

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SMA SOLAR TECHNOLOGY AMERICA, LLC,
Petitioner,

v.

TIGO ENERGY, INC.,
Patent Owner.

IPR2023-00879
Patent 9,584,021 B2

Before JO-ANNE M. KOKOSKI, ELIZABETH M. ROESEL, and
JULIA HEANEY, *Administrative Patent Judges*.

ROESEL, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. *Background and Summary*

SMA Solar Technology America, LLC (“Petitioner”) filed a Petition (Paper 1, “Pet.”) seeking an *inter partes* review of claims 1–20 of U.S. Patent No. 9,584,021 B2 (Ex. 1001, “the ’021 Patent”). Tigo Energy, Inc. (“Patent Owner”) did not file a Preliminary Response. The Board instituted an *inter partes* review. Paper 9.

After institution, Patent Owner filed a Response (Paper 18, “PO Resp.”), Petitioner filed a Reply (Paper 19, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 24, “PO Sur-reply”). We held an oral hearing on August 6, 2024, and a transcript is in the record. Paper 30 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). We determine that Petitioner has not shown by a preponderance of the evidence that the challenged claims of the ’021 Patent are unpatentable.

B. *Related Matters*

The parties identify the following district court case as a related matter: *Tigo Energy Inc. v. SMA Solar Technology America LLC*, No. 22-cv-915-VAC (D. Del.) (“the related litigation”). Pet. 4; Paper 5, 2 (Patent Owner’s mandatory notices).

C. *The ’021 Patent (Ex. 1001)*

The ’021 Patent is titled “Systems and Methods for Enhanced Efficiency Auxiliary Power Supply Module.” Ex. 1001, code (54). The ’021 Patent discloses “a power supply for use in a solar electric production system.” *Id.* at code (57), 1:49–51, 1:60–61. “One application of the . . . disclosure is to power control circuits for a solar panel using the

power generated by the solar panel.” *Id.* at 2:61–63. An objective is to enhance efficiency for auxiliary power supply modules in photovoltaic systems that convert sunlight into electricity. *Id.* at 1:22–25, 2:43–60.

The '021 Patent includes the following description:

One of the problematic aspects of operating a controller in a solar power environment is the unreliability of the power source during the early morning hours as well as during late evening hours, when faint blue light allows the panel to generate a high voltage, but presents barely enough current to properly operate. As a result, circuits often create a “false start” in which the voltages appear to be there, but as soon as the controller becomes active there is a drop or brown out or power outage, leading to the undesirable occurrence of unstable or even meta-stable modes, which may occur more frequently for small processors.

Ex. 1001, 8:4–14.

Figure 4 of the '021 Patent is reproduced below.

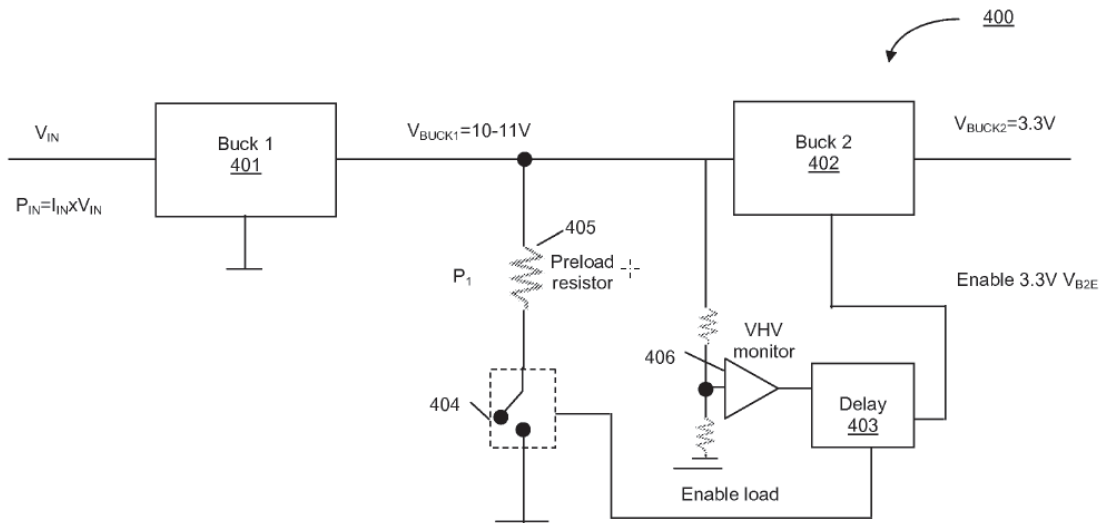


Figure 4

Figure 4 shows circuit 400 that may be used as an auxiliary power supply for a photovoltaic system. Ex. 1001, 8:15–19. The circuit includes buck

converter 401, buck converter 402, switch 404, delay circuit 403, preload resistor 405, and amplifier (VHV monitor) 406. *Id.* at 8:19–26. A buck converter is a type of step-down converter. *Id.* at 4:51–54. In operation, circuit 400 receives input voltage V_{IN} from a solar panel at buck converter 401, which outputs first voltage V_{BUCK1} . *Id.* at 9:64–10:1, Fig. 4. Voltage V_{BUCK1} powers preload resistor 405 when switch 404 is turned on by delay circuit 403. *Id.* at 8:33–40. Delay circuit 403 simultaneously suppresses buck converter 402. *Id.* at 8:40–41. If V_{BUCK1} is above a predefined threshold for the full delay period of delay circuit 403, then delay circuit 403 turns off switch 404 to provide power to buck converter 402. *Id.* at 8:41–45. Buck converter 402 then outputs second output voltage V_{BUCK2} to its load, such as a micro-controller, which is not shown in Figure 4. *Id.* at 8:30–32, 8:45–48, 8:53–57. The '021 Patent discloses that circuit 400

can be used to address the false start problem that occurs when the solar panel is able to provide enough output voltage when it is not connected to the output, but not enough to sustain even a small current provided by the buck converter (402) to its load, such as a control logic, a control circuit, a micro-controller, etc.

Id. at 8:26–32.

D. Illustrative Claims

Petitioner challenges claims 1–20 (all claims) of the '021 Patent. Claims 1, 10, and 18 are independent and are reproduced below.

1. A method to supply power, the method comprising:

providing a power supply having a first stage and a second stage, wherein the first stage converts power from a direct current input into a first output, and the second stage powered by the first output has a second output for a micro-controller;

connecting the first output of the first stage to a switchable load to consume at least a portion of the first output while

disabling the second stage in supplying the second output to the micro-controller;

determining whether the first output from the first stage powering the switchable load is above a threshold during a time period in which the second output to the micro-controller is disabled; and

in response to a determination that the first output from the first stage powering the switchable load is above the threshold during the time period in which the second output to the micro-controller is disabled,

disconnecting the switchable load from the first output of the first stage; and

instructing the second stage to enable the second output to the micro-controller using power from the first output of the first stage.

Ex. 1001, 11:2–25.

10. A system to supply power, the system comprising:

a power source to provide a direct current input;

a first stage power converter configured to convert the direct current input into a first output;

a second stage power converter configured to be powered by the first output to generate a second output;

a micro-controller powered by the second output;

a switchable load; and

a control circuit powered by the first output and configured to connect the first output to the switchable load to consume at least a portion of the first output while disabling the second stage power converter in supplying the second output to the micro-controller;

determine whether a voltage of the first output powering the switchable load is above a threshold during a time period in which the second output to the micro-controller is disabled; and

in response to the voltage being above the threshold during the time period in which the second output to the micro-controller is disabled, disconnect the switchable load from the first output of the first stage power converter and signal the second stage power converter to enable the second output to the micro-controller using power from the first output of the first stage power converter.

Id. at 11:66–12:25.

18. A system to supply power, the system comprising:

a photovoltaic panel to provide a direct current input;

a first stage power converter connected to the photovoltaic panel to generate a first output from the direct current input;

a second stage power converter connected to convert the first output to a second output;

a micro-controller;

a power absorption circuit; and

a control circuit coupled with the first stage power converter and the second stage power converter, the control circuit powered by the first output to control the second stage power converter, wherein

when the second stage power converter is disabled in providing the second output to the micro-controller, the control circuit monitors a voltage of the first output powering the power absorption circuit and signals the second stage power converter to continue disabling the providing of the second output to the micro-controller during a time period in which the voltage is below a threshold;

when the voltage is above the threshold, the control circuit signals the second stage power converter to enable the providing of the second output to the micro-controller.

Id. at 13:1–14:6.

E. Asserted Challenges to Patentability

Petitioner asserts the following challenges to patentability:

Claim(s) Challenged	35 U.S.C. §¹	Reference(s)/Basis
1–7, 9	102(b)	Mieth ²
1–12, 15–18, 20 ³	103(a)	Mieth, Balogh ⁴
13, 14	103(a)	Mieth, Balogh, Nishi ⁵
19	103(a)	Mieth, Balogh, Liu ⁶

Pet. 20.

F. Testimonial Evidence

The record includes initial and reply declarations of Douglas Holberg, Ph.D., submitted by Petitioner. Ex. 1007 (“Holberg Declaration”); Ex. 1023

¹ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”) amended 35 U.S.C. §§ 102 and 103 with an effective date of March 16, 2013. Because the ’021 patent claims priority to an application filed before March 16, 2013, we refer to the pre-AIA version of §§ 102 and 103. *See* Pet. 10 (discussing priority date).

² Ex. 1002, English translation of DE 37 25 476 A1 (Ex. 1008), published February 9, 1989 (“Mieth”). An incorrect version of Exhibit 1002 was filed with the Petition; with agreement of the parties, the incorrect version was expunged, and Petitioner filed a correct version of Exhibit 1002 on October 19, 2023. *See* Ex. 3001.

³ The Petition’s summary table lists only claims 1, 8, 10–12, 15–18, and 20 as challenged based on Mieth and Balogh. Pet. 20. But the body of the Petition challenges claims 1–12, 15–18, and 20 based on Mieth and Balogh. Pet. 50–77; *see* Pet. 55 (“Additionally, claims 2–7 and 9 are obvious in view of Mieth-Balogh . . .”). We therefore include the latter set of claims in our summary tables.

⁴ Ex. 1003, US 6,246,592 B1, issued June 12, 2001 (“Balogh”).

⁵ Ex. 1004, US 2005/0105224 A1, published May 19, 2005 (“Nishi”).

⁶ Ex. 1005, US 6,798,177 B1, issued September 28, 2004 (“Liu”).

(“Reply Declaration”). The record also includes Dr. Holberg’s deposition testimony submitted by Patent Owner. Ex. 2005.

II. ANALYSIS

A. Legal Standards

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)); *see also* 37 C.F.R. § 42.104(b) (requiring a petition for *inter partes* review to identify how the challenged claim is to be construed and where each element of the claim is found in the prior art patents or printed publications relied upon).

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987).

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter 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 based on 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 presented, objective evidence of

nonobviousness, i.e., secondary considerations.⁷ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

Additionally, the obviousness inquiry typically requires an analysis of “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring “articulated reasoning with some rational underpinning to support the legal conclusion of obviousness”)). Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements,” but “must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

B. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art (“POSITA”) “would have had a bachelor’s degree in electrical engineering, or a similar discipline and at least two years of design experience with circuit design.” Pet. 22. Patent Owner does not dispute Petitioner’s contention, except to add that “a person may qualify as a POSITA with more education and less experience or vice versa.” PO Resp. 5.

We apply Petitioner’s articulation of the level of ordinary skill in the art, as modified by Patent Owner, and further modified to omit “at least,” which expands the range of experience with no upper bound, thus encompassing a person of extraordinary skill in the art. We determine that the foregoing is consistent with the level of skill in the art at the time of the

⁷ In this case, neither party addresses objective evidence of nonobviousness.

invention as reflected in the specification of the '021 Patent and the asserted prior art.

C. Claim Construction

In an *inter partes* review, we apply the same claim construction standard as would be used by a district court to construe a claim in a civil action involving the validity or infringement of a patent. 37 C.F.R. § 42.100(b). Under that standard, claim terms are given their ordinary and customary meaning, as would have been understood by a person of ordinary skill in the art at the time of the invention, in light of the language of the claims, the specification, and the prosecution history of record. *Id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–19 (Fed. Cir. 2005) (en banc); *Thorner v. Sony Comput. Entm't Am. LLC*, 669 F.3d 1362, 1365–66 (Fed. Cir. 2012). “The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (quoting *Vivid Techs., Inc. v. Am. Sci. Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

We determine that no claim terms require express construction for purposes of resolving the controversy.

D. Anticipation

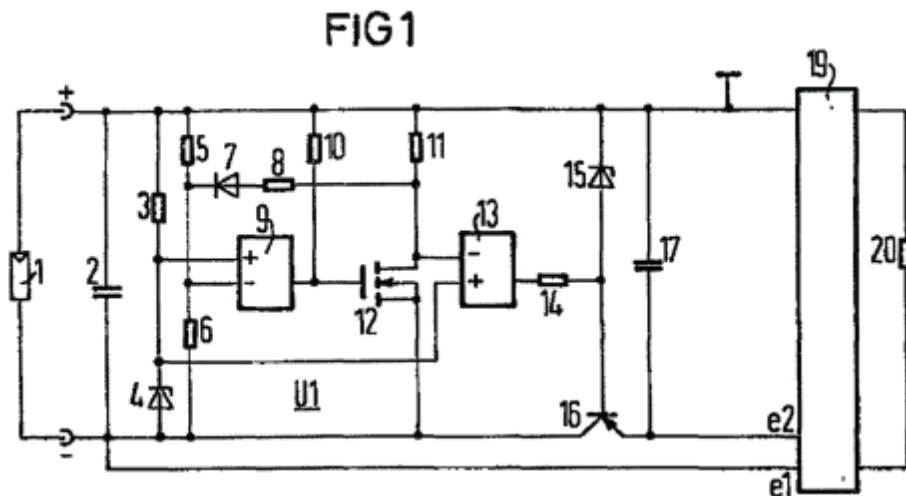
Petitioner challenges claims 1–7 and 9 as anticipated by Mieth. Pet. 23–50. Patent Owner opposes. PO Resp. 1–3, 10–33. We begin with an overview of Mieth.

1. Mieth (Ex. 1002)

Mieth is a German patent application titled “Circuit arrangement for supplying power to an electrical load from an electrical energy source with

fluctuating performance.” Ex. 1002, code (54). The energy source with fluctuating performance may be a solar generator. *Id.* at 4:29–32. Mieth discusses problems with start-up operation when insufficient sunlight reaches the solar generator. *Id.* at 5:22–34. The objective of Mieth’s circuit arrangement is to provide reliable start-up operation. *Id.* at 6:1–4.

Figure 1 of Mieth is reproduced below:



Mieth’s Figure 1 shows a circuit arrangement for supplying power from a solar generator to an electrical load. Ex. 1002, 8:8–9. The Figure 1 circuit includes solar generator 1, capacitor 2, resistor 3, Zener diode 4, voltage divider consisting of resistors 5 and 6, division ratio dividing apparatus 7, resistor 8, comparator 9, switching apparatus U1, resistor 10, preliminary load 11, field-effect transistor 12, comparator 13, Zener diode 15, bipolar transistor 16, capacitor 17, power supply apparatus 19, and electrical load 20. *Id.* at 8:20–12:30, Fig. 1.

Solar generator 1 supplies power to electrical load 20. Ex. 1002, 8:20–23. Solar generator 1 provides supply voltage input e1 and auxiliary voltage input e2 to power supply apparatus 19, which provides its output to electrical load 20. *Id.* at 8:29–35, Fig. 1. As shown in Figure 1, capacitor 2

is connected in parallel with solar generator 1. *Id.* at 9:5–6. Switching apparatus U1 is connected in parallel with solar generator 1 and capacitor 2. *Id.* at 9:7–9.

Switching apparatus U1 includes comparator 9 connected by way of its positive input to a reference voltage generator and by way of its negative input to the tap of a voltage divider. Ex. 1002, 9:34–37. Zener diode 4 serves as the reference voltage generator and connects to solar generator 1 via resistor 3. *Id.* at 9:37–10:3. The output of comparator 9 is connected to field-effect transistor 12, which forms a first electronic switch in switching apparatus U1. *Id.* at 10:5–14. Switching apparatus U1 includes a feedback branch “arranged between the connection point of the field effect transistor 12 and the preliminary load 11 on one side and . . . at the negative input of the comparator 9 on the other side.” *Id.* at 10:22–25.

Switching apparatus U1 further includes bipolar transistor 16 that serves as a second electronic switch. Ex. 1002, 10:31–32. Transistor 16 is “connected by way of its collector to the negative pole of the solar generator 1 and is routed by way of its emitter to the auxiliary voltage input e2 of the power supply apparatus 19.” *Id.* at 10:33–36. “The emitter-collector path of the transistor 16 forms the switching path of the second electronic switch of the switching apparatus.” *Id.* at 11:1–4.

In operation, switching apparatus U1, depending on the voltage of solar generator 1, connects solar generator 1 to either preliminary load 11 or power supply apparatus 19. Ex. 1002, 9:9–13. If the voltage is below a predefined minimum value, switching apparatus U1 connects solar generator 1 to preliminary load 11. *Id.* at 9:15–32. If the voltage is above the predefined minimum value, switching apparatus U1 connects solar generator 1 to power supply apparatus 19. *Id.* Comparator 9 compares the

voltage of solar generator 1 with a reference voltage at Zener diode 4. *Id.* at 12:13–19. “If the generator voltage is too small, the field-effect transistor 12 serving as a circuit breaker has low resistance and the increased preliminary load formed by the resistor 11 is in effect. The bipolar transistor 16 is off here.” *Id.* “If the generator voltage rises above the predefined threshold voltage,” which can be 20 V in the case of a 36 V solar generator, “the transistor 12 is turned off and the transistor 16 is connected up and delivers auxiliary energy for the power supply apparatus 19 formed by a charging converter.” *Id.* at 12:21–26.

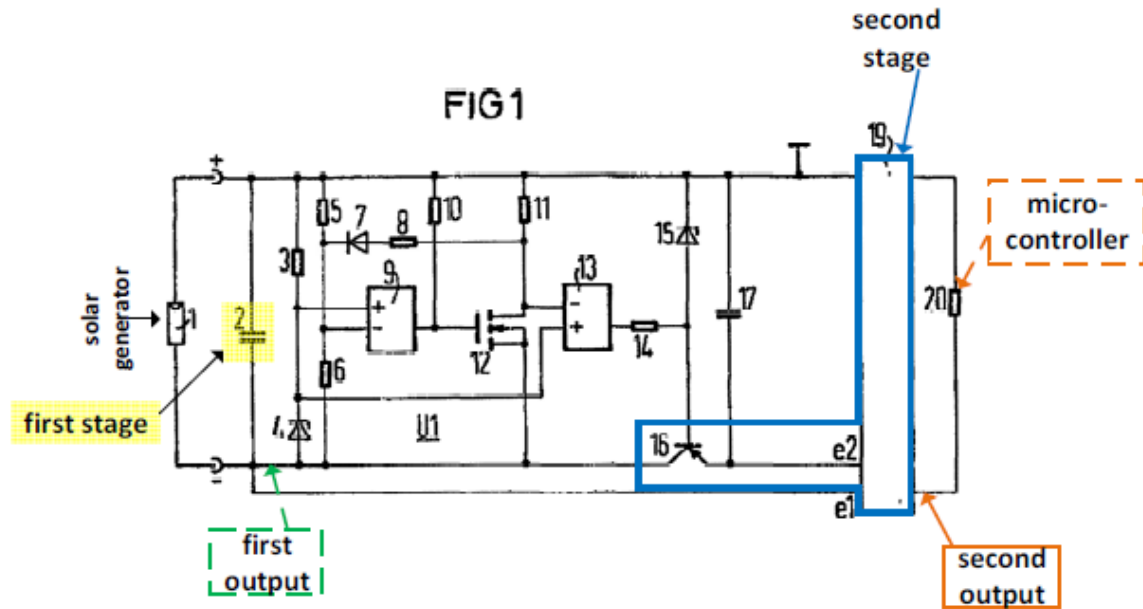
2. *Claim 1—Micro-controller Limitation*

Claim 1 recites a micro-controller. For example, the first step of the claimed method is “providing a power supply having a first stage and a second stage, wherein the first stage converts power from a direct current input into a first output, and the second stage powered by the first output has a second output for a micro-controller.” Ex. 1001, 11:3–7.

Addressing the micro-controller limitation of claim 1, Petitioner contends that a POSITA “would understand that a load in a circuit can be or include a micro-controller, as such the load 20 is analogous to the claimed micro-controller (dashed-orange).” Pet. 26 (emphasis and color-coding omitted;⁸ citing Ex. 1007 ¶ 105; Ex. 1014,⁹ 1180, Fig. 5). Petitioner illustrates its contention with the following annotation of Mieth’s Figure 1.

⁸ We quote this sentence of the Petition multiple times in the remainder of this Decision without repeating our parenthetical notation that emphasis and color-coding are omitted.

⁹ J. Arias et al., *A Modular PV Regulator Based on Microcontroller with Maximum Power Point Tracking*, IEEE IAS (Industrial Applications Society) 1178 (2004).



Ex.1002, Fig.1(annotated-1D.1)

Pet. 26. Petitioner’s annotation of Mieth’s Figure 1 labels load 20 as a “micro-controller” (dashed orange).

Patent Owner argues that “Mieth’s ‘load’ does not expressly or inherently disclose the claimed ‘microcontroller.’” PO Resp. 10–16.

In the Reply, Petitioner argues that “[l]oad 20 of Mieth constitutes a genus that encompasses the micro-controller as a species.” Pet. Reply 5–7 (citing Ex. 1023 ¶¶ 4–30). Alternatively, Petitioner argues that a POSITA “would reasonably understand or infer from Mieth that a micro-controller is disclosed therein.” *Id.* at 8 (emphasis omitted; citing Ex. 1023 ¶¶ 31–33).

After considering the parties’ arguments, we are not persuaded that Petitioner shows that Mieth discloses a micro-controller, as recited in claim 1.

To prove anticipation, Petitioner must show that every claim element is either expressly or inherently described in Mieth. *Verdegaal*, 814 F.2d at 631. For claim 1’s recitation of a micro-controller, Petitioner relies on

express disclosure, not inherent disclosure. Tr. 9:26 (“We never alluded that it was inherently disclosed.”). Petitioner fails to show that Mieth expressly discloses a micro-controller. The Petition argues that a POSITA “would understand that a load in a circuit can be or include a micro-controller, as such the load 20 is analogous to the claimed micro-controller.” Pet. 26. But Petitioner never points to any express disclosure of a micro-controller in Mieth.

In the Reply, Petitioner advances two legal theories of anticipation: “at once envisage” and “reasonably understand or infer.” Pet. Reply 5 (emphasis omitted). As discussed below, we are not persuaded Petitioner has proven anticipation under either theory.

a) At once envisage

For purposes of determining whether a prior art reference anticipates a patent claim, the prior art may be deemed to disclose each member of a genus “when, reading the reference, a person of ordinary skill can ‘at once envisage each member of this limited class.’” *Mylan Pharms. Inc. v. Merck Sharp & Dohme Corp.*, 50 F.4th 147, 152 (Fed. Cir. 2022) (citing *In re Petering*, 301 F.2d 676, 681 (CCPA 1962)). To prevail on this theory, a patent challenger must establish that the prior art discloses “a definite and limited class.” *ArcelorMittal France v. AK Steel Corp.*, 700 F.3d 1314, 1323 (Fed. Cir. 2012) (“[W]hen a prior art reference discloses a ‘definite and limited class’ of suitable members within a general formula, it may be read to disclose each member of that class.”); *Eli Lilly & Co. v. Zenith Goldline Pharms., Inc.*, 471 F.3d 1369, 1376 (Fed. Cir. 2006) (distinguishing precedent where “the prior art . . . expressly spelled out a definite and

limited class of compounds that enabled a person of ordinary skill in the art to at once envisage each member of this limited class.”).

The Petition does not establish that Mieth discloses a “definite and limited class.” *ArcelorMittal*, 700 F.3d at 1323; *Eli Lilly*, 471 F.3d at 1376. Petitioner argues that a POSITA “would understand that a load in a circuit can be or include a micro-controller, as such the load 20 is analogous to the claimed micro-controller.” Pet. 26 (citing Ex. 1007 ¶ 105; Ex. 1014, 1180, Fig. 5). There is no discussion of any genus or class in the Petition or Holberg Declaration. Dr. Holberg testifies that a micro-controller is “ubiquitous in electronic systems” and “commonplace” at the output of a voltage regulator, citing a single example. Ex. 1007 ¶ 105 (citing Ex. 1014, 1180, Fig. 5). There is no argument or evidence in the Petition or Holberg Declaration that Mieth’s load 20 comprises a definite and limited class of circuit components.

Petitioner’s Reply attempts to remedy this shortcoming by arguing that “[l]oad 20 of Mieth constitutes a genus that encompasses the micro-controller as a species.” Pet. Reply 5. According to Petitioner, “[a] load is any circuit, device or apparatus that, when connected to a source of electrical energy, consumes electrical energy.” *Id.* at 6 (citing Exs. 1017, 1018; Ex. 1023 ¶¶ 4–21).¹⁰ Petitioner does not establish that load 20, as disclosed

¹⁰ Exhibit 1017 is a claim construction order from the related litigation. It construes the term “switchable load” in the ’021 Patent as “something that consumes electrical power and can be switched on and off.” Ex. 1017, 3. Exhibit 1018 is an excerpt from the IEEE Standard Dictionary of Electrical and Electronic Terms, 6th Edition, 1996. It provides many definitions for the word “load,” including “[t]he electric power used by devices connected to an electrical generating system” and “[a] power-consuming device connected to a circuit.” Ex. 1018, 593.

in Mieth, encompasses a definite and limited class of circuit components. The Reply Declaration does not persuasively support such a finding. According to Dr. Holberg, “[l]oads come in many forms” and could be a light bulb, a light emitting diode, or a motor. Ex. 1023 ¶ 14. Dr. Holberg provides “a fairly exhaustive catalog of loads,” which encompasses many different types of loads, including heaters, resistors, inductors, relays, solenoids, speakers, and so on. *Id.* Although Dr. Holberg identifies different types of loads, explains the differences between them, and provides examples (*id.* ¶¶ 14–20), this testimony is untethered to the disclosure of Mieth.

Aside from a micro-controller, Dr. Holberg does not identify any other members of the alleged genus corresponding to load 20 of Mieth and does not discuss the size of the alleged genus. *See* Ex. 1023 ¶ 22. Absent such an identification or discussion, we do not credit Dr. Holberg’s opinion that Mieth discloses a load “as a term of art that is well-defined and limits the contours of the species that fall within this term.” *Id.* ¶ 29; *Wasica Fin. GmbH v. Cont’l Auto. Sys., Inc.*, 853 F.3d 1272, 1286 (Fed. Cir. 2017) (affirming the Board’s determination of no anticipation where the “petition did not identify the ‘any modulating scheme’ genus, did not establish its size, and did not name any of its modulation scheme species”); *ArcelorMittal*, 700 F.3d at 1323 (overturning jury verdict of anticipation, where there was “insufficient evidence that the varieties of paints and metal alloys are sufficiently narrow that one of ordinary skill in the art would ‘at once envisage *each member* of this limited class’” (citing *In re Petering*, 301 F.2d at 681)).

Petitioner and Dr. Holberg turn the “at once envisage” standard on its head by arguing that a POSITA “can evaluate any circuit, circuit element, or

electric device in its context and readily ascertain whether that item constitutes a load.” Pet. Reply 7; Ex. 1023 ¶ 23 (“when provided with a device or circuit element(s) in its context [a POSITA] can readily ascertain whether that device or circuit element(s) constitutes a load”); *id.* ¶ 29 (same). The issue before us is whether a POSITA would “at once envisage” a micro-controller based on Mieth’s disclosure of electrical load 20, not whether a POSITA would recognize that a micro-controller, as recited in the claim, is a load.

The “at once envisage” standard does not permit us to fill in a missing claim limitation for purposes of anticipation. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 851 F.3d 1270, 1274 (Fed. Cir. 2017). Petitioner invites the same error the Federal Circuit identified in *Nidec*, where the Board erred by holding that “anticipation can be found even when a prior art reference fails to disclose a claim element so long as a skilled artisan reading the reference would ‘at once envisage’ the claimed arrangement.” *Id.* (citing *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015)). As our reviewing court explained, “*Kennametal* does not stand for the proposition that a reference missing a limitation can anticipate a claim if a skilled artisan viewing the reference would ‘at once envisage’ the missing limitation.” *Id.*

b) Reasonably understand or infer

“In the context of anticipation, the question is not whether a prior art reference suggests the claimed subject matter” *AstraZeneca LP v. Apotex, Inc.*, 633 F.3d 1042, 1055 (Fed. Cir. 2010) (internal quotation marks omitted). “Rather, the dispositive question regarding anticipation is whether one skilled in the art would reasonably understand or infer from a prior art

reference that every claim element is disclosed in that reference.” *Id.* (internal quotation marks and brackets omitted); *Eli Lilly & Co. v. Los Angeles Biomedical Research Institute*, 849 F.3d 1073, 1074–75 (Fed. Cir. 2017).

The Petition does not establish that a POSITA would reasonably understand or infer from Mieth that a micro-controller is disclosed. Petitioner argues that a POSITA “would understand that a load in a circuit **can be or include** a micro-controller, as such the load 20 is **analogous** to the claimed micro-controller.” Pet. 26 (emphasis added; citing Ex. 1007 ¶ 105; Ex. 1014, 1180, Fig. 5). Using almost the same words, Dr. Holberg testifies that a POSITA would “understand that a load in a circuit **can include** a micro-controller, as such, the load 20 is **analogous** to the claimed micro-controller.” Ex. 1007 ¶ 105 (emphasis changed).

The Petition and Holberg Declaration do not apply the legal standard of *Eli Lilly* and *AstraZeneca*, which considers what a POSITA “would reasonably understand or infer from a prior art reference.” *Eli Lilly*, 849 F.3d at 1074–75; *AstraZeneca*, 633 F.3d at 1055. Even if true, the assertion that a load “can be” or “can include” a micro-controller (Pet. 26; Ex. 1007 ¶ 105) does nothing more than establish that a micro-controller can function as a load. It does not establish that a POSITA would reasonably understand or infer from Mieth that a micro-controller is disclosed by load 20. The assertion that “the load 20 is analogous to the claimed micro-controller” (Pet. 26; Ex. 1007 ¶ 105) is similarly deficient and fails to establish that a

POSITA would reasonably understand or infer from Mieth that a micro-controller is disclosed by load 20.¹¹

In his initial declaration, Dr. Holberg testifies that a micro-controller is “ubiquitous in electronic systems” and “commonplace” at the output of a voltage regulator, citing a single example. Ex. 1007 ¶ 105 (citing Ex. 1014, 1180, Fig. 5). That testimony does not apply the “reasonably understand or infer” standard and is not enough to establish that Mieth discloses a micro-controller. Dr. Holberg does not explain how Exhibit 1014 supports his opinion about Mieth. For example, Dr. Holberg makes no comparison between Mieth’s circuit and the circuit disclosed in Figure 5 of Exhibit 1014.

Petitioner’s Reply attempts to remedy the shortcomings of the Petition and Holberg Declaration by arguing that “Mieth anticipates a micro-controller because a [POSITA] would reasonably understand or infer from Mieth that a micro-controller is disclosed therein.” Pet. Reply 8 (emphasis omitted; citing Ex. 1023 ¶¶ 31–33). In an attempt to support that contention, Petitioner compares Mieth with the disclosure of the ’021 Patent. *Id.* at 8–10 (citing Ex. 1001, 2:54–56, 8:4–14, 8:19–26, 8:28–34, 8:55–58, Fig. 4). For example, Petitioner argues:

A [POSITA], upon reading Mieth understands its load 20 is the output of a power converter 19 and receives and consumes a regulated supply of power despite a fluctuating power source (i.e., the solar generator). *Upon reading the ’021 patent*, a [POSITA] understands that the micro-controller when connected to buck converter 405 operates as a load and receives a regulated supply of energy supplied by buck converter 402. Thus, both Mieth and the ’021 patent are configured identically

¹¹ Petitioner undermines its anticipation challenge by arguing in the Reply that “analogous” to “means that differences exist.” Pet. Reply 12–13.

Id. at 9–10 (emphasis added). “*As both Mieth and the ’021 patent* are providing the exact same functionality . . . a [POSITA] reasonably understands or infers that Mieth is disclosing the same element as recited in the claims of the ’021 patent.” *Id.* at 10 (emphasis changed; citing Ex. 1012,¹² Fig. 2; Ex. 1014, Fig. 5; Ex. 1023 ¶¶ 32–40).

Dr. Holberg likewise relies on the disclosure of the ’021 Patent to interpret Mieth, testifying that his “conclusion is buttressed by the ’021 patent itself.” Ex. 1023 ¶ 33; *see also id.* ¶¶ 39–40 (relying on descriptions in the ’021 Patent to support his opinion that a POSITA would understand that Mieth’s load 20 discloses a micro-controller).

Petitioner’s and Dr. Holberg’s reliance on the ’021 Patent to interpret Mieth is improper. The applicable legal standard requires us to consider “whether one skilled in the art would reasonably understand or infer *from a prior art reference* that every claim element is disclosed in that reference.” *AstraZeneca*, 633 F.3d at 1055 (emphasis added; brackets omitted). The exercise of hindsight is *not* permitted in an anticipation analysis. *Glaxo Grp. Ltd. v. Apotex, Inc.*, 376 F.3d 1339, 1348 (Fed. Cir. 2004) (affirming district court’s determination of no anticipation where patent challenger engaged in impermissible hindsight when recreating a prior art example); *In re Schaumann*, 572 F.2d 312, 316 (CCPA 1978) (disallowing “hindsight anticipations with the guidance of an applicant’s disclosures”).

Turning to Exhibit 1014, Petitioner argues that “both Mieth and the ’021 patent . . . operate identically to Ex. 1014, Fig. 5.” Pet. Reply 9–10 (citing Ex. 1007 ¶ 105). The Holberg Declaration (Ex. 1007 ¶ 105) does not explain how Exhibit 1014 supports Petitioner’s interpretation of Mieth. In

¹² US 2007/0001653 A1, published January 4, 2007.

the Reply Declaration, Dr. Holberg opines that Exhibit 1014's micro-controller receives a regulated voltage and operates as a load and that Exhibit 1014 "shows an identical arrangement and functionality of both Mieth and the '021 patent." Ex. 1023 ¶ 35. Dr. Holberg's testimony is flawed because it relies on the '021 Patent to interpret Mieth. *Id.*

Moreover, Dr. Holberg's opinion is undermined by the admissions of Petitioner's counsel at the oral hearing. Petitioner agreed that, in the '021 Patent, the control circuit is not operating as a load (Tr. 6:19–22), which casts doubt on Dr. Holberg's opinion that the similarly situated micro-controller in Figure 5 of Exhibit 1014 operates as a load (Ex. 1023 ¶ 35). Petitioner also agreed that, whereas Exhibit 1014's micro-controller provides control functionality for voltage regulation, Mieth's load 20 provides work that "was not pertinent to the control functionality." Tr. 13:9–14:19. That admission casts doubt on Dr. Holberg's opinion that Exhibit 1014 "shows an identical arrangement and functionality" of Mieth. Ex. 1023 ¶ 35. In view of these admissions and the improper reliance on the '021 Patent disclosure, we do not view Exhibit 1014 as sufficient support for Dr. Holberg's opinion that "the load of Mieth and the micro-controller are arranged and operate identically" and "the load 20 of Mieth satisfies the Eli Lilly standard for anticipation." *Id.* ¶ 34 (referencing *Eli Lilly*, 849 F.3d at 1074–75).

For the first time in the Reply, Petitioner and Dr. Holberg cite Exhibit 1012, Figure 2 as support for their contention that Mieth anticipates claim 1. *Compare* Pet. 26; Ex. 1007 ¶ 105 (addressing the micro-controller limitation), *with* Pet. Reply 10; Ex. 1023 ¶ 36 (citing Exhibit 1012 in the context of anticipation). Even if Petitioner's new reliance on Exhibit 1012 were proper, it is not persuasive. There is no assertion by Petitioner or

Dr. Holberg that Figure 2 of Exhibit 1012 is similar to Mieth or would inform a POSITA's understanding of Mieth.

To prevail on its anticipation challenge, Petitioner must show that Mieth discloses each and every limitation of the claim, including a micro-controller. *Verdegaa*, 814 F.2d at 631. Petitioner has not done so.

3. Dependent Claims 2–7 and 9

Claims 2–7 and 9 depend, directly or indirectly, from claim 1. Petitioner's contentions for these claims (Pet. 33–50) do not remedy the deficiencies in Petitioner's showing for claim 1.

4. Conclusion

Petitioner has not shown by a preponderance of the evidence that Mieth anticipates claims 1–7 and 9.

E. Obviousness

Petitioner challenges claims 1–20 as obvious based on Mieth and Balogh, by themselves, or with Nishi or Liu. Pet. 20, 50–88. Patent Owner opposes. PO Resp. 1–3, 10–41.

Independent claims 1, 10, and 18 each recite a micro-controller. Ex. 1001, 11:7, 12:5, 13:9.

For the micro-controller limitation of claims 1, 10, and 18, Petitioner's obviousness challenge relies on the same argument and evidence that it presents for anticipation of claim 1. Pet. 26 (section VII.A.1.iv addressing anticipation and the micro-controller limitation of claim 1); Pet. 50, 60, 71 (cross-referencing section VII.A.1.iv for obviousness challenge to independent claims 1, 10, and 18). The Petition presents reasons to combine Mieth and Balogh. Pet. 51–55. But Petitioner's obviousness rationale does not modify Mieth's load 20, which remains

unchanged in Petitioner’s proposed combination of Mieth and Balogh. Pet. 52 (relying on “load 20 of Mieth” as part of the combination with Balogh). The Petition presents no rationale for modifying or replacing Mieth’s load 20 and presents no argument or evidence that it would have been obvious to modify Mieth’s circuit by adding or substituting a micro-controller.

In short, the Petition and Holberg Declaration assert that the micro-controller limitation is expressly disclosed in Mieth and do not present or support any obviousness rationale for that limitation. Pet. 26, 50–55; Ex. 1007 ¶ 105. Petitioner presents a new theory of unpatentability in the Reply, arguing that “the differences between Mieth’s ‘load 20’ and the claimed micro-controller are such that the subject matter as a whole would have been obvious to a [POSITA].” Pet. Reply 11–19 (reformatted). More particularly, Petitioner argues that “a [POSITA] understands that a micro-controller is a typical type of load that could be substituted into and replace whatever type of load is being employed by Mieth.” *Id.* at 17 (citing Exs. 1012, 1014, 1022). The Petition does not present that argument.

“It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3)). A petitioner’s “reply may only respond to arguments raised in the corresponding . . . patent owner response[] or decision on institution.” 37 C.F.R. § 42.23(b). “[A]n IPR petitioner may not raise in reply an entirely new rationale for why a claim would have been obvious.” *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1330–31 (Fed. Cir. 2019) (internal quotation marks omitted). Any

marked departure from the grounds identified with particularity in the petition would impose “unfair surprise” on the patent owner and, consequently, violate both the Administrative Procedure Act and the *inter partes* review statute. *Arthrex Inc. v. Smith & Nephew, Inc.*, 935 F.3d 1319, 1328 (Fed. Cir. 2019). Accordingly, “the Board acts within its discretion when declining to consider a new theory of unpatentability raised by petitioner in reply.” *Rembrandt Diagnostics, LP v. Alere, Inc.*, 76 F.4th 1376, 1383 (Fed. Cir. 2023). The Board must make a judgment about whether a reply contention crosses the line from the responsive to the new. *Yita LLC v. MacNeil IP LLC*, 69 F.4th 1356, 1366 (Fed. Cir. 2023).

In our view, Petitioner’s Reply presents an impermissible new theory of unpatentability by arguing that it would have obvious to use a micro-controller as Mieth’s load 20. Pet. Reply 12–19. Petitioner supports that new theory with new evidence. *Id.* at 17 (citing Exs. 1012, 1020–1022;¹³ Ex. 1023 ¶¶ 48–51). The Petition does not rely on Exhibit 1012 for the micro-controller limitation. *See* Pet. 5 (Exhibit 1012 “is not being relied upon herein for teaching any element of the issued claims”); Ex. 1007 ¶¶ 84, 153, 160 (citing Exhibit 1012 to show cascaded buck converters and motivation to combine). Exhibits 1020–1022 were submitted for the first time with the Reply. In the Reply Declaration, Dr. Holberg provides a new opinion that a micro-controller would have been obvious in view of Mieth’s load 20. Ex. 1023 ¶¶ 44–52.

¹³ Ex. 1020, Silicon Labs, C8051F020/1/2/3, 8K ISP FLASH MCU Family (2003); Ex. 1021, Analog Devices, *Choosing the Right Power-Supply IC for your Application* (November 29, 2001), available at <https://www.analog.com/media/en/technical-documentation/techarticles/choosing-the-right-powersupply-ic-for-your-application.html>; Ex. 1022, US 2008/0266922 A1, published October 30, 2008.

Petitioner’s Reply and the Reply Declaration rely on Exhibit 1014 as support for their argument that a micro-controller would have been obvious. Although the Petition and Holberg Declaration cite Exhibit 1014 for the micro-controller limitation of claim 1 (Pet. 26; Ex. 1007 ¶ 105), they present no rationale for combining the teachings of Mieth and Exhibit 1014 or for modifying Mieth’s load 20.

On the issue of whether we should consider Petitioner’s obviousness argument for the micro-controller limitation, the Federal Circuit’s decision in *Yita* is particularly instructive. There, the petitioner “waited until its reply to present what in substance [was] an argument that it would have been obvious to a relevant artisan to modify [a prior art reference] to arrive at” a claim limitation.” *Yita*, 69 F.4th at 1367. The Court determined that this argument was a “meaningfully distinct contention” from those made in the petition, “which focused (for the claim limitation at issue) only on what [the prior art reference] discloses.” *Id.* The Court also determined that petitioner’s new theory was not within the scope of a proper reply because the patent owner response “argued only about what [the prior art reference] teaches—not what a relevant artisan would have found obvious to modify.” *Id.*

In *Yita*, the Court was guided by its prior decision in *Intelligent Bio-Systems*, where the Court

affirmed the Board’s decision not to consider an argument made on reply because in the original petition the challenger argued only that a reference disclosed a limitation . . . , while in the reply the challenger argued that a relevant artisan would have considered it obvious to modify that reference to arrive at the limitation.

Yita, 69 F.4th at 1366 (citing *Intelligent Bio-Systems*, 821 F.3d at 1369).

The facts of this case are similar to *Yita* and *Intelligent Bio-Systems*. Like the petitioners in those cases, Petitioner waited until its reply to present an argument that it would have been obvious to modify Mieth's load 20 to arrive at the micro-controller limitation. Pet. Reply 12–19. As discussed above, the Petition and Holberg Declaration rely on Mieth's express disclosure for that limitation and do not present or support any obviousness rationale. Pet. 26; Ex. 1007 ¶ 105.

In the Reply, Petitioner asserts that Patent Owner concedes in the Patent Owner Response that the Petition raises an obviousness argument. Pet. Reply 12–13 (citing PO Resp. 13). According to Petitioner, Patent Owner “concedes that Mieth's load being ‘analogous’ to a ‘micro-controller’ means that differences exist, but Petitioner is arguing that they are sufficiently insubstantial to render the claim element obvious.” *Id.* We disagree.¹⁴ Patent Owner argues “Petitioner effectively admits there is no express disclosure of a micro-controller in Mieth.” PO Resp. 13 (citing Pet. 25–26). That is a response to Petitioner's anticipation argument and *not* a concession that Petitioner is arguing obviousness. Petitioner's “analogous to” argument falls under the heading, “Anticipation of claims 1–7, and 9 in view of Mieth.” Pet. 23, 26. Obviousness is addressed in a separate section of the Petition. Pet. 50. Arguments in a petition must be made with particularity. 35 U.S.C. § 312(a)(3); *Intelligent Bio-Sys.*, 821 F.3d at 1369.

Petitioner argues that the Patent Owner Response “open[s] the door” to Petitioner's new obviousness argument. Tr. 20:21–21:6, 40:18–25. We disagree. The Patent Owner Response presents no substantive argument

¹⁴ Petitioner's agreement with Patent Owner that “differences exist” (Pet. Reply 12–13) is itself an admission that Mieth's load 20 does not expressly disclose a micro-controller.

about nonobviousness for the micro-controller limitation. Petitioner agrees, pointing only to the table of contents of the Patent Owner Response. Pet. Reply 13 n.1; Tr. 21:1–3, 22:9–18. Although the table of contents includes a heading stating, “Mieth does not disclose or suggest ‘a microcontroller’” (PO Resp. i), that statement does not accurately reproduce the corresponding heading in the body of the Patent Owner Response, which states “Mieth does not disclose ‘a microcontroller’” and does not include the word “suggest” (*id.* at 10 (emphasis omitted)). An inaccurate heading in the table of contents does not open the door to a new theory of unpatentability.

Petitioner argues that its new reply evidence, including Exhibits 1012 and 1022, is proper under *Anacor Pharms., Inc. v. Iancu*, 889 F.3d 1372 (Fed. Cir. 2018). Tr. 22:1–8 (referencing *Anacor*). We disagree. *Anacor* holds there is “no blanket prohibition against the introduction of new evidence during an inter partes review proceeding.” *Anacor*, 889 F.3d at 1380. *Anacor* instructs that

the petitioner in an inter partes review proceeding may introduce new evidence after the petition stage if the evidence is a legitimate reply to evidence introduced by the patent owner, or if it is used to document the knowledge that skilled artisans would bring to bear in reading the prior art identified as producing obviousness.

Id. at 1380–81 (internal quotation marks omitted).

The reasoning in *Anacor* does not apply to the facts of this case. Here, Petitioner’s new evidence (Exs. 1012, 1020–1022; Ex. 1023 ¶¶ 48–51) is not “a legitimate reply to evidence introduced by” Patent Owner. *Anacor*, 889 F.3d at 1380–81. Patent Owner does not argue that a micro-controller would not have been obvious in view of Mieth’s load 20. In both the Response and the Sur-reply, Patent Owner confines its substantive

arguments about the micro-controller to anticipation—the only theory supported by the Petition for that limitation. PO Resp. 10–16; PO Sur-reply 1–14. Because the Patent Owner Response does not argue nonobviousness of the micro-controller limitation, Petitioner’s new argument and evidence exceed the proper scope of a reply. 37 C.F.R. § 42.23(b).

Claims 2–9 depend, directly or indirectly, from claim 1. Ex. 1001, 11:26–65. Claims 11–17 depend, directly or indirectly, from claim 10. *Id.* at 12:26–67. Claims 19 and 20 depend, directly or indirectly, from claim 18. *Id.* at 14:7–18. Petitioner’s arguments and evidence for dependent claims 2–9, 11–17, 19, and 20 (Pet. 55–56, 62–69, 77–88) do not remedy the deficiency in Petitioner’s showing for the micro-controller limitation of independent claims 1, 10, and 18.

For these reasons, Petitioner has not shown by a preponderance of the evidence that claims 1–20 are unpatentable for obviousness.

III. CONCLUSION

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatent- able
1–7, 9	102(b)	Mieth		1–7, 9
1–12, 15–18, 20	103(a)	Mieth, Balogh		1–12, 15–18, 20
13, 14	103(a)	Mieth, Balogh, Nishi		13, 14
19	103(a)	Mieth, Balogh, Liu		19

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatent- able
Overall Outcome				1–20

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has not shown that claims 1–20 of the '021 Patent are unpatentable; and

FURTHER ORDERED that because this Decision is final, a party 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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