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Paper 12
Entered: September 25, 2013

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TEXAS INSTRUMENTS INCORPORATED
Petitioner

v.

UNIFI SCIENTIFIC BATTERIES, LLC
Patent Owner

Case IPR2013-00213
Patent 6,791,298 B2

Before JONI Y. CHANG, MICHAEL R. ZECHER, and JUSTIN T. ARBES, *Administrative Patent Judges.*

ARBES, *Administrative Patent Judge.*

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

Texas Instruments Incorporated filed a Petition ("Pet.") to institute an *inter partes* review of claims 1 and 4-18 of U.S. Patent No. 6,791,298 B2 (the "'298 patent") pursuant to 35 U.S.C. § 311 *et seq*. Patent Owner Unifi Scientific Batteries, LLC filed a preliminary response ("Prelim. Resp.") to the Petition. We have jurisdiction under 35 U.S.C. § 314. For the reasons that follow, the Board has determined to institute an *inter partes* review.

I. BACKGROUND

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a):

> THRESHOLD—The Director may not authorize an inter partes review to be instituted unless the Director determines that the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.

Petitioner challenges claims 1 and 4-18 as unpatentable under 35 U.S.C. § 103(a). Pet. 9-59. We grant the Petition as to claims 1 and 4-18 on certain grounds of unpatentability as discussed below.

A. The '298 Patent (Ex. 1009)

The '298 patent, entitled "Monolithic Battery Charging Device," issued on September 14, 2004 based on Application No. 10/288,177, filed November 5, 2002, which claims priority to Provisional Application No. 60/337,301, filed November 5, 2001.

The '298 patent relates to "monolithically formed battery charging devices having at least one voltage step-down direct-current-to-direct-current [DC-DC] converter." Col. 1, ll. 25-28. A step-down DC-DC

converter "provides an output voltage that is stepped down from (i.e., less than) an applied input voltage." Col. 1, ll. 33-38. Because the output voltage is less than the input voltage, the output current can be greater than the input current. Col. 1, ll. 42-46. A step-down DC-DC converter may be used to charge a rechargeable battery and may be characterized by its "duty ratio," which is the ratio of the output voltage to the input voltage. Col. 1, ll. 46-64.

The '298 patent describes how prior art step-down DC-DC converters used certain external components (e.g., transformers, inductors, and capacitors), which increased the package size and resulting cost to manufacture. Col. 2, ll. 31-46. As a result, manufacturers began using "monolithic" DC-DC converters, but such converters also had problems, such as "high inductor current, inductor saturation and switch saturation, which result in low efficiency and small duty ratios." Col. 2, ll. 47-56. The '298 patent states that there was a need in the art for "an efficient, monolithically-formed-step-down DC-DC converter that can supply enough drive current to charge a battery without inductor and switch saturation" and that can "provide small as well as large duty ratios." Col. 2, ll. 57-62.

Figure 1 of the ’298 patent is reproduced below:

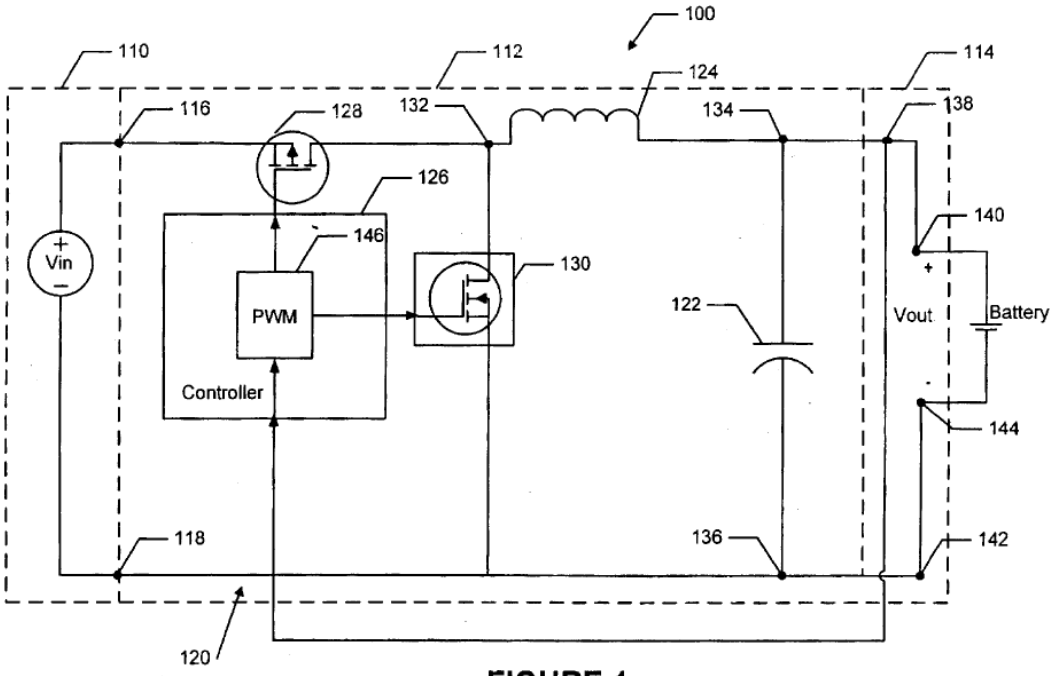

FIGURE 1

As shown in Figure 1 above, monolithic battery charger 100 comprises (1) an external DC input supply 110 that supplies an input voltage V_{in} and corresponding input current; (2) a step-down converter 112; and (3) a battery-terminal interface 114 that supplies an output voltage V_{out} and corresponding output current to a rechargeable battery. Col. 4, ll. 1-33. Step-down converter 112 comprises a “monolithically-formed DC-DC converter 120 in standard buck-style configuration (hereinafter referred to as a ‘synchronous-buck regulator’),” which includes capacitor 122, inductor 124, controller 126, switch 128, and rectifier 130. Col. 4, ll. 48-57. The ’298 patent describes a process by which synchronous-buck regulator 120 performs a voltage step-down of input voltage V_{in} to output voltage V_{out}. Col. 7, l. 14-col. 8, l. 2.

B. Exemplary Claim

Claim 1 of the '298 patent is exemplary of the claims at issue:

1. A monolithic battery charger comprising:

a step-down converter having a duty ratio in the range of approximately 10 to approximately 95 and comprising at least one monolithically formed buck-type regulator coupled to a capacitor and an inductor, wherein the at least one monolithically formed buck-type regulator comprises a switching controller, a switch, and a rectifier in a standard buck configuration, and wherein the controller operates at a switching frequency of at least 1 megahertz; and

a battery-terminal interface connected to the step-down converter for providing an output current and an output voltage to a rechargeable battery.

C. The Prior Art

Petitioner relies on the following prior art:

1. U.S. Patent No. 5,483,182, issued Jan. 9, 1996 ("Rybicki") (Ex. 1015);

2. U.S. Patent No. 6,437,549 B1, filed Aug. 31, 2000, issued Aug. 20, 2002 ("Takagishi") (Ex. 1016);

3. A.J. Forsyth & S.V. Mollov, "Modelling and Control of DC-DC Converters," *Power Engineering Journal*, Oct. 1998, pp. 229-36 ("Forsyth") (Ex. 1013);

4. *Si9167: 600-mA Synchronous Buck Converter for 2-Cell Li+ Cellular Phones*, Vishay Siliconix, Aug. 23, 1999 ("Si9167 Datasheet") (Ex. 1014);

5. Haruo Nakazawa *et al*., "Micro-DC/DC Converter that Integrates Planar Inductor on Power IC," *IEEE Transactions on Magnetics*, Vol. 36, No. 5, Sept. 2000, pp. 3518-20 ("Nakazawa") (Ex. 1012); and

6. *TPS62000, TPS62001, TPS62002, TPS62003, TPS62004, TPS62005, TPS62006, TPS62007 High-Efficiency Step-Down Low Power DC-DC Converter*, Texas Instruments Inc., Feb. 2001 ("TPS62000 Datasheet") (Ex. 1017).

D. The Asserted Grounds

Petitioner challenges claims 1 and 4-18 of the '298 patent under 35 U.S.C. § 103(a) on the following grounds:

References	**Claims Challenged**
TPS62000 Datasheet and Forsyth	1 and 4-18
Nakazawa and Forsyth	1, 4-10, 13, 14, 17, and 18
Takagishi and Si9167 Datasheet	1 and 4-18
Takagishi and Rybicki	1 and 4-18

E. Claim Interpretation

Consistent with the statute and legislative history of the America Invents Act (AIA), the Board interprets claims using the "broadest reasonable construction in light of the specification of the patent in which [they] appear[]." 37 C.F.R. § 42.100(b); *see also* Office Patent Trial Practice Guide, 77 Fed. Reg. 48756, 48766 (Aug. 14, 2012). There is a "heavy presumption" that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002). However, a "claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history." *Id*. "Although an inventor is indeed free to define the specific terms used to

describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Also, we must be careful not to read a particular embodiment appearing in the written description into the claim if the claim language is broader than the embodiment. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993) ("[L]imitations are not to be read into the claims from the specification.").

For purposes of this decision, we construe certain claim limitations as follows:

1. Preamble of Claim 1

Claim 1 recites a "monolithic battery charger" comprising a "step-down converter" and a "battery-terminal interface connected to the step-down converter for providing an output current and an output voltage to a rechargeable battery." In interpreting the language of claim 1, we must determine whether the preamble limits the claimed invention.

"In general, a preamble limits the invention if it recites essential structure or steps, or if it is 'necessary to give life, meaning, and vitality' to the claim. Conversely, a preamble is not limiting 'where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention.'" *Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (citations omitted). In claim 1, the recitation of a "battery charger" in the preamble describes fundamentally what the claimed apparatus is, not merely how it is intended to be used. *See Vizio, Inc. v. ITC*, 605 F.3d 1330, 1340 (Fed. Cir. 2010) ("[T]he 'for decoding' language . . . is properly construed as

a claim limitation, and not merely a statement of purpose or intended use for the invention, because 'decoding' is the essence or a fundamental characteristic of the claimed invention."). This is reinforced by the body of the claim, which recites providing an output current and voltage to a "rechargeable battery," as well as the Specification of the '298 patent, which describes various exemplary embodiments of a "monolithic battery charger" that charges a battery. *See, e.g.*, Ex. 1009, Abstract; col. 1, ll. 25-28; col. 2, l. 65-col. 3, l. 32; *see also On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1343 (Fed. Cir. 2006) (preamble was limiting where "the entirety of the claim implements the preamble's high speed manufacture of a single copy" and "[t]he preamble embraces the totality of these limitations, and limits the claim to the subject matter of the preamble"); *Poly-America, L.P. v. GSE Lining Tech., Inc.*, 383 F.3d 1303, 1309-10 (Fed. Cir. 2004) ("blown-film" in the preamble was limiting where the specification was "replete with references to the invention as a 'blown-film' liner" and described it as a fundamental characteristic of the invention). Applying the broadest reasonable interpretation of the claim in light of the Specification, we conclude that the preamble's recitation of a "monolithic battery charger" limits the claimed invention.

2. "Duty Ratio in the Range of Approximately 10 to Approximately 95" (Claim 1)

Claim 1 recites "a step-down converter having a duty ratio in the range of approximately 10 to approximately 95." Petitioner argues that "duty ratio in the range of approximately 10 to approximately 95" should be interpreted to include "range values expressed as a unitless digit or as a

percent."[1] Pet. 5. Patent Owner contends that the duty ratio of a step-down converter is "a fraction between zero and one, or a percentage between zero and 100," and a person of ordinary skill in the art would understand a range of 10-95 to represent a percentage and a range of 0.1-0.95 to represent a numerical ratio value. Prelim. Resp. 14.

The Specification explains that a duty ratio is the ratio of the "output voltage to the input voltage" (i.e., V_{out}/V_{in}), which, in the case of a step-down converter, will be less than one. *See* Ex. 1009, col. 1, ll. 46-55. The Specification further describes a specific duty ratio of "approximately 10 to 95 percent." *Id*., col. 2, ll. 65-67; col. 3, ll. 27-30. While claim 1 does not use the term "percent," a person of ordinary skill in the art would read the claim language in light of the disclosures in the Specification and would understand "approximately 10 to approximately 95" to refer to percentages. Applying the broadest reasonable interpretation of the claim in light of the Specification, for purposes of this decision, we interpret "duty ratio in the range of approximately 10 to approximately 95" to mean a duty ratio of approximately 10% to approximately 95%.[2]

[1] Petitioner also argues that "[u]nder the standard applied in litigation," a court could not rewrite the claim phrase to recite percentages "even if the claim as issued produces a nonsensical result." Pet. 5. Our function, however, is to determine the broadest reasonable interpretation of the claim in light of the Specification, not how the claim would be interpreted under any other standard. *See* 37 C.F.R. § 42.100(b).

[2] Although the meaning of the claim phrase is ascertainable in light of the Specification, Patent Owner will have an opportunity to move to amend the claims to correct the measure of the range. *See* 37 C.F.R. § 42.121(a).

3. "Monolithically Formed" (Claim 1)

Claim 1 recites "a step-down converter . . . comprising at least one monolithically formed buck-type regulator." The parties do not propose any interpretation for the term "monolithically formed." One dictionary defines "monolithic" as a "[t]erm applied to an integrated circuit in which all the elements are formed *in situ* within a *single* semiconductor chip." NEWNES DICTIONARY OF ELECTRONICS at 204 (1999) (Ex. 3001) (emphasis added). The Specification of the '298 patent provides a number of examples of "monolithically formed" components, such as a "monolithically formed coupling capacitor" that is "preferably integrated into . . . the *same package or wafer die* as the synchronous buck converter." Ex. 1009, col. 6, ll. 45-64 (emphasis added). Applying the broadest reasonable interpretation of the claim in light of the Specification, we interpret "monolithically formed" to mean formed in a single integrated circuit package or wafer die.

4. Other Terms

All other terms in claims 1 and 4-18 are given their ordinary and customary meaning as would be understood by one with ordinary skill in the art and need not be further construed at this time.

II. DISCUSSION

We turn now to Petitioner's asserted grounds of unpatentability and Patent Owner's arguments in its preliminary response to determine whether Petitioner has met the threshold standard of 35 U.S.C. § 314(a).

A. Whether the Petition Should be Denied for Failure to Interpret the Claims

As an initial matter, Patent Owner in its preliminary response argues that the Petition should be denied as incomplete because Petitioner contends that the broadest reasonable construction should be applied to all terms, but "provides no explanation or description as to what that broadest reasonable construction should be." Prelim. Resp. 13-14. We disagree.

A petition for *inter partes* review must state "[h]ow the challenged claim is to be construed" and "[h]ow the construed claim is unpatentable." 37 C.F.R. § 42.104(b). Petitioner in its Petition proposes an interpretation for one term ("duty ratio in the range of approximately 10 to approximately 95"), explains why that term should be interpreted as proposed, and argues that all other terms should be given their broadest reasonable interpretation. Pet. 5. While we conclude that two additional terms require interpretation, *see supra* Section I.E, Petitioner stated sufficiently its position as to how the challenged claims should be interpreted. Moreover, Patent Owner does not identify any specific terms it believes Petitioner should have interpreted or contend that it is unable to respond to Petitioner's grounds of unpatentability because of the alleged deficiency. Thus, we are not persuaded that the Petition should be denied for failure to interpret the claims.

B. Asserted Ground Based on the TPS62000 Datasheet and Forsyth

Petitioner contends that claims 1 and 4-18 are unpatentable over the TPS62000 Datasheet and Forsyth under 35 U.S.C. § 103(a). Pet. 32-42. To support its assertions, Petitioner relies on the Declaration of Dr. Robert W. Erickson (Ex. 1018). We are persuaded that Petitioner has established a

reasonable likelihood of prevailing on its assertion that claims 1 and 4-18 are unpatentable for the reasons explained below.[3]

1. The TPS62000 Datasheet (Ex. 1017)

The TPS62000 Datasheet is a product datasheet describing various models of a "High-Efficiency Step-Down Low Power DC-DC Converter." Ex. 1017 at 1. The datasheet states that the TPS6200x devices are "low-noise synchronous step-down dc-dc converters that are ideally suited for systems powered from a 1-cell Li-ion battery or from a 2- to 3-cell NiCd, NiMH, or alkaline battery. The TPS6200x operates typically down to an input voltage of 1.8 V, with a specified minimum input voltage of 2 V." *Id.* The TPS6200x devices have a "2 V to 5.5 V Operating Input Voltage Range," "Adjustable Output Voltage Range From 0.8 V to V_I," and "Up to 600 mA Output Current." *Id.*

[3] We note that Petitioner contends that the challenged claims are not entitled to the November 5, 2001 filing date of Provisional Application No. 60/337,301, and instead have an effective filing date of November 5, 2002, the filing date of the application that issued as the '298 patent. Pet. 7-8. We need not resolve this issue at this time, however, because, based on the current record, both references on which a trial is instituted (the TPS62000 Datasheet and Forsyth) qualify as prior art under at least one provision of 35 U.S.C. § 102 even if the claims are entitled to the earlier filing date.

Figure 15 of the TPS62000 Datasheet is reproduced below:

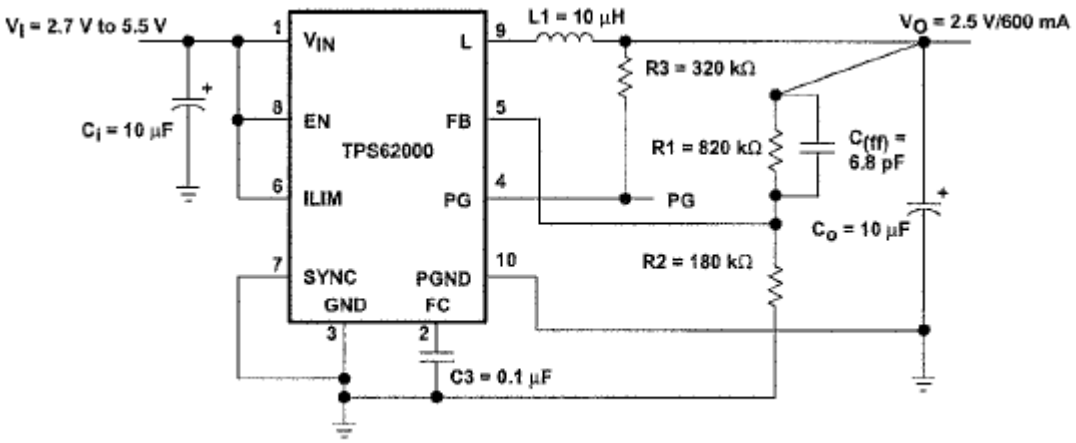

Figure 15. Typical Application Circuit for Adjustable Output Voltage Option

Id. at 14. The circuit depicted in Figure 15 above includes a capacitor C_0 and inductor L1, and has an input voltage of 2.7-5.5 V and output voltage of 2.5 V, reflecting a duty ratio range of approximately 45% (2.5 V / 5.5 V) to 92% (2.5 V / 2.7 V). *See id*.

2. Forsyth (Ex. 1013)

Forsyth is a "tutorial article" for DC-DC converters. Ex. 1013 at 1. Forsyth discloses:

> *DC-DC converters are some of the simplest power electronic circuits. They are widely used in the power supply equipment for most electronic instruments and also in specialised high-power applications such as battery charging, plating and welding.* In addition to a controllable and theoretically lossless DC voltage transformation, DC-DC converter circuits may also provide voltage isolation through the incorporation of a small high-frequency transformer. The wide variety of circuit topologies ranges from the Single-transistor buck, boost and buck/boost converters to complex configurations comprising two or four devices and employing soft-switching or resonant techniques to control the

> switching losses. However, similar methods of analysis and control are applied to many of these converters.

Id. (emphasis added). Forsyth describes a variety of DC-DC converters, such as a buck converter. *See id*. at 1-8, Fig. 1.

3. Independent Claim 1

Petitioner contends that the TPS62000 Datasheet discloses all of the limitations of claim 1 except the limitations of a "battery charger" and "providing an output current and an output voltage to a rechargeable battery." Pet. 32-36. For example, Petitioner argues that the TPS62000 Datasheet discloses a "monolithically formed buck-type regulator" comprising a "switching controller" (shown in the figure on page 3 of the reference, including "PFM/PWM [pulse frequency modulation/pulse width modulation] Control Logic," "Driver Shoot-Through Logic," and an "Oscillator") and a "switch" and "rectifier" (the P-Channel and N-Channel Power MOSFETs shown in the figure on page 3), and coupled to a "capacitor" (C_0 in Figure 15) and "inductor" (L1 in Figure 15). *Id*. at 34-35 (citing Ex. 1018 ¶ 30).

Petitioner relies on Forsyth for the battery charging limitations of claim 1, citing Forsyth's statement that DC-DC converters are "widely used . . . in specialised high-power applications such as battery charging." *Id*. at 33, 36 (citing Ex. 1013 at 1). Petitioner also relies on the analysis of Dr. Erickson, who testifies that it was "well-known in the art at the time of the invention to use DC-DC converters, and in particular buck or step-down DC-DC converters, as battery chargers," as evidenced by the statement in Forsyth. Ex. 1018 ¶ 36; *see* Pet. 33, 36. According to Dr. Erickson, modifying the circuit in Figure 15 of the TPS62000 Datasheet to use the

output node V_O as an interface to a rechargeable battery would be a "matter of routine design choice" suggested by Forsyth. Ex. 1018 ¶ 36. Upon review of Petitioner's analysis and supporting declaration, we are persuaded that Petitioner's asserted ground of unpatentability of claim 1 based on the TPS62000 Datasheet and Forsyth has merit.

Patent Owner makes three arguments. First, Patent Owner argues that a person of ordinary skill in the art would not have combined the teachings of the two references because, while Forsyth describes a variety of DC-DC converters, it does not teach using a "synchronous buck-type switching regulator" of the type described in the TPS62000 Datasheet to charge a battery. Prelim. Resp. 35-36. From this, Patent Owner infers that Forsyth must not have been "referring to synchronous step-down converters" when it stated broadly that DC-DC converters can be used for battery charging. *Id.*

Patent Owner's argument is not persuasive. Petitioner relies on the TPS62000 Datasheet's description of a particular DC-DC converter and relies on Forsyth for the suggestion that a DC-DC converter can be used to charge a battery. Pet. 32-36. The fact that Forsyth does not disclose the *specific* DC-DC converter disclosed in the TPS62000 Datasheet does not mean necessarily that a person of ordinary skill in the art would not have looked to Forsyth as a secondary reference. Given Forsyth's unrestricted statement that DC-DC converters in general are "widely used . . . in specialised high-power applications such as battery charging," as well as the analysis of Dr. Erickson, Petitioner has shown a sufficient basis for combining the references. *See* Ex. 1013 at 1; Ex. 1018 ¶ 36.

Second, Patent Owner contends that using the converter described in the TPS62000 Datasheet to charge a battery would cause the converter to

"break down and destroy the purpose and function of the converter." Prelim. Resp. 36-38. Patent Owner cites another reference, Takagishi, which discloses that "[m]ost switching regulators available [in 2000 when Takagishi was filed were] not intended to be used as battery chargers." Ex. 1016, col. 1, ll. 48-49; *see* Prelim. Resp. 37-38. Takagishi states that one reason for this was that a battery can supply power *to* or receive power *from* a switching regulator:

> [T]he entire switching regulator is (in some sense) symmetric in that it can either transmit power from its input to its output (the normal "buck" direction), or it can transmit power from its output to its input (the reverse "boost" direction). As a result, if the primary power source (e.g., input) is turned off, the synchronous buck switching regulator can draw power from the battery and charge its input filter capacitor. The voltage on the input filter capacitor will increase until some component breaks down. This is a problem that requires special attention on the part of a charger designer.

Ex. 1016, col. 1, l. 63-col. 2, l. 6. According to Patent Owner, the TPS62000 Datasheet does not account for this problem or indicate that the disclosed circuit could be used for battery charging. Prelim. Resp. 37-38.

Patent Owner does not point to sufficient and credible evidence demonstrating that the specific converter in the TPS62000 Datasheet would suffer the problems described in Takagishi or that, even if that were the case, a person of ordinary skill in the art would not have been able to overcome such problems. Indeed, Takagishi itself describes a prior art "attempted solution" of adding a "large, high current rectifier diode in series with the output filter inductor," as well as Takagishi's own improved battery charger. *See* Ex. 1016, col. 2, ll. 7-19; col. 2, l. 52-col. 5, l. 47. Thus, we are not persuaded that an ordinarily skilled artisan would not have been able to

combine the references due to the problem described in Takagishi. Further, we note that it is often necessary and within the level of ordinary skill in the art to modify the teachings of two references in order to combine them. *See In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983) ("[I]t is not necessary that the inventions of the references be physically combinable to render obvious the invention under review."); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.").

Third, Patent Owner argues that Forsyth teaches away from the use of a monolithically formed buck-type regulator as a battery charger because Forsyth discloses, in discussing a particular type of circuit, that control systems using dedicated integrated circuits are "the most appropriate for many DC-DC converter applications due to their low cost and high speed." Ex. 1013 at 3, Fig. 3; *see* Prelim. Resp. 38-39. This argument also is not persuasive. Petitioner does not rely on Forsyth for the particular circuit structure (Figure 3) cited by Patent Owner, but rather for the general suggestion to use a DC-DC converter for charging a battery. Moreover, the fact that Forsyth discloses a particular circuit as the "most appropriate" for "many" applications does not mean that it teaches away from the monolithically formed buck-type regulator of claim 1. A reference does not teach away if it expresses merely a general preference for an alternative invention from amongst options available to the ordinarily skilled artisan and the reference does not "criticize, discredit, or otherwise discourage the solution claimed." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004).

Patent Owner does not point to statements in Forsyth criticizing or discrediting the use of monolithically formed buck-type regulators of the type recited in claim 1.

We are persuaded that Petitioner's analysis is sufficient to demonstrate a reasonable likelihood that claim 1 is unpatentable over the combination of the TPS62000 Datasheet and Forsyth.

4. Dependent Claims 4-18

Petitioner contends that dependent claims 4-18 are unpatentable over the TPS62000 Datasheet and Forsyth, citing the analysis of Dr. Erickson. Pet. 36-42; Ex. 1018 ¶¶ 29-39. Patent Owner argues that Dr. Erickson's testimony is unsupported as to claims 6, 10, 12, and 16, and, therefore, Petitioner has not met its burden as to those claims. Prelim. Resp. 47-51. Upon review of Petitioner's analysis and supporting declaration, we are persuaded that Petitioner has demonstrated a reasonable likelihood of prevailing as to the challenged dependent claims.

Claim 6

Claim 6 recites a "P-type Metal Oxide Semiconductor switch compris[ing] a plurality of P-type Metal Oxide Semiconductor Field Effect Transistors." Dr. Erickson acknowledges that the P-Channel Power MOSFET on page 3 of the TPS62000 Datasheet does not have multiple transistors, but states:

> At the time of the invention, it was well-known to replace one transistor with many as a matter of obvious design choice to, for example, distribute current over several parallel transistors. Having this type of arrangement can achieve a lower

> on-resistance and lower losses. Because the on-resistance and forward voltage drop of the MOSFETs have a positive temperature coefficient, it is easy to place them in parallel. Therefore, one skilled in the art at the time of the invention would have reason to replace the P-Channel Power MOSFET with many as claimed in Claim 6 of the '298 Patent.

Ex. 1018 ¶ 37; *see* Pet. 37. Patent Owner argues that this analysis is factually unsupported, and "[a]dding more components to an already complicated circuit and then monolithically forming the modified circuit would not appear to be intuitive let alone obvious to one skilled in the art." Prelim. Resp. 47-49.

Patent Owner's arguments are not persuasive. While Dr. Erickson does not cite a secondary reference that teaches a plurality of transistors, he provides a number of reasons why a person of ordinary skill in the art would have modified the circuitry of the TPS62000 Datasheet to have a second transistor (in addition to the one cited by Petitioner for claim 5, which Patent Owner does not argue). Specifically, Dr. Erickson testifies that "it was well-known to replace one transistor with [a plurality of transistors] as a matter of obvious design choice to, for example, distribute current over several parallel transistors"—a fact that is not disputed with evidence by Patent Owner. *See* Ex. 1018 ¶ 37. Dr. Erickson also testifies that having a plurality of transistors can "achieve a lower on-resistance and lower losses." *Id*. Patent Owner does not argue that using two transistors in the TPS62000 Datasheet circuitry was not possible or cite evidence showing that the reasons submitted by Dr. Erickson are incorrect. Given the straightforward nature of the limitation at issue in claim 6 (a plurality of transistors as opposed to one), and absent sufficient and credible evidence refuting

Dr. Erickson's opinions, on this record, we are persuaded that the analysis is sufficient to demonstrate a reasonable likelihood of prevailing as to claim 6.

Claim 10

Claim 10 recites that the switching controller provides a "first trigger" to a synchronous switch and a "second trigger" to a synchronous rectifier, wherein:

> the switching controller asynchronously provides a first trigger to the synchronous switch and a second trigger to the synchronous rectifier in synchrony, wherein when the first trigger causes the synchronous switch to cycle from an on state to an off state, the second trigger causes the synchronous rectifier to cycle from an off state to an on state, and wherein when the first trigger causes the synchronous switch to cycle from the off state to the on state, the second trigger causes the synchronous rectifier to cycle from the on state to the off state.

According to Dr. Erickson, this functionality is known in the art as "break-before-make" functionality. Ex. 1018 ¶ 35; *see* Pet. 38-39. Dr. Erickson testifies that with "break-before-make" functionality, the synchronous switch is turned off a short time before the synchronous rectifier is turned on, which prevents both the synchronous switch and rectifier from conducting simultaneously and causing a "shoot-through current" that might damage components of the device. Ex. 1018 ¶ 35. Dr. Erickson opines that the "Driver Shoot-Through Logic" in the TPS62000 Datasheet has "break-before-make" functionality, citing the reference's statement that it provides a "minimum dead time [to] prevent[] shoot through current." Ex. 1018 ¶ 35 (citing Ex. 1017 at 3-4).

Patent Owner does not dispute Dr. Erickson's conclusion that claim 10 describes "break-before-make" functionality or his explanation of how

such functionality works. Rather, Patent Owner argues that the TPS62000 Datasheet (as well as the other prior art references cited by Petitioner) does not describe the use of first and second "triggers" to control the switch and rectifier, as recited in claim 10. Prelim. Resp. 50-51. However, Petitioner's position, supported by the testimony of Dr. Erickson, is that the limitations of claim 10, including the recited "triggers," amount *collectively* to "break-before-make" functionality and that the "Driver Shoot-Through Logic" in the TPS62000 Datasheet performs such functionality. On this record, and absent evidence to the contrary, only attorney argument, we credit Dr. Erickson's testimony and are persuaded that Petitioner has made a sufficient showing as to claim 10.

Claims 12 and 16

Claims 12 and 16 each recite a "switching controller compris[ing] a single gate driver and a buffer driver." Dr. Erickson testifies that:

> Similar to pulse-width-amplifier 263 and buffer driver 251 of FIGS. 2 and 3 of the '298 Patent, the PWM comparator/PWM logic and driver logic, respectively, operate like pulse-width-amplifier 263 and buffer driver 251. Therefore, one of ordinary skill in the art would recognize that the PWM logic and driver logic, respectively, form [the] "single gate driver" and "buffer driver" as claimed in Claims 11, 12, 15, and 16 of the '298 Patent.

Ex. 1018 ¶ 38; *see* Pet. 40. Patent Owner contends that even if the cited components in the TPS62000 Datasheet "operate like" the components described in the Specification of the '298 patent as Dr. Erickson suggests, that is not enough to show that they are actually a "single gate driver" and "buffer driver" as recited in claims 12 and 16. Prelim. Resp. 49-50.

Patent Owner mischaracterizes Dr. Erickson's testimony. Dr. Erickson describes the operation of the PWM logic and driver logic in the TPS62000 Datasheet and, based on that operation, identifies the former as the claimed "single gate driver" and the latter as the claimed "buffer driver." Ex. 1018 ¶ 38. Patent Owner in its preliminary response does not provide sufficient and credible evidence demonstrating that this identification is incorrect. Further, Dr. Erickson's statement that the TPS62000 components "operate[] like" the corresponding components in the Specification of the '298 patent, while not sufficient by itself because it compares to an exemplary embodiment rather than the claims themselves, lends support to Dr. Erickson's claim reading because the cited components are examples of what is recited in the claims. *See id*. ¶¶ 24, 38. At this stage of the proceeding, Petitioner's analysis and the testimony of Dr. Erickson are sufficient to demonstrate a reasonable likelihood of prevailing as to claims 12 and 16.

Finally, Patent Owner argues generally that Dr. Erickson's declaration is conclusory and should be excluded or given little weight. Prelim. Resp. 52-55. We have reviewed the declaration and determine that it supports Petitioner's analysis as to all of the challenged claims. Petitioner has demonstrated a reasonable likelihood that claims 1 and 4-18 are unpatentable based on the combination of the TPS62000 Datasheet and Forsyth.

C. Additional Asserted Grounds

Petitioner contends that claims 1, 4-10, 13, 14, 17, and 18 are unpatentable over Nakazawa and Forsyth under 35 U.S.C. § 103(a). Pet.

42-58. Similar to Petitioner's asserted ground regarding the combination of the TPS62000 Datasheet and Forsyth, Petitioner relies on Nakazawa for the majority of limitations of claim 1 and relies on Forsyth for the limitation of using a buck converter as a battery charger. *See id*. at 42-48. Petitioner also contends that claims 1 and 4-18 are unpatentable over Takagishi and the Si9167 Datasheet under 35 U.S.C. § 103(a), and over Takagishi and Rybicki under 35 U.S.C. § 103(a). *Id*. at 11-32. The additional asserted grounds are denied as redundant in light of our determination that there is a reasonable likelihood that the challenged claims are unpatentable based on the TPS62000 Datasheet and Forsyth. *See* 37 C.F.R. § 42.108.

D. Conclusion

We conclude that Petitioner has demonstrated a reasonable likelihood of prevailing on the following ground of unpatentability asserted in the Petition:

Claims 1 and 4-18 under 35 U.S.C. § 103(a) as unpatentable over the TPS62000 Datasheet and Forsyth.

The Board, however, has not made a final determination under 35 U.S.C. § 318(a) with respect to the patentability of the challenged claims.

E. Joinder

The AIA permits joinder of *inter partes* review proceedings:

> (c) JOINDER.—If the Director institutes an inter partes review, the Director, in his or her discretion, may join as a party to that inter partes review any person who properly files a petition under section 311 that the Director, after receiving a preliminary response under section 313 or the expiration of the

> time for filing such a response, determines warrants the institution of an inter partes review under section 314.

35 U.S.C. § 315(c); *see* 37 C.F.R. § 42.122(a) ("[w]here another matter involving the patent is before the Office, the Board may during the pendency of the *inter partes* review enter any appropriate order regarding the additional matter including providing for the stay, transfer, consolidation, or termination of any such matter"). The Board's rules for AIA proceedings "shall be construed to secure the just, speedy, and inexpensive resolution of every proceeding." 37 C.F.R. § 42.1(b); *see* Office Patent Trial Practice Guide, 77 Fed. Reg. at 48758.

On April 4, 2013, after the Petition in the instant proceeding was filed, Samsung Electronics Co., Ltd. ("Samsung") filed a petition to institute an *inter partes* review of claims 1, 4-10, 13, 14, 17, and 18 of the '298 patent. *See* IPR2013-00236, Paper 1 at 2. In a decision entered concurrently with this decision, Samsung's petition is granted as to claims 1, 4-10, 13, 14, 17, and 18. Thus, Case IPR2013-00236 overlaps with this proceeding as to claims 1, 4-10, 13, 14, 17, and 18. The parties should be prepared to discuss during the initial conference call whether this proceeding should be joined with Case IPR2013-00236, taking into account the need for a just, speedy, and inexpensive resolution of both proceedings.

III. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is granted as to claims 1 and 4-18 of the '298 patent;

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), *inter partes* review of the '298 patent is hereby instituted commencing on the

entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial;

FURTHER ORDERED that the trial is limited to the ground identified under the heading "Conclusion" above, and no other grounds set forth in the Petition as to claims 1 and 4-18 of the '298 patent are authorized; and

FURTHER ORDERED that an initial conference call with the Board is scheduled for 2:00 PM Eastern Time on October 16, 2013. The parties are directed to the Office Patent Trial Practice Guide, 77 Fed. Reg. 48756, 48765-66 (Aug. 14, 2012), for guidance in preparing for the initial conference call, and should come prepared to discuss any proposed changes to the Scheduling Order entered herewith and any motions the parties anticipate filing during the trial. The parties also should be prepared to discuss whether this proceeding should be joined with Case IPR2013-00236.

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