

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ELMOS SEMICONDUCTOR SE,
Petitioner,

v.

TEXAS INSTRUMENTS INCORPORATED,
Patent Owner.

IPR2024-00802
Patent 11,653,432 B1

Before JOSIAH C. COCKS, AMBER L. HAGY, and BACH V. HOANG,
Administrative Patent Judges.

HOANG, *Administrative Patent Judge.*

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

On April 24, 2024, Elmos Semiconductor SE (“Petitioner”) filed a petition requesting an *inter partes* review of claims 1–20, i.e., all claims, of U.S. Patent No. 11,653,432 B1 (Ex. 1001, “the ’432 Patent”). Paper 2 (“Pet.”). Texas Instruments Incorporated (“Patent Owner”) timely filed a Preliminary Response. Paper 7 (“Prelim. Resp.”).

An *inter partes* review may not be instituted unless “the information presented in the petition . . . and any response . . . 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.” 35 U.S.C. § 314(a).

Having reviewed the parties’ papers and the evidence of record, we determine that Petitioner has not shown a reasonable likelihood it would prevail in establishing the unpatentability of any of the challenged claims. Accordingly, we do not institute an *inter partes* review.

A. *Real Parties in Interest*

Petitioner identifies itself as the real party in interest. Pet. 2. Patent Owner identifies itself as the real party in interest. Paper 3, 1.

B. *Related Matters*

The parties do not identify any related matters or co-pending proceedings. Pet. 2; Paper 3, 1.

C. *Asserted References*

Petitioner’s unpatentability challenges rely on eight references:

- Sudhaus, US 10,136,496 B2, issued Nov. 20, 2018. Ex. 1005 (“Sudhaus”).
- Ryoichi, JP 2012-160287 A, published Aug. 23, 2012.

- Ex. 1006 (“Ryoichi”). Ryoichi includes the Japanese patent application publication and an English-language translation of Ryoichi. *See id.*; Ex. 1007 (certification). We refer to the English-language translation, unless otherwise stated.
- Andre Sudhaus, *Die Verlustleistung in linearen Regelsystemen günstig verteilen*, Elektronik Praxis (October 2016). Ex. 1008 (as translated) (“Praxis”). Praxis includes the German patent application publication and an English-language translation of Praxis. *See id.* We refer to the English-language translation, unless otherwise stated.
 - Wu, US 11,599,132 B2, issued Mar. 7, 2023, filed Feb. 26, 2021. Ex. 1009 (“Wu”).
 - Benoit Provost, *On-Chip Ramp Generators for Mixed-Signal BIST and ADC Self-Test*, IEEE Journal of Solid-State Circuits, Vol. 38, No. 2 (Feb. 2003). Ex. 1010 (“Provost”).
 - Texas Instruments, *Analog Engineer’s Circuit: Voltage-to-current (V-I) converter circuit with MOSFET* (2021). Ex. 1011 (“TI Paper”).
 - University of Kansas, *The MOSFET Current Mirror* (Apr. 2011). Ex. 1012 (“UK Paper”).

Pet. 4.

We also note Petitioner has submitted declarant testimony of Peter Glösekötter. Ex. 1003. Petitioner, however, has not cited Mr. Glösekötter’s testimony in its Petition. *See generally* Pet.

D. Asserted Grounds

Petitioner asserts the following grounds of unpatentability (Pet. 4):

Claims Challenged	35 U.S.C.¹ §	Reference(s)/Basis
1–3, 6, 10, 11, 16, 17	103	Sudhaus

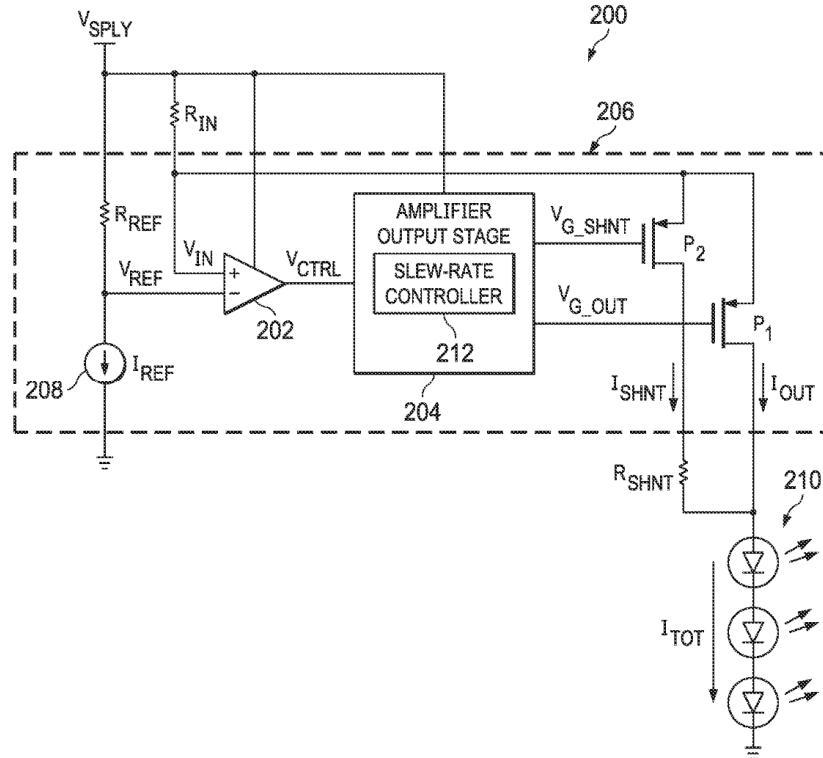
¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 285–88 (2011), revised 35 U.S.C. § 103 effective March 16, 2013.

Claims Challenged	35 U.S.C. ¹ §	Reference(s)/Basis
1–4, 6, 7, 10–12, 15–18	103	Sudhaus, Ryoichi
1–4, 6, 7, 10–12, 15–18	103	Sudhaus, Ryoichi, Praxis
1–4, 6, 7, 10–12, 15–18	103	Sudhaus, Ryoichi, Praxis, Wu
1–20	103	Sudhaus, Ryoichi, Praxis, Provost, TI Paper, UK Paper

E. The '432 Patent (Ex. 1001)

The '432 Patent describes a light-emitting diode (LED) driver system for activating a string of LEDs, e.g., automobile indicator lights (turn signals, brake lights, reverse indicators, etc.). Ex. 1001, 1:13–20, 2:16–22. The LED driver system can be implemented by an LED driver circuit. *Id.* at 4:11–16. Figure 2, reproduced below, shows a circuit diagram for such an LED driver circuit. *Id.*

Because the challenged patent was filed after March 16, 2013, we refer to the AIA version of § 103.



At a high level, Figure 2 shows error amplifier 202 connected to amplifier output stage 204, which provides two output voltages controlling two respective output currents combined to power LED string 210. *Id.* at 4:17–24, 4:34–38, 4:53–55.

In greater detail, error amplifier 202 receives and compares two voltages, input voltage V_{IN} and reference voltage V_{REF} , to generate control voltage V_{CTRL} . *Id.* at 4:17–24. Control voltage V_{CTRL} is provided to amplifier output stage 204. *See id.* Based on control voltage V_{CTRL} , amplifier output stage 204 outputs two voltages, V_{G_OUT} and V_{G_SHNT} , to respective power transistors P_1 and P_2 . *Id.* at 4:34–38, 4:47–52. V_{G_OUT} and V_{G_SHNT} are respectively input to the gates of power transistors P_1 and P_2 , thereby respectively controlling output current I_{OUT} and shunt current I_{SHNT} . *Id.* at 4:34–47, 6:35–39. With particular regards to shunt current I_{SHNT} , amplifier output stage 212 includes slew-rate controller 212, which controls the slew rate of shunt current I_{SHNT} by controlling voltage V_{G_SHNT} .

Id. at 3:59–62, 5:57–61. Finally, output current I_{OUT} and shunt current I_{SHNT} are combined to form total output current I_{TOT} , which is provided to power LED string 210. *Id.* at 4:53–55.

The '432 Patent explains that such an arrangement, which controls the slew-rate of shunt current I_{SHNT} , provides an approximately constant amplitude sum for total output current I_{TOT} . *Id.* at 3:32–38, 4:55–61; *see id.* at Fig. 3, 3:10–28, 6:8–11. The '432 Patent also explains that, in addition to “settling” total output current I_{TOT} , controlling the slew-rate can reduce undesired electromagnetic interference. *Id.* at 6:8–15.

F. Challenged Claims

Petitioner challenges claims 1–20, i.e., all claims, of the '432 Patent. Claims 1, 11, and 16 are independent. For purposes of this Decision, our discussion focuses on claim 1, which recites dispositive features common to all independent claims and is representative of all dispositive issues. Independent claim 1 is reproduced below with added line breaks and formatting for clarity.

1. A light-emitting diode (LED) driver system comprising:
an error amplifier configured to compare an input voltage with
a reference voltage to generate a control voltage; and
an amplifier output stage configured to control an output
current through a first current path and a shunt current
through a second current path based on the control voltage,
the amplifier output stage comprising a slew-rate controller
configured to control a slew-rate of the shunt current,
the shunt current provided through a shunt resistor in the
second current path and added to the output current to
provide a total current through an LED string.

Ex. 1001, 8:13–26.

We note that independent claim 16, although drafted differently, recites similar dispositive limitations as claim 1. Claim 16 is reproduced below with added line breaks and formatting.

16. A light-emitting diode (LED) driver system comprising:
a first power transistor comprising an input and an output
coupled to an LED string and a shunt resistor;
a second power transistor comprising an input and an output
coupled to the shunt resistor;
an error amplifier comprising a first input to receive an input
voltage, a second input to receive a reference voltage, and an
output to provide a control voltage; and
an amplifier output stage comprising an input coupled to the
output of the error amplifier,
a first output coupled to the input of the first power
transistor, and
a second output coupled to the input of the second power
transistor,
the amplifier output stage comprising a slew-rate controller,
the slew-rate controller comprising an output coupled to
the input of the second power transistor.

Ex. 1001, 10:13–31.

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”)). This burden of persuasion never

shifts to the patent owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

Furthermore, at the institution stage, Petitioner bears the burden to “identify, with particularity, evidence sufficient to establish a reasonable likelihood that the reference was publicly accessible before the critical date of the challenged patent and therefore that there is a reasonable likelihood that it qualifies as a printed publication.” *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 13 (PTAB Dec. 20, 2019) (precedential).

The legal 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 evidence, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). One seeking to establish obviousness based on more than one reference also must articulate sufficient reasoning with rational underpinnings to combine teachings. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

B. Level of Ordinary Skill in the Art

Petitioner asserts that “a person having ordinary skill in the art (‘POSITA’) at the relevant time, would have had at least a bachelor’s degree in electrical engineering, or equivalent experience of at least two years working in the field of the design electrical driver systems for Light Emitting Diodes (LEDs).” Pet. 20. Patent Owner has not addressed the level of ordinary skill in the art. *See generally* Prelim. Resp.

For purposes of this Decision, we adopt Petitioner’s proposed level of ordinary skill, as articulated above. We determine this level of skill comports with the qualifications a person would have needed to understand and implement the teachings of the ’432 Patent and the prior art of record. *Cf. Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (noting that the prior art itself may reflect an appropriate level of skill in the art). We note, however, that the open-ended language “at least” expands the range of education and experience indefinitely with no upper bound. Therefore, we do not adopt this aspect of Petitioner’s formulation.

C. Claim Construction

We interpret claim terms using “the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b). Under the principles set forth by our reviewing court, the “words of a claim ‘are generally given their ordinary and customary meaning,’” as would be understood by a person of ordinary skill in the art at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)).

Petitioner proposes claim constructions for seven claim terms:

1. “amplifier output stage” means an electrical circuit that receives at least one input and outputs a signal based on the at least one input.
2. “control voltage” means an electrical signal used as an input to an electrical device that can influence an operation of the electrical device.
3. “current path” is a means for conveying electrical current along a controlled pathway.

4. “error amplifier” means an electrical circuit that detects a difference between two electrical input signals and outputs a signal based on the difference.
5. “reference voltage” means a voltage representing a desired level of an electrical parameter in a circuit.
6. “slew rate” means a rate of change of an electrical signal over time.
7. “slew-rate controller” means an electrical circuit that controls a rate of change of an electrical signal over time.

Pet. 19 (emphasis omitted).

Patent Owner has not expressly addressed the construction of any claim terms or phrases. *See* Prelim. Resp. 6.

Based on the record before us, we do not find it necessary to expressly construe any claim terms or phrases to reach our decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (per curiam) (claim terms need to be construed “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))). Petitioner’s constructions do not affect our determinations, and, even under Petitioner’s constructions, Petitioner fails to show a reasonable likelihood of success with respect to its proposed grounds of unpatentability for the challenged claims of the ’432 Patent.

D. Summary of Asserted References

Below we summarize the asserted references. We discuss any additional pertinent details of the references in our patentability analysis.

1. Sudhaus (Ex. 1005)

Sudhaus describes a circuit to control the electrical current powering LED lights. Ex. 1005, 1:18–24, 1:53–55. Figure 1 of Sudhaus, reproduced below, is a circuit diagram showing an exemplary control circuit for powering an LED chain. *Id.* at 3:49–50, 4:25–28.

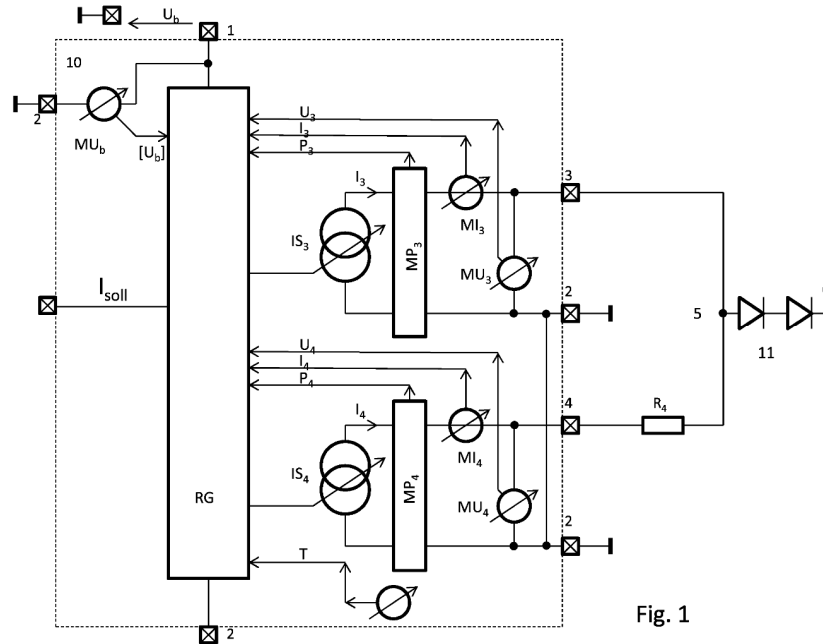


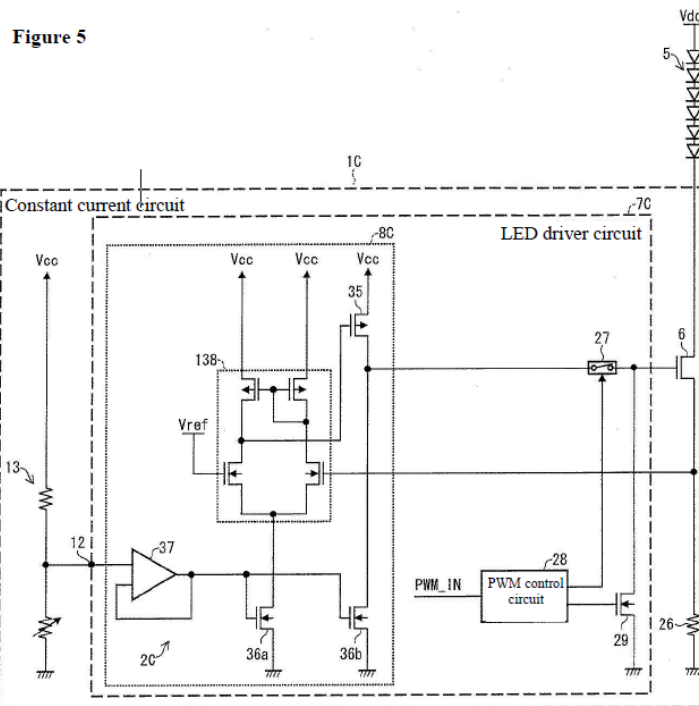
Fig. 1

As shown in Figure 1, control circuit 10 powers LED chain 11 through the combined current of outputs 3 and 4, respectively supplying output currents I_3 and I_4 . *Id.* at 4:25–32; *see id.* at 5:51–52, 6:29–30. That is, LED chain 11 is powered by total current total current $I_3 + I_4$. *Id.* Currents I_3 and I_4 flow from current sources IS_3 and IS_4 , which are controlled by controller RG. *Id.* at 4:25–28, 4:46–47. Controller RG controls current sources IS_3 and IS_4 based on desired value I_{soll} as well as measurement values related to control circuit 10; such measurement values include measurements of output voltages U_3 and U_4 , currents I_3 and I_4 , powers P_3 and P_4 , and temperature T . *Id.* at 4:32–39, 4:44–51.

Further, controller RG may “gradually” change the output of currents I_3 and I_4 . *Id.* at 5:40–46, 6:18–60. For example, the current at output 3 may be reduced while the current at output 4 is gradually increased such that total current $I_3 + I_4$ remains constant. *Id.* at 6:16–30.

2. Ryoichi (Ex. 1006)

Ryoichi describes an LED driver circuit that controls a driving current for LEDs. Ex. 1006 ¶ 17. Figure 5, reproduced below, is a circuit diagram for an exemplary LED driver circuit showing LED array 5 powered by constant current circuit 1C which includes, among other components, driving transistor 6, LED driver circuit 7C, operational amplifier 8C, and differential part 138. *Id.* ¶¶ 47, 82–83.



Constant current circuit 1C supplies current to LED array 5 via driving transistor 6. *Id.* ¶¶ 47, 83. Driving transistor 6 is controlled by LED driver circuit 7C which includes operational amplifier 8C. *Id.* Operational amplifier 8C supplies control pulses to driving transistor 6. *Id.* ¶¶ 49, 85.

3. Praxis (Ex. 1008)

Praxis describes an integrated driver circuit for automobile LEDs. Ex. 1008, 1. Figure 1 of Praxis, reproduced below, is a circuit diagram of an exemplary driver circuit. *Id.* at 2–3.

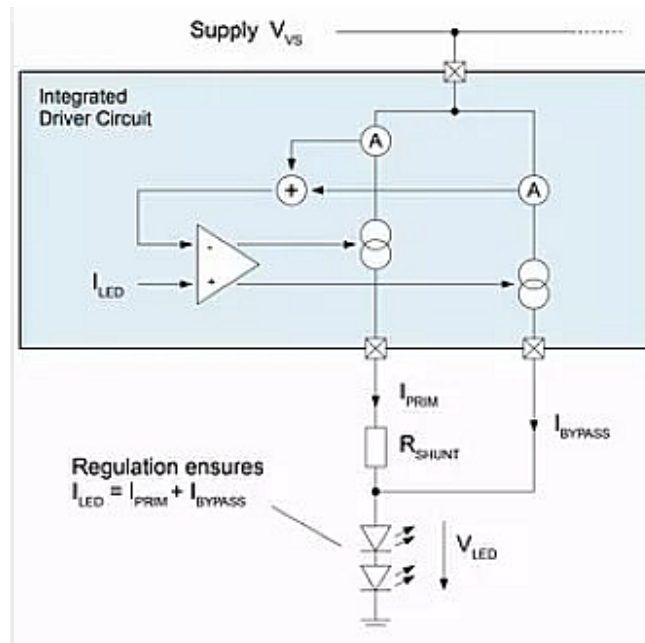


Figure 1 shows an integrated driver circuit with two current outputs, I_{PRIM} and I_{BYPASS} , which combine to form a total current to power LEDs. *Id.* at 3.

4. Wu (Ex. 1009)

Wu describes an amplifier circuit that includes a slew-rate control circuit. Ex. 1009, code (57).

5. Provost (Ex. 1010)

Provost describes on-chip adaptive ramp generators providing precise and slow analog ramps. Ex. 1010, 263, 273.

6. TI Paper (Ex. 1011)

TI Paper describes a voltage-to-current converter that delivers regulated current to a load. Ex. 1011, 1.

7. UK Paper (Ex. 1012)

UK Paper describes a MOSFET current mirror. Ex. 1012, 1.

E. Asserted Obviousness over Sudhaus

Petitioner contends that the subject matter of claims 1–3, 6, 10, 11, 16, and 17 would have been obvious over Sudhaus. Pet. 21–22, 36–106. Patent Owner argues that Petitioner’s showing is insufficient. Prelim. Resp. 8–29, 37–40.

We have considered the parties’ arguments and the evidence presented. For the reasons explained below, we determine that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that the claimed subject matter would have been obvious over Sudhaus.

1. Independent Claim 1

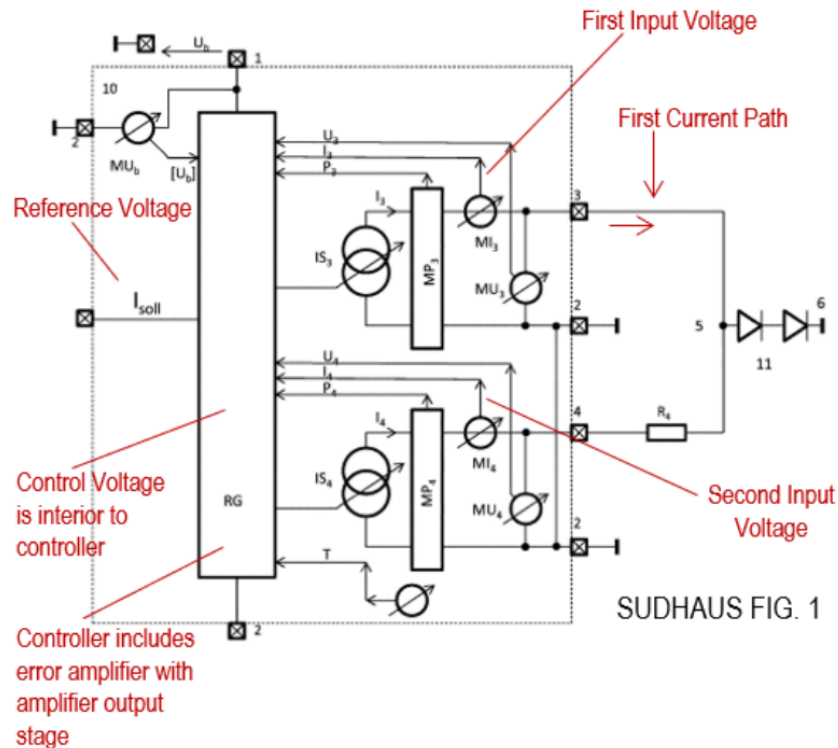
Petitioner has not adequately shown that claim 1 would have been obvious over Sudhaus. In particular, Petitioner has not adequately shown that Sudhaus teaches certain limitations recited in claim 1. Our discussion focuses on those shortcomings.

Petitioner contends Sudhaus teaches the following limitations recited in claim 1:

an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage; and

an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage.

Pet. 37–41 (citing Ex. 1005, 2:32–33, 4:25–28, 4:46–50, 8:47–55, Fig. 1); *see id.* at 21–22. Petitioner supports that contention with annotations to Figure 1 of Sudhaus (in red text), reproduced below.



Pet. 38. Annotated Figure 1 above shows an exemplary control circuit of Sudhaus’s disclosure with annotations by Petitioner purporting to explain certain aspects of the circuit. *See* Ex. 1005, 4:25; Pet. 38. Petitioner argues controller RG meets three separately claimed elements: “an error amplifier,” “a control voltage,” and “an amplifier output stage.” Pet. 37–38, 40–41. In particular, Petitioner argues controller RG “includes error amplifier with amplifier output stage” and further has “Control Voltage [that] is interior to controller [RG].” *Id.* Petitioner asserts controller RG “performs the functions of an error amplifier and amplifier output stage.” *Id.* at 37.

Additionally, Petitioner argues I_{soll} teaches a “Reference Voltage,” I_3 teaches a “First Input Voltage,” and I_4 teaches a “Second Input Voltage.” *Id.* at 37–38.

Petitioner has not presented adequate explanation or evidence showing Sudhaus teaches these limitations for a number of reasons.

First, even under Petitioner’s assertion that “controller RG . . . performs the functions of an error amplifier and amplifier output stage” (*id.* at 37), Petitioner has not adequately shown that controller RG meets all three of “an error amplifier,” “a control voltage,” and “an amplifier output stage.” Petitioner’s assertions that those elements are “interior to” or “include[d]” in controller RG are conclusory and unsupported. Petitioner summarizes and reproduces portions of Sudhaus regarding the output currents of controller RG, but has not explained the relevance of its summary and reproduction with respect to each recited claim element. *See id.* at 37–38 (citing Ex. 1005, 2:32–33, 4:25–28, 4:46–50, 8:47–55), 40–41. Nor has Petitioner explained *why* or *how* the summarized or reproduced portions of Sudhaus show that those claim elements are interior or included in controller RG. *See id.*

Further, Petitioner also fails to show how Sudhaus teaches the claimed interactions and relations between the error amplifier, control voltage, and amplifier output stage. The claim recites the error amplifier compares voltages to “generate a control voltage” and the amplifier output stage controls output current “based on the control voltage.” Petitioner has not explained what specific signal controller RG generates that teaches a “control voltage” used to control output current. Nor has Petitioner stated, let alone explained how, controller RG generates a control voltage in the claimed manner and controls output current based on that control voltage.

Simply because controller RG produces outputs that are allegedly similar to the claimed outputs does not by itself show that controller RG produces the claimed outputs *using the claimed elements in the claimed manner*.

Still further, Petitioner describes I_3 as a “First Input Voltage” and I_4 as a “Second Input Voltage” (Pet. 38), but Petitioner has not explained which of those it relies on to teach “an input voltage” that is compared to “a reference voltage” by an error amplifier, as recited by the claim. Petitioner identifies signals I_3 and I_4 . *Id.* at 38. But Petitioner has not identified which of those signals correspond to “an input voltage” which is compared with a reference voltage to generate a control voltage, let alone where Sudhaus describes making that comparison. To the extent Petitioner asserts I_3 and I_4 are combined to form a single input voltage (*see id.* at 95), Petitioner has not explained how, or shown where, Sudhaus describes combining I_3 and I_4 to form a single input voltage that is compared to I_{soll} .

Even further, Petitioner has not explained how I_3 or I_4 , which Sudhaus states are *currents* (Ex. 1005, 4:35), correspond to “an input *voltage*.” Although currents and voltages are related, Petitioner has not explained how that relationship applies to the claimed voltage.

Accordingly, for any of the reasons discussed above, Petitioner has not shown Sudhaus teaches or suggests the following limitations of claim 1:

- an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage; and

- an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage.

As Petitioner has not adequately shown Sudhaus teaches or suggests those limitations, Petitioner has not shown a reasonable likelihood that claim 1 would have been obvious over Sudhaus.

2. *Independent Claim 16*

Independent claim 16 recites limitations similar to the dispositive limitations discussed above in regards to claim 1. In particular, claim 16 similarly recites

an error amplifier comprising a first input to receive an input voltage, a second input to receive a reference voltage, and an output to provide a control voltage; and

an amplifier output stage comprising an input coupled to the output of the error amplifier.

Ex. 1001, 10:21–25.

Petitioner contends Sudhaus teaches those limitations, providing similar discussion, annotations, and citations as it does for claim 1. *See* Pet. 94–97 (citing Ex. 1005, 2:32–33, 4:25–28, 4:46–50, 8:47–55, Fig. 1); *see also id.* 21–22. For example, Petitioner asserts controller RG satisfies the “an error amplifier,” “a control voltage,” and “amplifier output stage” limitations. *Id.* at 95, 97. Petitioner also similarly asserts I_3 corresponds to the claimed “first input voltage” and I_4 corresponds to the claimed “second input voltage.” *Id.* at 95.

Petitioner’s discussion of claim 16 does not provide any additional explanation or cite additional evidence from what it presents for claim 1. As discussed above, Petitioner has not adequately shown controller RG satisfies the “error amplifier,” “control voltage,” and “amplifier output stage” limitations; how those claim elements interact or relate; which signal the asserted error amplifier of controller RG outputs; or which of Sudhaus’s input currents I_3 and I_4 correspond to the claimed input voltage. Accordingly, Petitioner has not shown a reasonable likelihood of showing claim 16 would have been obvious over Sudhaus.

3. Remaining Claims 2, 3, 6, 10, 11, and 17

For independent claim 11, Petitioner references its analysis of the dispositive limitations of claim 1 we discuss above. *See* Pet. 81–83. As such, Petitioner’s analysis of claim 11 suffers from the same deficiencies as those discussed above.

Claims 2, 3, 5, 9, and 10 depend from independent claims 1, 11, or 16. Petitioner’s analysis of these dependent claims does not cure the deficiencies of their respective independent claims. *See* Pet. 46–91, 103–107.

Accordingly, for the reasons explained above, Petitioner has not shown a reasonable likelihood it would prevail in establishing the unpatentability of at least one challenged claim as obvious over Sudhaus.

F. Asserted Obviousness over Sudhaus and Ryoichi

Petitioner contends that the subject matter of claims 1–4, 6, 7, 10–12, and 15–18 would have been obvious over the combination of Sudhaus and Ryoichi. Pet. 22–28, 36–108. Patent Owner argues that Petitioner’s showing is insufficient. Prelim. Resp. 8–22, 29–37, 41–47.

We have considered the parties’ arguments and the evidence presented. We determine that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that the claimed subject matter would have been obvious over the combination of Sudhaus and Ryoichi.

1. Independent Claim 1

Petitioner has not adequately shown that claim 1 would have been obvious over the combination of Sudhaus and Ryoichi for a number of independent reasons: Petitioner has not offered adequate motivation for the combination; Petitioner’s combination seemingly renders Sudhaus

inoperable for its intended purpose; and Petitioner has not shown Ryoichi teaches all the limitations Petitioner asserts it teaches. Our discussion below focuses on those shortcomings, starting with an overview of Petitioner's combination.

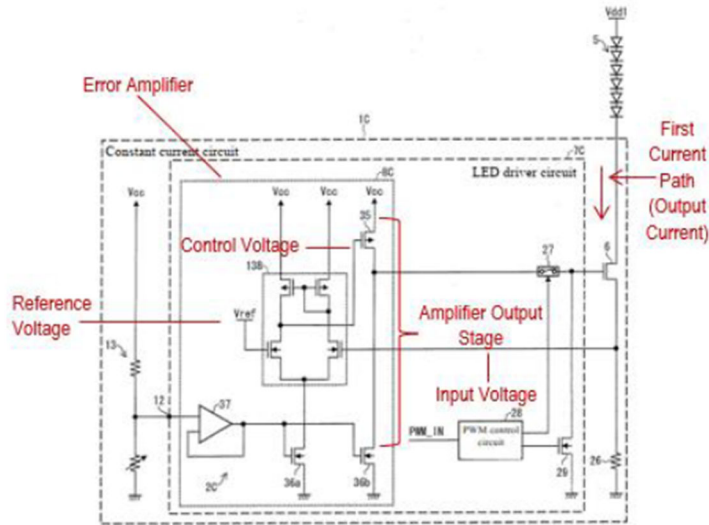
a) Petitioner's Combination

Petitioner contends the combination of Sudhaus and Ryoichi teaches the following limitations recited in claim 1:

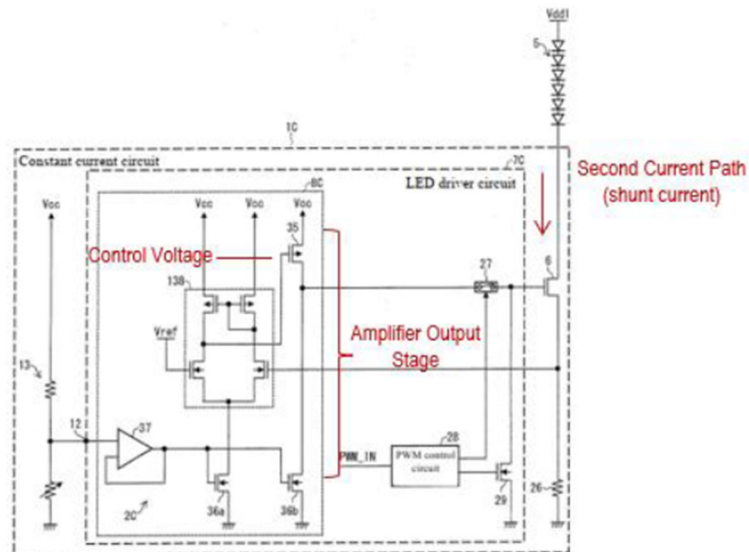
an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage; and

an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage.

Pet. 22–28, 36–41 (citations omitted). Petitioner relies on Sudhaus to teach “LED driver systems that deliver controlled total current to an LED load via two current paths.” *Id.* at 23. Petitioner argues to “the extent the Board finds that Sudhaus does not disclose an error amplifier and amplifier output stage . . . Ryoichi discloses a transistor level realization of an error amplifier and amplifier output stage for controlling a current to an LED load.” *Id.* at 35; *see id.* at 37–41 (citations omitted). Petitioner supports its argument with two separate annotations of Figure 5 of Ryoichi, reproduced below. *Id.* at 39, 41.



RYOICHI FIG. 5



RYOICHI FIG. 5

Both annotations of Figure 5 above show an exemplary LED actuation circuitry of Ryoichi's disclosure with annotations by Petitioner purporting to explain certain aspects of the circuit. *See* Ex. 1006 ¶ 83; Pet. 39, 41. Petitioner argues operational amplifier 8C teaches both “an error amplifier” and “an amplifier output stage” to control a “current path (transistor 6/resistor 26), providing current to LED load 5.” Pet. 24 (citing Ex. 1006 ¶ 83), 39, 41. In its first annotation, Petitioner asserts “current path

(transistor 6/resistor 26)” teaches “a first current path.” *Id.* at 39. In its second annotation, Petitioner asserts the same “current path (. . . transistor 6/resistor 26)” teaches “a second current path.” *Id.* at 41.

Petitioner argues a “POSITA would find it obvious to include Ryoichi’s error amplifier (including the amplifier output stage) in the Sudhaus controller.” *Id.* at 27. Petitioner supports its combination by asserting a “POSITA would have been motivated to combine Sudhaus and Ryoichi as Ryoichi discloses transistor level detail of a portion of a controller, such as the Sudhaus controller, including current control (the error amplifier and amplifier output stage).” *Id.* at 21.

b) Motivation

Petitioner’s argument that a “POSITA would have been motivated to combine Sudhaus and Ryoichi as Ryoichi discloses transistor level detail of a portion of a controller” (Pet. 21) does not adequately support the combination of Sudhaus and Ryoichi.

First, although Petitioner provided a declaration of Mr. Glösekötter (Ex. 1003), Petitioner has not provided any citations to that declaration or cited any other evidence to support its factual assertion that a skilled artisan would have been motivated to combine Sudhaus and Ryoichi. *See* Pet. 21; *Par Pharm., Inc. v. TWI Pharm., Inc.*, 773 F.3d 1186, 1196 (Fed. Cir. 2014) (citations omitted) (“The presence or absence of a motivation to combine references in an obviousness determination is a pure question of fact.”). And, even if we were to examine Petitioner’s uncited declarant testimony, we do not readily discern any portions of that testimony that discuss the existence of motivation. *See* Ex. 1003 ¶¶ 72–83. As such, Petitioner’s factual assertion that a skilled artisan would have been motivated to combine

Sudhaus and Ryoichi is insufficiently supported. *See, e.g., Icon Health & Fitness, Inc. v. Strava, Inc.*, 849 F.3d 1034, 1043 (Fed. Cir. 2017) (“Attorney argument is not evidence.”).

Moreover, the motivation Petitioner proffers is merely a statement of what Ryoichi allegedly discloses. But, to satisfy the motivation to combine inquiry, “[i]t does not suffice to simply be known. A reason for combining must exist.” *Virtek Vision Int’l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 888 (Fed. Cir. 2024). Petitioner has not explained, or cited evidence explaining, *why* Ryoichi’s alleged transistor-level detail of a portion of a controller would motivate Ryoichi’s incorporation into Sudhaus. *See* Pet. 21–22.

We also note that, although Petitioner asserts “[m]ultiple *KSR* obviousness rationales support the modifications set out,” Petitioner has not stated exactly which *KSR* rationales it relies on, let alone explain how those rationales are applicable to Petitioner’s combination. Pet. 20–21 (citing *KSR*, 550 U.S. 415–421). It is Petitioner’s burden to set forth its challenge *with particularity* and we do not guess which *KSR* rationales might apply. 35 U.S.C. § 312(a)(3); *see Parus Holdings, Inc. v. Google LLC*, 70 F.4th 1365, 1371–72 (Fed. Cir. 2023) (“Judges are not like pigs, hunting for truffles . . .”).

Accordingly, Petitioner has not set forth adequate motivation to combine Sudhaus and Ryoichi. For this reason alone, Petitioner has failed to show that claim 1 would have been obvious over the combination of Sudhaus and Ryoichi.

c) Operability

We agree with Patent Owner that Petitioner fails to show “Sudhaus would still function as intended” were Ryoichi and Sudhaus combined as suggested by Petitioner. Prelim. Resp. 30.

Petitioner’s combination “include[s] Ryoichi’s error amplifier (including the amplifier output stage) in the Sudhaus controller [RG].” Pet. 27. The intended purpose of controller RG, as Petitioner relies on, is to control *two* output currents to collectively power a load. Pet. 37 (citing Ex. 1005, 2:32–33, 4:46–50); *see* Ex. 1005, 4:33–46, Fig. 1. On the other hand, Ryoichi’s operational amplifier 8C, which Petitioner asserts reads on the claimed error amplifier and amplifier output stage, controls *one* output current. Ex. 1006 ¶ 83, Fig. 5.

The result of Petitioner’s proposed inclusion of Ryoichi’s single-output operation amplifier in Sudhaus’s two-output system is seemingly inoperative. As Patent Owner points out, it is unclear how “the single current output of Ryoichi would control both current sources of Sudhaus.” Prelim. Resp. 33. Further, Petitioner provides little detail explaining how its proposed combination would function. For example, Petitioner has not explained whether Ryoichi’s single output would replace Sudhaus’s two outputs, whether Ryoichi’s single output would be applied to both of Sudhaus’s two outputs, or whether Ryoichi’s single output would be applied to one of Sudhaus’s two outputs but not the other (or which output of the two). *See* Pet. 22–28. Because Petitioner has not resolved the technical differences in outputs, and has not explained the particulars of its combination, we agree with Patent Owner that Petitioner’s proposed combination would render Sudhaus’s control circuit inoperable for its intended purpose. Prelim. Resp. 29–30.

As Petitioner’s proposed combination appears to result in a device that is inoperable for its intended purpose, Petitioner has not adequately shown that a skilled artisan would have combined Sudhaus and Ryoichi in the manner proposed by Petitioner. *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1354 (Fed. Cir. 2001) (citing *In re Spinnoble*, 405 F.2d 578, 587 (1969) (references teach away from combination if combination produces a seemingly inoperative device)).

d) “an error amplifier . . . a control voltage . . . an amplifier output stage”

Petitioner does not adequately show Ryoichi teaches the following limitations recited in claim 1:

an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage.

Ex. 1001, 8:18–21.

Petitioner asserts the same “current path (transistor 6/resistor 26)” in Ryoichi teaches both “an output current through a first current path and a shunt current through a second current path.” *See* Pet. 39 (citing Ex. 1006 ¶ 83, Fig. 5), 41. The claim requires “a first current path” and, separately, “a second current path” with respective currents. Petitioner’s reliance on Ryoichi’s single current path does not explain how Ryoichi teaches two separate current paths and respective currents. Accordingly, Petitioner has not adequately shown that Ryoichi teaches this limitation.

For the foregoing reasons, Petitioner has not demonstrated a reasonable likelihood of showing claim 1 would have been obvious over the combination of Sudhaus and Ryoichi.

2. Independent Claim 16

Independent claim 16 recites limitations similar to the dispositive limitations discussed above in regards to claim 1. In particular, claim 16 recites

an error amplifier comprising a first input to receive an input voltage, a second input to receive a reference voltage, and an output to provide a control voltage; and

an amplifier output stage comprising an input coupled to the output of the error amplifier.

Ex. 1005, 10:21–25.

Petitioner contends the combination of Sudhaus and Ryoichi teaches those limitations, relying on the same teachings as it did for claim 1. *See* Pet. 94–98 (citing Ex. 1005, 2:32–33, 4:25–28, 4:46–50, 8:47–55, Fig. 1). Moreover, Petitioner relies on the same flawed combination of teachings and inadequate motivation as it does for claim 1. *See id.* at 22–28, 94–98.

Petitioner’s showing in claim 16 does not add any explanation or citation to what it presents for claim 1. Accordingly, for the same reasons as discussed above, Petitioner has not demonstrated a reasonable likelihood of showing claim 16 would have been obvious over the combination of Sudhaus and Ryoichi.

3. Remaining Claims 2–4, 6, 7, 10–12, 15, 17, and 18

For independent claim 11, Petitioner has not provided separate arguments, evidence, and motivation to support the combination of Sudhaus and Ryoichi. *See* Pet. 22–28, 81–87. As such, Petitioner’s analysis of these claim suffers from the same deficiencies discussed above.

Claims 2–4, 6, 7, 10, 12, 15, 17, and 18 depend from independent claims 1, 11, or 16. Petitioner’s analysis of these dependent claims does not cure the deficiencies of their respective independent claims. *See* Pet. 46–91, 103–108.

Accordingly, Petitioner has not shown a reasonable likelihood it would prevail in establishing the unpatentability of at least one challenged claim as obvious over the combination of Sudhaus and Ryoichi.

G. Asserted Obviousness over Sudhaus, Ryoichi, and Praxis

Petitioner contends that the subject matter of claims 1–4, 6, 7, 10–12, and 15–18 would have been obvious over the combination of Sudhaus, Ryoichi, and Praxis. Pet. 28–30, 36–108. Patent Owner argues that Petitioner’s showing is insufficient. Prelim. Resp. 8–22, 29–37, 41–48.

We have considered the parties’ arguments and the evidence presented. For the reasons explained below, we determine that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that the claimed subject matter would have been obvious over the combination of Sudhaus, Ryoichi, and Praxis.

1. Public Accessibility of Praxis

Patent Owner contends that Petitioner has not met its burden to show Praxis is a printed publication usable in its challenge because Petitioner has not shown Praxis was publicly accessible. Prelim. Resp. 47–48. We agree.

“[P]ublic accessibility” is the touchstone in determining whether a reference constitutes a “printed publication.” *In re Hall*, 781 F.2d 897, 899 (Fed. Cir. 1986) (citations omitted). “A given reference is ‘publicly accessible’ upon a satisfactory showing that such document has been

disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it.” *SRI Int’l, Inc. v. Internet Sec. Sys., Inc.*, 511 F.3d 1186, 1194 (Fed. Cir. 2008) (quoting *Bruckelmyer v. Ground Heaters, Inc.*, 445 F.3d 1374, 1378 (Fed. Cir. 2006)). Petitioner bears the burden to establish a reasonable likelihood that the reference was publicly accessible at the institution stage. *Hulu*, Paper 29 at 13.

Petitioner’s discussion of Praxis’s public accessibility simply asserts “[t]he Elektronik Praxis Article (Praxis), by Sudhaus, was published in the October 2016 edition of Elektronik Praxis and is prior art under 35 U.S.C. § 102(a)(1).” Pet. 11. That assertion does not provide explanation or relevant evidence supporting Praxis’s publication in the October 2016 edition. In particular, Petitioner has not identified what indicia on Praxis shows it was published in the October 2016 edition. *See id.* Nor do we readily find any indication of publication in the October 2016 edition. *See* Ex. 1008.

While Praxis includes a date on its face, “29.09.2016” (*id.* at 1, the “September date”), that date does not by itself establish Praxis was, in fact, published in the October 2016 edition. For one thing, the September date does not match, and so does not establish, an October publication. The September date could represent an unpublished, internal draft date or something else unrelated to public accessibility. Petitioner has not explained what the September date signifies, let alone acknowledge that date, and we do not fill that gap for Petitioner.

Nor has Petitioner provided any other evidence showing Praxis was included in the October 2016 edition of Elektronik Praxis, e.g., a table of contents from that edition or a declaration stating that it was included in that

edition. *See* Pet. 11. As such, Petitioner's mere assertion that Praxis was published in the October 2016 edition of Elektronik Praxis is not supported adequately by evidence.

Still further, even assuming, *arguendo*, Praxis was included in the October 2016 edition of Elektronik Praxis, Petitioner has not presented any evidence that the October 2016 edition of Elektronik Praxis was publicly accessible. *See id.* Nor has Petitioner explained what type of periodical Elektronik Praxis is or provided any details regarding its dissemination. *See id.*

Accordingly, Petitioner has not adequately shown that Praxis was publicly accessible before the critical date of the '432 Patent and so has not shown that Praxis qualifies as a printed publication usable in its challenge. For at least this reason, Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that any challenged claim would have been obvious over any combination relying on Praxis. For further information for the parties, we also address the merits of Petitioner's challenge, below.

2. *Independent Claim 1*

Petitioner has not adequately shown that claim 1 would have been obvious over the combination of Sudhaus, Ryoichi, and Praxis for at least two independent reasons: Petitioner has not shown adequate motivation for the combination and Petitioner has not shown Praxis teaches asserted claim features. Our discussion below focuses on those shortcomings, starting with an overview of Petitioner's combination.

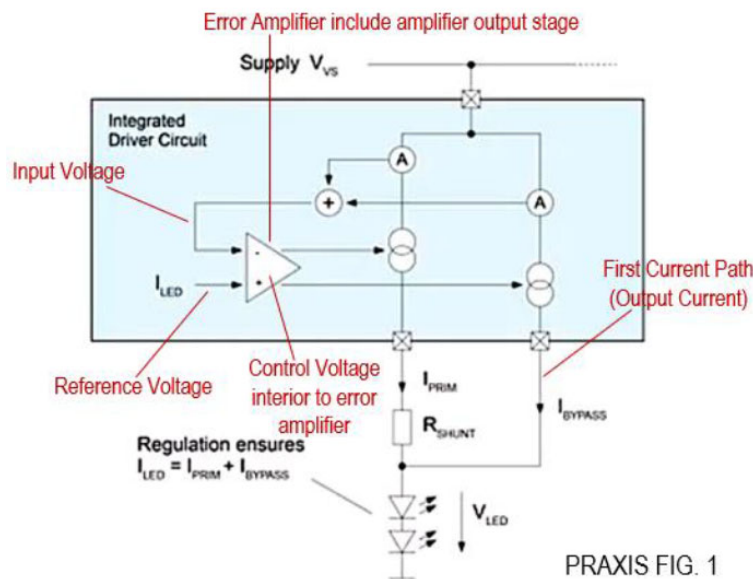
a) *Petitioner's Combination*

Petitioner contends the combination of Sudhaus, Ryoichi, and Praxis teaches the following limitations recited in claim 1:

an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage; and

an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage.

Pet. 28–30, 36–41 (citations omitted). Petitioner argues Sudhaus teaches “an LED driver system that delivers a total controlled current to an LED load via two current paths.” *Id.* at 28. Petitioner further argues “[t]o the extent the Board finds that Sudhaus does not disclose an error amplifier and amplifier output stage, Praxis discloses an error amplifier for controlling two current paths” for two current sources. *Id.* at 35; *see id.* at 28–29 (citing Ex. 1008, 1, 3, Fig. 1), 39–42. Petitioner supports its argument with annotations to Figure 1 of Praxis, reproduced below.



Id. at 40; *see id.* at 42. Annotated Figure 1 above shows an exemplary circuit diagram for a driver circuit of Praxis’s disclosure with annotations by

Petitioner purporting to explain certain aspects of the circuit. *See* Ex. 1008 Fig. 1; Pet. 40.

Petitioner argues a “POSITA would find it obvious to include Praxis’ error amplifier with an output stage hav[ing] two outputs, to control two current sources in Sudhaus’ LED driver system.” *Id.* at 29. Petitioner supports its combination by asserting a “POSITA would have been motivated to combine Sudhaus and Praxis as Praxis discloses an analog approach to the design need of controlling a sum of two currents.” *Id.* at 21.

b) Motivation

Petitioner’s argument that a “POSITA would have been motivated to combine Sudhaus and Praxis as Praxis discloses an analog approach to the design need of controlling a sum of two currents” (Pet. 21) does not adequately support the combination of Sudhaus and Praxis.

As Petitioner did in its challenge over Sudhaus and Ryoichi, Petitioner has not cited any supporting evidence and so has not adequately established its factual assertion that a skilled artisan would have been motivated to combine Sudhaus and Ryoichi. *See id.* Furthermore, Petitioner’s proffered motivation is mostly a statement of what the prior art allegedly discloses, i.e., an analog approach to controlling a sum of two currents, but the disclosure itself does not suffice to support the combination. *See Virtek Vision*, 97 F.4th at 888. And, although Petitioner generically asserts there is a “design need” for controlling the sum of two currents, Petitioner has not explained what that specific design need is, why it existed, or why Praxis’s approach would have been selected for combination with Sudhaus. *See* Pet. 21–22. Accordingly, Petitioner has not shown a skilled artisan would have had motivation to combine Sudhaus and Praxis. Therefore,

Petitioner has not shown a reasonable likelihood that claim 1 would have been obvious over Sudhaus and Praxis.

c) *“an error amplifier . . . a control voltage . . . an amplifier output stage”*

Petitioner also fails to show Praxis teaches the following limitations recited in claim 1:

an error amplifier configured to compare an input voltage with a reference voltage to generate a control voltage; and

an amplifier output stage configured to control an output current through a first current path and a shunt current through a second current path based on the control voltage.

Ex. 1001, 8:15–21. As shown in its annotation of Figure 1 of Praxis, Petitioner asserts Praxis’s error amplifier “include[s] amplifier output stage” and has a “Control Voltage interior to [the] error amplifier.” Pet. 39–40 (citing Ex. 1008, 3, Fig. 1). That is, Petitioner asserts Praxis’s error amplifier alone teaches all of: an error amplifier, which generates a control voltage, which an amplifier output stage uses to control two output currents. *See id.* at 39–42 (citations omitted).

As it failed to do in its challenge over Sudhaus alone, Petitioner has not adequately explained how, or shown where the record supports, that, Praxis’s error amplifier meets all three of “an error amplifier,” “a control voltage,” and “an amplifier output stage.” Nor has Petitioner adequately explained how, or shown where the record supports, those three elements interacting in the claimed manner, i.e., the error amplifier generating a control voltage and the amplifier output stage controlling two current paths based on the control voltage. Accordingly, Petitioner has not shown a reasonable likelihood that claim 1 would have been obvious over the combination of Sudhaus, Ryoichi, and Praxis.

3. *Independent Claim 16*

Independent claim 16 recites limitations similar to the dispositive limitations discussed above in regards to claim 1. In particular, claim 16 recites

an error amplifier comprising a first input to receive an input voltage, a second input to receive a reference voltage, and an output to provide a control voltage; and

an amplifier output stage comprising an input coupled to the output of the error amplifier.

Ex. 1001, 10:21–25.

Petitioner contends the combination of Sudhaus, Ryoichi, and Praxis teaches those limitations, relying on the same teachings as it does for claim 1. *See* Pet. 94–97 (citing Ex. 1005, 2:32–33, 4:25–28, 4:46–50, 8:47–55, Fig. 1). Moreover, Petitioner relies on the same flawed combination of teachings and inadequate motivation as it does for claim 1. *See id.* at 22–28, 94–97.

Petitioner’s showing for claim 16 does not add explanation or citation to what Petitioner presents for claim 1. Accordingly, for the same reasons discussed above, Petitioner has not demonstrated a reasonable likelihood of showing claim 16 would have been obvious over the combination of Sudhaus, Ryoichi, and Praxis.

4. *Remaining Claims 2–4, 6, 7, 10–12, and 15–18*

For independent claim 11, Petitioner has not provided separate arguments, evidence, and motivation to support the combination of Sudhaus, Ryoichi, and Praxis. *See* Pet. 28–30. As such, Petitioner’s analysis of these claims suffers from the same deficiencies discussed above.

Claims 2–4, 6, 7, 10, 12, 15, 17, and 18 depend from independent claim 1, 11, or 16. Petitioner’s analysis of these dependent claims does not cure the deficiencies of their respective independent claims. *See* Pet. 46–91, 103–108.

Accordingly, for the reasons explained above, Petitioner has not shown a reasonable likelihood it would prevail in establishing the unpatentability of at least one challenged claim as obvious over the combination of Sudhaus, Ryoichi, and Praxis.

H. Remaining Challenges

Petitioner presents two additional challenges incorporating the three challenges discussed above. Petitioner’s fourth challenge asserts claims 1–4, 6, 7, 10–12, and 15–18 would have been obvious over Sudhaus, Ryoichi, Praxis, and Wu. Pet. 30–32. Petitioner’s fifth challenge asserts claims 1–20 would have been obvious over Sudhaus, Ryoichi, Praxis, Provost, TI Paper, and UK Paper. *Id.* at 32–35. Petitioner has not shown a reasonable likelihood of prevailing on these remaining challenges.

Petitioner’s fourth and fifth challenges rely on Petitioner’s earlier three challenges to teach the claimed error amplifier that provides a control voltage and the claimed amplifier output stage that receives the control voltage features. The fourth and fifth challenges add references addressing different claim features, namely slew-rate control, and do not resolve the deficiencies of the earlier three challenges. As such, for the reasons we provide above, Petitioner’s fourth and fifth challenges also fail to demonstrate a reasonable likelihood of prevailing in showing the unpatentability of at least one claim.

In addition, Petitioner has not provided adequate motivation supporting the combinations in its fourth and fifth challenges. Petitioner asserts the additional references in those challenges “provide alternatives for slew rate control and a POSITA would be motivated to combine any of these references to accommodate a particular design need.” Pet. 21. Petitioner has not described what that particular design need is. Nor has Petitioner presented any evidence that such design needs existed. *See id.* at 21–22. Further, Petitioner fails to provide evidence supporting its factual assertion.

Patent Owner also contends that Petitioner’s fourth and fifth challenges fail to meet the particularity requirement of 35 U.S.C. § 312(a)(3). Prelim. Resp. 9–13. We agree. Each reference Petitioner adds in its fourth challenge (Wu) and fifth challenge (Provost, TI Paper, UK Paper) assertedly teaches the same feature: slew-rate control. Pet. 30 (“Wu is presented as an alternative to the slew rate control of Sudhaus and/or Ryoichi), 32 (“Combinations of Provost, the TI Paper and the UK Paper are presented as alternative methods of slew rate control.”); *see id.* at 43–44. Those asserted teachings are in addition to Petitioner’s assertion that Sudhaus and Ryoichi also each teach slew-rate control. *Id.* at 22, 27–28, 40–43. In total, Petitioner asserts that at least five references teach various techniques for slew-rate control. Petitioner simply states “[a]dditionally (and alternatively)” each of those references teaches slew-rate control. *Id.* at 42–45. Petitioner, however, has not detailed how its combinations rely on those references. *See generally id.* at 30–35. Instead, Petitioner vaguely suggests that “any of these references” could be combined (Pet. 21), leaving us with a large number of potential permutations of Petitioner’s challenge, e.g., permutations may rely on some subset of references and not others and some permutations may rely on certain portions of some references and not

others. *See* Prelim. Resp. 9–11 (table showing various combinations of the references). We agree with Patent Owner (*id.* at 11–12) that Petitioner inappropriately invites the Board and Patent Owner to search the record for evidence that might support the full breadth of Petitioner’s contentions. *Adaptics Ltd. v. Perfect Co.*, IPR2018-01596, Paper 20 at 22–23 (PTAB March 6, 2019); *see Netflix, Inc. v. DivX, LLC*, 84 F.4th 1371, 1377 (Fed. Cir. 2023) (“[T]he Board should also not have to decode a petition to locate additional arguments beyond the ones clearly made.”).

Accordingly, Petitioner has not shown a reasonable likelihood it would prevail in establishing the unpatentability of at least one challenged claim under either its fourth or fifth grounds of unpatentability.

Accordingly, for the reasons explained above, Petitioner has not shown a reasonable likelihood it would prevail in establishing the unpatentability of at least one challenged claim as obvious over the combination of Sudhaus, Ryoichi, Praxis, and Wu, or the combination of Sudhaus, Ryoichi, Praxis, Provost, TI Paper, and UK Paper.

III. CONCLUSION

As explained above, Petitioner has not shown a reasonable likelihood that it would prevail in establishing the unpatentability of at least one claim on any of the grounds asserted in the Petition. In addition to the reasons discussed in this Decision, Patent Owner has provided additional arguments why Petitioner has not shown a reasonable likelihood that it would prevail. *See generally* Prelim. Resp. We need not address those additional arguments, as our discussion in this Decision explains our reasons for denying institution.

Accordingly, we do not institute an *inter partes* review.

IV. ORDER

It is ORDERED that the Petition is denied and no *inter partes* review is instituted.

IPR2024-00802
Patent 11,653,432 B1

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