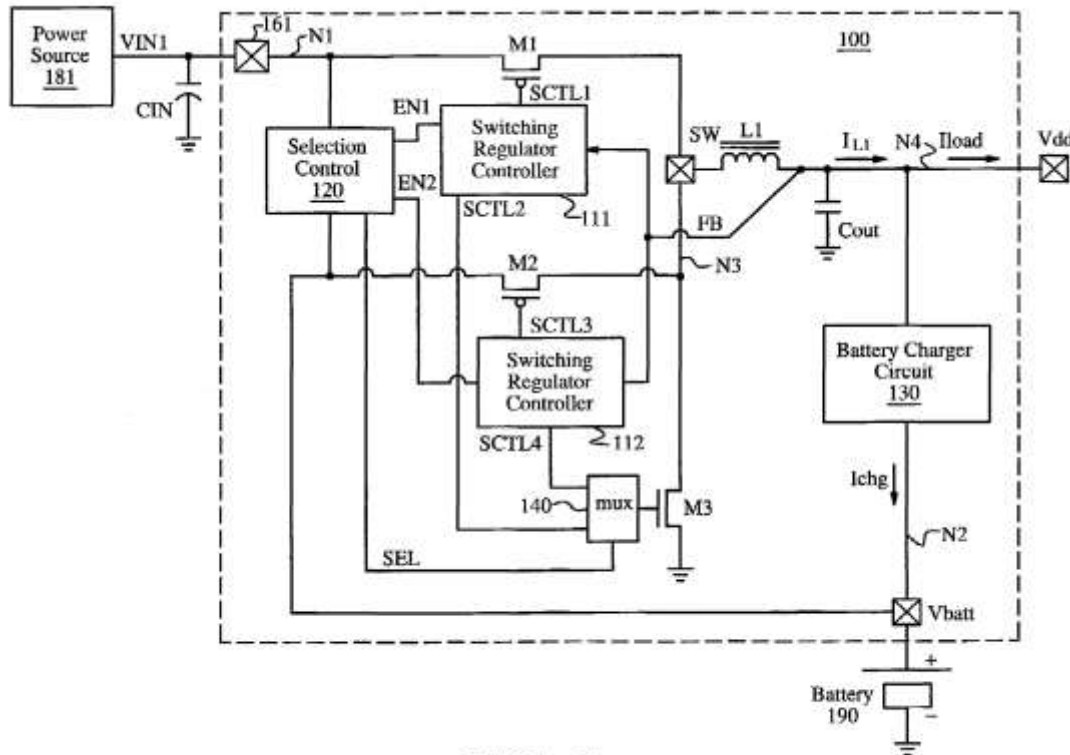


FIG. 1

Figure 1 illustrates Kranzen's system, which "can simultaneously charge battery 190 and provide supply output voltage Vdd to the external load." *Id.* at 3:3–5. Kranzen's system uses two switching regulator controller circuits, such that the first circuit provides system power when the system is connected to an external power source, and the second circuit is used when power comes from the battery. *Id.* at 2:38–42. Kranzen describes that the switching regulator circuits "employ any switching regulation method known in the art, such as pulse width modulation (PWM), constant on-time (COT), hysteric control, or the like" (*id.* at 4:3–6) and that "the switching regulation is inductive-based buck regulation" (*id.* at 8:43–64).

2. Analysis

Petitioner provides an element-by-element analysis showing where the elements of claims 2–11 are purportedly found in the combination of Veselic, Vyssotski, and Kranzen. Pet. 31–56. Petitioner also provides supporting testimony from Mr. Geier. Ex. 1001 ¶¶ 108–153. We determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 2–11 are unpatentable over the combined teachings of Veselic, Vyssotski, and Kranzen. We address claim 2 and then claims 3–11 below.

Claim 2

Claim 2 depends from claim 1. For the reasons discussed above, Petitioner has not demonstrated by a preponderance of the evidence that claim 1 is unpatentable over the combined teachings of Veselic and Vyssotski. Here, Petitioner relies on Kranzen to disclose that the step of generating output power “comprises deriving said output power from an external power source in a manner such that said output power has a higher current and a lower voltage than power provided by said external power source,” as recited in claim 2. Petitioner’s arguments regarding Kranzen, however, do not address whether a person of ordinary skill in the art would have been motivated to combine the teachings of Veselic and Vyssotski and, thus, do not remedy the deficiencies in its challenge to claim 1 based on Veselic and Vyssotski. Thus, Petitioner has not demonstrated by a preponderance of the evidence that claim 2 is unpatentable under 35 U.S.C. § 103 over the combined teachings of Veselic, Vyssotski, and Kranzen.

Claims 3–11

Claims 3 and 8 are independent. Claims 4–7 depend from claim 3, and claims 9–11 depend from claim 8. Claims 3 and 8 recite limitations similar to those in claim 1 involving a reference voltage. Just as with claim 2, Petitioner’s arguments regarding Kranzen do not remedy the deficiencies of Petitioner’s proposed combination of Veselic and Vyssotski. For this reason alone, Petitioner has not demonstrated by a preponderance of the evidence that claims 3–11 are unpatentable over the combined teachings of Veselic, Vyssotski, and Kranzen.

In addition, Petitioner does not make a sufficient showing that the combination of Veselic, Vyssotski, and Kranzen teaches or suggests all the limitations of claims 3 and 8. In particular, Petitioner relies on Kranzen in combination with Veselic to teach claim limitations 3b and 8f, which recite “switch-mode battery charging circuitry having an integrated circuit” arranged “to supply said output power with a current of greater magnitude than current of said external power.” Ex. 1002, 9:13–17, 10:20–23. Relying on Mr. Geier’s testimony, Petitioner asserts that Veselic

discloses battery charging circuitry (*i.e.*, battery charge controller 20) for receiving power from an external power source (*i.e.*, V_{BUS}) and for supplying output power, through an output node, to an electronic system of an electronic communication device (*i.e.*, portable device 18) and to a battery (*i.e.*, battery 24), via a switch (*i.e.*, semiconductor switch Q1).

Pet. 35 (discussing claim 3b, citing Ex. 1001 ¶ 110), 52–53 (discussing claim 8f). Petitioner asserts that “[t]o the extent Veselic does not expressly

describe **switch-mode** battery charging circuitry, Kranzen plainly does.”⁴ *Id.* at 35.

Petitioner’s annotated Figure 2 of Kranzen is presented below:

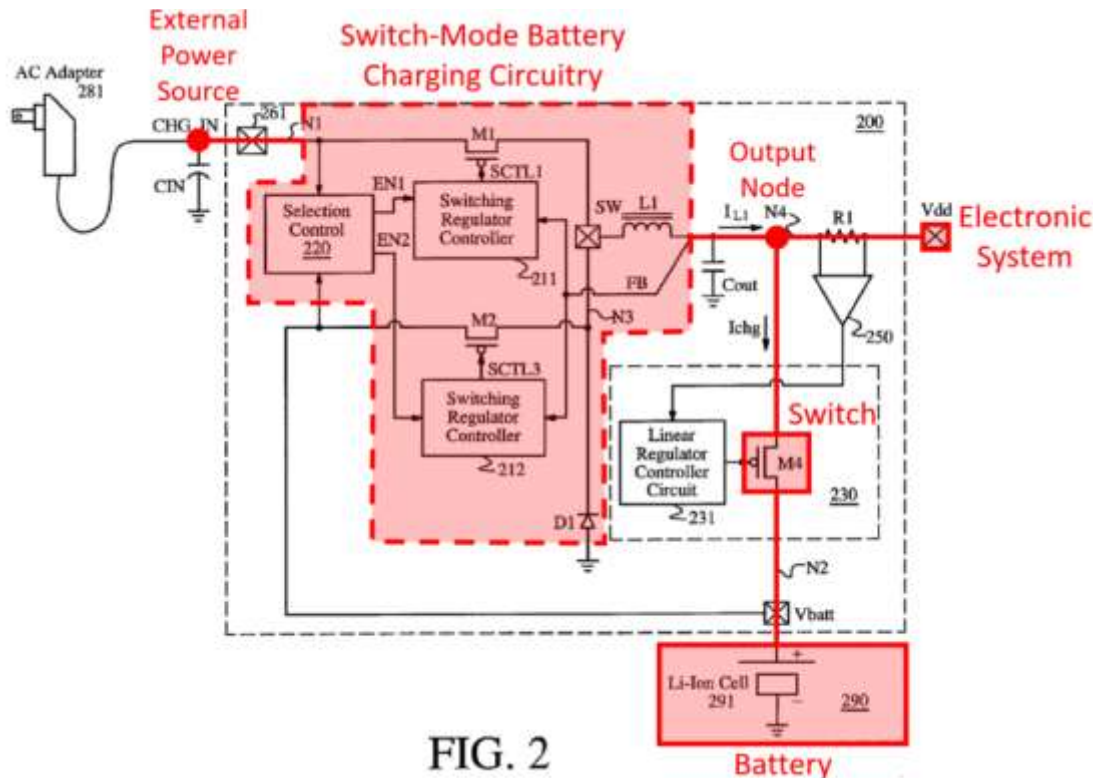


FIG. 2

Id. at 36. Petitioner asserts that this annotated Figure 2 illustrates the “switch-mode battery charging circuitry” recited in claim limitations 3b and 8f. Pet. 36–37. According to Petitioner, Kranzen

⁴ Petitioner does not argue that Veselic teaches the recited “switch-mode” battery charging circuitry. See Pet. 27–31, 34–35; see, e.g., Tr. 21:16–22 (Petitioner’s counsel stating that, “What Mr. Geier said is in light of Veselic, which does not use switch mode circuitry and that’s because Veselic says Veselic was focused on trying to use off-the-shelf battery charging circuitry and just to build around that, but it would have been obvious to one of ordinary skill in the art as Mr. Geier said to take other teachings and improve things, for example by looking to the switch mode circuitry of Kranzen.”).

discloses switch-mode battery charging circuitry (*i.e.*, switching regulator controller circuits 111, 112, 211, and 212 and transistors M1, M2 and M3) for receiving power from an external power source (*i.e.*, power source 181 or 281) and for supplying output power, through an output node (*i.e.*, node N4), to an ^{electronic} system of an electronic communication device (*i.e.*, at Vdd) and to a battery (*i.e.*, battery 190 or 290), via a switch (*i.e.*, transistor M4).

Id. at 37 (citing Ex. 1001 ¶ 112). Notably, Petitioner’s identified “switch-mode” circuitry in Kranzen does not include battery charging circuit 230 in Fig. 2 (or 130 in Fig. 1). Petitioner also asserts that Kranzen discloses that its “switching regulation is inductive-based buck regulation,” and a person of ordinary skill in the art would have understood that a buck regulator “steps down” or “down-converts” an input voltage to a lower value and correspondingly increases the output current relative to what is received. *Id.* at 38 (citing Ex. 1001 ¶ 116).

We agree with Patent Owner that Petitioner’s identified “switch-mode” circuitry in annotated Figure 2 of Kranzen is not “switch-mode battery charging circuitry,” as recited in claim limitations 3b and 8f, because it is unable to properly charge a battery and, therefore, is not battery charging circuitry. PO Resp. 67–69. We credit Dr. Fernald’s testimony that a person of ordinary skill in the art would understand that the identified “switch-mode” circuitry is for voltage regulation of the Vdd node. Ex. 2010 ¶ 98; *see also* Ex. 1001 ¶¶ 130–131 (explaining how Kranzen maintains a target output voltage Vdd). Dr. Fernald also credibly testifies that the circuitry that Petitioner identifies as “switch-mode battery charging circuitry” cannot regulate or manage battery charging. Ex. 2010 ¶¶ 105–107, 147–148. Petitioner, on the other hand, does not present sufficient evidence that the identified “switch-mode” circuitry can regulate or manage

battery charging. Instead, Mr. Geier confirms that without charging circuits 103 (in Fig. 1) and 230 (in Fig. 2), the identified “switch-mode” circuitry in Kranzen would not charge a battery properly. *See* Ex. 2024, 82:20–83:10. Accordingly, we credit Dr. Fernald’s testimony that replacing Veselic’s battery charge controller with the identified “switch-mode” circuitry in Kranzen would render Veselic inoperable. *See* Ex. 2010 ¶ 216.

For the foregoing reasons, we find that Petitioner fails to establish by a preponderance of evidence that claims 3–11 of the ’655 patent are unpatentable under 35 U.S.C. § 103 as obvious over the combined teachings of Veselic, Vyssotski, and Kranzen.

F. Constitutionality

Patent Owner argues that this *inter partes* review proceeding is unconstitutional, and requests the denial of the Petition, because

it violates the due process clause and retroactively applies the AIA statute to patents issued prior to AIA’s enactment and because the APJs, exercising their patent cancellation authority, are principal officers under the Appointment Clause and have not been validly appointed to their positions.

PO Resp. 75.

We do not address Petitioner’s arguments. As the Supreme Court has cautioned, “[c]onstitutional questions obviously are unsuited to resolution in administrative hearing procedures and, therefore, access to the courts is essential to the decision of such questions.” *Califano v. Sanders*, 430 U.S. 99, 109 (1977); *see also Riggin v. Office of Senate Fair Emp’t Practices*, 61 F.3d 1563, 1569 (Fed. Cir. 1995) (“[T]he general rule [is] that

administrative agencies do not have jurisdiction to decide the constitutionality of congressional enactments.”).

G. Motion to Strike

Petitioner filed a Motion to Strike certain portions of Mr. Geier’s cross-examination testimony (Ex. 2030). Paper 43. We do not reach the merits of Petitioner’s Motion to Strike because our Decision does not rely on Exhibit 2030. Accordingly, we dismiss Petitioner’s Motion to Strike as moot.

IV. CONCLUSION

After reviewing the record and weighing the evidence offered by both parties, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 1–11 of the ’655 patent are unpatentable.

V. ORDER

It is, therefore,

ORDERED that Petitioner has not shown by a preponderance of the evidence that claims 1–11 of the ’655 patent are unpatentable;

FURTHER ORDERED that Petitioner’s Motion to Strike (Paper 43) is dismissed; 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.

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PETITIONER:

Charles McMahon
cmcmahon@mwe.com

Hersh Mehta
hmehta@mwe.com

Brian Jones
bajones@mwe.com

PATENT OWNER:

Hong Zhong
hzhong@irell.com

Michael Fleming
mfleming@irell.com