

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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WANGS ALLIANCE CORPORATION d/b/a WAC LIGHTING CO.,  
Petitioner,

v.

KONINKLIJKE PHILIPS N.V.,  
Patent Owner.

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Case IPR2015-01287  
Patent 6,013,988

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Before, GLENN J. PERRY, TREVOR M. JEFFERSON, and  
MIRIAM L. QUINN, *Administrative Patent Judges*.

QUINN, *Administrative Patent Judge*.

FINAL WRITTEN DECISION  
*35 U.S.C. § 318(a) and 37 C.F.R. § 42.73*

Wangs Alliance Corporation (“Petitioner”) filed a Petition to institute *inter partes* review of claims 1 and 2 of U.S. Patent No. 6,013,988 (“the ’988 patent”) pursuant to 35 U.S.C. § 311–319. Paper 2 (“Pet.”). Koninklijke Philips N.V. (“Patent Owner”) timely filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). Upon consideration of the Petition and the Preliminary Response, we instituted trial as to claims 1 and 2. Paper 8 (“Dec.”).

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 22, “PO Resp.”); and Petitioner filed a Reply (Paper 35, “Reply”). Patent Owner also filed Motions for Observations on Cross Examination of Petitioner’s Reply Witness Mr. Tingler. Paper 51 (“Mot. for Obs.”). Petitioner responded to Patent Owner’s Motion for Observations. Paper 55 (“Resp. Obs.”). Petitioner also filed a Motion to Exclude (Paper 45, “Mot. to Exclude”), which Patent Owner opposes (Paper 50, “Opp. Mot. to Exclude”).<sup>1</sup>

An oral hearing was held on August 23, 2016.<sup>2</sup>

We have jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons discussed herein, and in view of the record in this trial, we determine that Petitioner has shown by a preponderance of the evidence that claims 1 and 2 of the ’988 patent are unpatentable.

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<sup>1</sup> Petitioner also filed a Reply in support of its Motion to Exclude. Paper 54 (“Reply Mot. to Exclude”).

<sup>2</sup> A transcript of the oral hearing is entered in the record as Paper 58 (“Tr.”).

I. BACKGROUND

A. RELATED MATTERS

Petitioner states that the patent-at-issue is the subject matter of a district court case filed in the U.S. District Court for the District of Massachusetts (Case No. 14-cv-12298-DJC). Pet. 1.

B. INSTITUTED GROUNDS OF UNPATENTABILITY

We instituted trial based on the following grounds (Dec. 21–22):

Reference[s]	Basis	Claims
Hochstein <sup>3</sup> and Hildebrand <sup>4</sup>	§ 103	1 and 2
Perry <sup>5</sup>	§ 102	1

C. THE '988 PATENT (EX. 1001)

The '988 patent is directed to a circuit arrangement for operating a semiconductor light source, or light emitting diode (“LED”) lights. Ex. 1001, 1:11–18. The '988 patent describes that control units in existing signaling systems often conduct “leakage current” when the control unit is in a non-conducting, or off, state. *Id.* at 1:36–38.

Figure 1 of the '988 patent, reproduced below, illustrates the control unit VB and semiconductor light source LB, or LED light.

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<sup>3</sup> U.S. Patent No. 5,661,645 (Exhibit 1003) (“Hochstein”).

<sup>4</sup> U.S. Patent No. 5,075,601 (Exhibit 1005) (“Hildebrand”).

<sup>5</sup> U.S. Patent No. 6,150,771 (Exhibit 1004) (“Perry”).

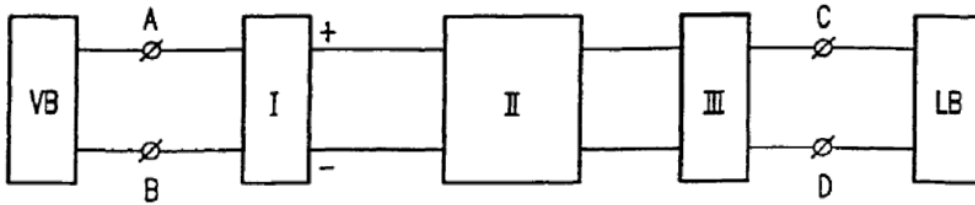
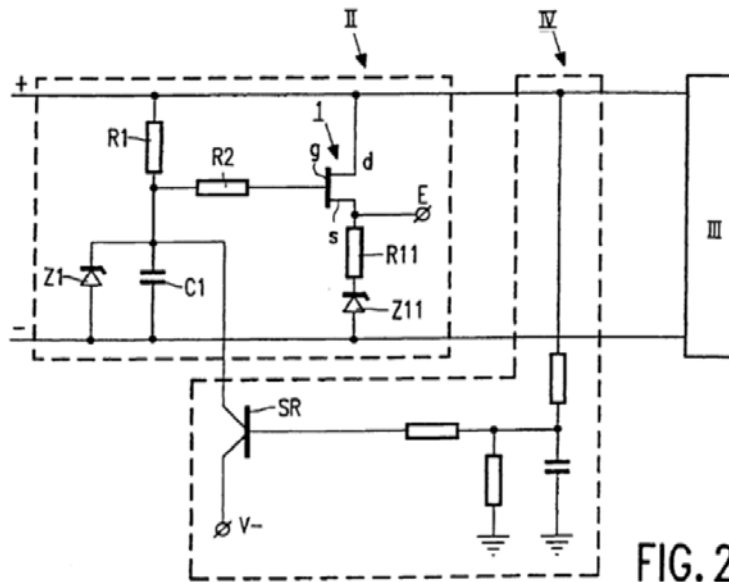


FIG. 1

Figure 1 depicts connection terminals A and B, input filter means I, self-regulating current-conducting network II, converter III, and output terminals C and D. *Id.* at 2:55–62. Figure 2, reproduced below, shows an embodiment of the self-regulating current-conducting network II. *Id.* at 2:63–3:13.



According to the embodiment depicted in Figure 2 above, when the control unit is switched on, the voltage at the positive pole + will rise, and switch SR becomes conducting, cutting off MOSFET 1, resulting in self-regulating, current-conducting network II being deactivated. *Id.* at 3: 21–25.

D. CLAIMS-AT-ISSUE

The challenged claims are reproduced below.

1. A circuit arrangement for operating a semiconductor light source, said circuit arrangement comprising:

connection terminals for connecting the circuit arrangement to outputs from a control unit for controlling the semiconductor light source;

input filter means coupled to the connection terminals;

a converter comprising a control circuit, said converter being coupled to output means of the input filter means; and

output terminals for coupled to output means of said converter for connecting said circuit arrangement to the semiconductor light source,

characterized in that said converter comprises a switched-mode power supply for providing power to said semiconductor light source, said switched-mode power supply having a switching element which is cyclically switched on and off by said control circuit, and the circuit arrangement further comprises a self-regulating current-conducting network coupled between said filter means and said converter, said self-regulating current-conducting network draining off a leakage current in the control unit when said control unit is in a non-conducting state.

2. The circuit arrangement as claimed in claim 1, characterized in that the circuit arrangement comprises means [f]or deactivating the self-regulating current-conducting network [w]hen the converter is switched on.

## II. ANALYSIS

### A. CLAIM INTERPRETATION

The Board interprets claims using the “broadest reasonable construction in light of the specification of the patent in which [they] appear[.]” 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142–43 (2016). We presume that claim terms have their ordinary and customary meaning. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (“The ordinary and customary meaning ‘is the meaning that the term would have to a person of ordinary skill in the art in question.’” (citation omitted)).

In our Decision on Institution, we construed three terms: input filter means, output means, and means for deactivating. Dec. 6–12. The parties appear to not dispute the Board’s construction of these terms, but the parties do dispute the application of the Board’s construction of “input filter means” to the prior art. PO Resp. 50; Reply 20–21; Tr. 10:18–14:5, 26:8–29:25. Our claim construction analysis, therefore, begins by reviewing, on the full record before us, the construction of “input filter means,” in light of the parties’ dispute.

#### 1. “input filter means”

In our Decision on Institution, we determined, first, that the term “input filter means” was not a means-plus-function term. Dec. 6–7. In particular, we were persuaded by Patent Owner’s argument and evidence that the term recites sufficient structure. *Id.* We noted that Patent Owner relied on testimony of Dr. Batarseh, Exs. 1008–09, and Dr. Smith, Ex. 2002,

to allege that an “input filter” identifies structure to a person of ordinary skill in the art. *Id.* at 6. We stated,

We agree with Patent Owner that the term “input filter means” is not a means-plus-function term because it recites sufficient structure. Although the term is presumptively a means-plus-function claim limitation under 35 U.S.C. § 112, paragraph 6, the presumption can be rebutted “if the evidence intrinsic to the patent and any relevant extrinsic evidence so warrant.” *Personalized Media Commc’ns, LLC v. Int’l Trade Comm’n*, 161 F.3d 696, 704 (Fed. Cir. 1998). In this case, “input filter means” are not associated with a recited function and “input filter” is itself a structure. *See York Prod., Inc., Inc. v. Cent. Tractor Farm & Family Ctr.*, 99 F.3d 1568, 1574 (Fed. Cir. 1996) (“Without a ‘means’ sufficiently connected to a recited function, the presumption in use of the word ‘means’ does not operate.”). Notwithstanding that an “input filter” is not a specific structure, it is sufficient “if the claim term is used in common parlance or by persons of skill in the pertinent art to designate structure, even if the term covers a broad class of structures and even if the term identifies the structures by their function.” *Lighting World v. Birchwood Lighting*, 882 F.3d 1354, 1359–1360 (Fed. Cir. 2004).

Furthermore, the evidence of record shows that the term “filter” has generally understood meaning, even though the noun is derived from the function it performs. For example, as evidence of the meaning of “filter,” a dictionary defines the word as “[a]n electric circuit or device which selectively transmits or rejects signals in one or more intervals of frequencies.” *Definition filter*, WILEY ELECTRICAL AND ELECTRONICS ENGINEERING DICTIONARY, 285 (Steven M. Kaplan, 2004) (Ex. 1011). *See also Definition filter*, MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS, 715 (4<sup>TH</sup> ed., 1989) (“In general, a selective device that transmits a desired range of matter or energy while substantially attenuating all other ranges.”) (Ex. 1012). In the context of claim 1, and guided by the evidence of the meaning of “filter,” the term “input filter means” means an electronic circuit or

device that selectively transmits or rejects signals in one or more intervals or frequencies. The word “input” connotes that the claimed filter is located at the input stage of the circuit arrangement. *See* Ex. 1001, Fig. 1, 4:11–14 (describing terminal A as an input terminal). The location of the filter, however, need not be clarified further because the claim recites the devices and terminals the input filter means is coupled to, according to the claims, e.g., coupled to the connection terminals.

Therefore, in accordance with the ordinary and customary meaning of the claim, and consistent with the specification (Ex. 1001, 2:19–24) for purposes of this Decision, we construe “input filter means” as an electronic circuit or device that selectively transmits or rejects signals in one or more intervals or frequencies.

*Id.* at 6–8. The dispute during the trial phase focuses on whether an “input filter means” requires that the device operate “based on frequency.” That is, Patent Owner contends that the “only way a circuit can be ‘selective’ is to behave differently for signals in different intervals of frequencies.” PO Resp. 51. Additionally, Patent Owner argues that an “input filter is necessarily frequency dependent.” *Id.* Patent Owner supports these statements by citing generally to an excerpt of a book titled “Fundamentals of Power Electronics,” dated 2001, and filed as Exhibit 2003. The Patent Owner response, however, does not explain how the excerpt, focused on input filter design, supports these statements. *Id.* To be sure, the first page of book’s excerpt states that “[i]t is nearly always required that a filter be added at the power input of a switching converter,” and we assume that this is relevant to the claims-at-issue via the claimed “converter,” which “comprises a switched mode power supply.” Ex. 2003, 3; Ex. 1001,



5:22–23. The book’s excerpts also point out that an input filter allows compliance with regulations that limit conducted electromagnetic interference or EMI, and it does so by attenuating switching harmonics. Ex. 2003, 3. A filter suitable for attenuating harmonics is described as an L-C low-pass filter. *Id.* at 4. According to the explanation in the cited book, the current harmonics that have certain amplitudes are attenuated, and each harmonic is associated with a specific angular frequency. *Id.*

Patent Owner also provides testimony from Dr. Regan Zane, who opines that an “input filter means” is a frequency filter or is frequency dependent. Ex. 2013 ¶¶ 144–45. Dr. Zane relies on the book excerpt quoted above. Dr. Zane also describes the basic operation of a low-pass filter and states that the role of an “input filter transmits the D.C. signals and attenuates the current ripple harmonics from the switching function.” *Id.* ¶¶ 145–46. Dr. Zane takes issue with the Board’s interpretation of an input filter as not being limited to suppressing voltage surges based on frequency because our construction may encompass a filter that operates on one or more intervals of frequencies. *Id.* ¶ 147.

Finally, Patent Owner alleges that the parties agree that an “input filter means’ must be *frequency* dependent.” PO Resp. 50. Further, Patent Owner asserts that Dr. Robert N. Tingler, Petitioner’s declarant, agreed that an input filter means “transmits or rejects signals depending on what their frequencies are.” PO Resp. 51 (citing Ex. 2015, 36:5–10). Petitioner argues that it does not agree with Patent Owner’s position, and that Patent Owner mischaracterizes Mr. Tingler’s testimony. Reply 21–22.

At the heart of this dispute is the simple fact that the specification of the '988 patent does not describe any embodiment or operation of the input filter means. At most, the '988 patent specification states that the input filter may include a rectifier. Ex. 1001, 2:21–24. But neither the specification nor the claims describes the “input filter means” in any appreciable detail sufficient to discern which signals it selectively transmits or rejects and how it does so. The omission is not fatal, for the dictionary definitions we relied on to construe the term in our Decision on Institution were sufficient to discern that a person of ordinary skill in the art ascribed structure to the term. Dec. 7–8. The dispute centers on whether the dictionary definitions accurately reflect the understanding of a person of ordinary skill in the art. Given the dearth of intrinsic evidence on this issue, we evaluate the extrinsic evidence presented by the parties, and discussed above, to discern the role of *frequency* in the construction of “input filter means.” See *Phillips v. AWH Corp.*, 415 F.3d 1303, 1318 (Fed. Cir. 2005) (“[E]xtrinsic evidence in the form of expert testimony can be useful to a court for a variety of purposes, such as to provide background on the technology at issue, to explain how an invention works, to ensure that the court’s understanding of the technical aspects of the patent is consistent with that of a person of skill in the art, or to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field.”).

Upon review of Dr. Zane’s testimony and the statements in the book excerpt described above, we find that it was known to a person of ordinary skill in the art to use an EMI filter as an input filter in switch-mode power supply applications, like the one claimed. In fact, the book excerpt states

that it is “nearly always required.” The record also shows that a low-pass filter is suitable for the application as an EMI filter because it attenuates harmonics of certain amplitudes, and each harmonic is characterized by a certain frequency. *See* Ex. 2003, 3–4. The input filter, thus, would be configured to select which harmonics to reject, which are identified by phase angle or frequency. *Id.* Dr. Zane also opines that the input filter “‘rejects’ the undesired higher frequency signal content.” Ex. 2013 ¶ 145. Therefore, Patent Owner and its declarant provide extrinsic evidence that tends to show “input filter means” that transmit or reject signals based on frequency.

Petitioner, on the other hand, argues that an input filter is not required to transmit or reject signals *based on frequency*. Reply 21. Petitioner states that an input filter merely must select which signals to transmit and which signals to reject, but does not require “a selection of frequency intervals on which to operate.” *Id.* Petitioner also proffers cross-examination testimony of Mr. Tingler explaining that an input filter would have different structures depending on the function. Ex. 2015, 54:3–55:3. For example, if trying to attenuate a certain band of frequencies from going out onto the AC mains, that would be one design, but if filtering out incoming transients and their effects or noise, then the input filter would be so designed. *Id.* We note, however, that Mr. Tingler’s explanations are provided without reference to the context of the ’988 patent. That is, what constitutes an input filter, indeed, may be different depending on the application. But in the context of the claimed device, we are not persuaded that an “input filter means” could be any structure that simply rejects unwanted signals.

Having reviewed the arguments and evidence, as summarized above, we credit Dr. Zane’s testimony on this issue. We also rely on the book excerpt discussed above for its disclosure about input filter design in the context of a switched mode power supply. Specifically, we find that in the context of the ’988 patent, an input filter transmits or rejects certain signals, where those signals are selected because they are undesirable harmonics. We also find that those harmonics are identified by frequency. Accordingly, the “input filter means” is properly construed as an electronic circuit or device that selectively transmits or rejects signals in one or more intervals of frequencies. More particularly, whether a signal is rejected or transmitted is a function of the frequency of that signal.

2. “*output means*”

In our Decision on Institution we determined that “output means” is not a means-plus-function term. We found persuasive Patent Owner’s arguments that the term “output means” does not recite a function and that “output” recites sufficient structure. Prelim. Resp. 19–20 (arguing that “output” means output connection or connections of a circuit). In particular, we found that “output” refers to the signal delivered out of the circuit or device. We stated,

The claim supports this interpretation when it recites two “output means:” “output means of the input filter means” and “output means of said converter.” Regarding the “input filter means,” the claim requires the converter to couple to the input filter’s output, which is described in the specification as “a positive pole + and a negative pole –.” Ex. 1001, 2:60–62, 3:3–6, 3:20–21. Regarding the “converter,” the claim requires that output terminals of the circuit arrangement couple to the output of the converter. The word “output” is a noun that takes

its name from the function it performs: delivery of an output signal or data. *See Definition output*, WILEY ELECTRICAL AND ELECTRONICS ENGINEERING DICTIONARY, 541 (Steven M. Kaplan, 2004) (Ex. 3001) (defining *output* (2) as “[t]he energy, voltage, current, or other signal delivered or produced by a component, circuit device, piece of equipment, system, or process. For example, a voltage output taken from an electronic device. Also, to deliver or provide such a signal.”).

We do not agree with Patent Owner that “output means” are an output *connection* because the claim recites specific connection terminals and output terminals as providing connection (“connection terminals for connecting” and “output terminals . . . for connecting”). Furthermore, the dictionary definition of output referred to above defines the noun as either the signal that is provided by the circuit or the terminals from which such a signal is delivered. *Id.* (see definition number 4, “[t]he terminals of a component, circuit, device, or piece of equipment from which an output (2) is delivered. Also called output terminals.”). The claim distinctly recites terminals as output terminals, i.e., output terminals coupled to output means. Construing the “output means” as an output connection would make redundant the “output terminals,” which are recited precisely for the purpose of connecting the circuit to the semiconductor light source. Therefore, in accordance with the ordinary and customary meaning of the term “output,” the claim language, and in the context of the specification, we construe “output means” as the signal that is delivered.

Dec. 8–9. Patent Owner’s Response maintains the position that the parties agree that “output means” should be construed as “terminals or wires at the output.” PO Resp. 4–5. Patent Owner also argues that the Board’s construction at institution is at odds with our finding that “output” recites sufficient structure. *Id.* at 5. Notwithstanding the argument presented by Patent Owner, we see no reason to revisit this construction. First, there is no material difference between “output terminals” and “terminals at the

output.” Again we rely on the claim language, which specifically uses different words for “outputs,” “output terminals,” and “output means.” Yet these would all refer to the same structure if we followed the parties’ proposal. Neither party presents evidence that these structures are different.<sup>6</sup> And further, if the “output means” were terminals, the claim would be inconsistent with Figure 1, which does not show the converter (III) coupled to terminals at the output of the input filter means (I), for there is an intervening self-regulating current conducting network (II) coupled therebetween. Second, neither party has presented argument that the scope of this term is in actual dispute for purposes of determining its applicability to the prior art of record. *Vivid Techs., Inc. v. Am. Science & Eng’g, Inc.*, 200 F.3d 795, 803, (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”). Accordingly, we maintain that “output means,” consistent with the broadest reasonable interpretation in the context of the specification, is the signal that is delivered.

### 3. “means [f]or deactivating”

During institution, we construed this term as a means-plus-function term. Dec. 10–12. We determined that the means for deactivating is a

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<sup>6</sup> Patent Owner in passing refers to the prosecution history of the ’988 patent, but does not explain the relevance of the cited amendment or how it sheds light on the meaning of “output means.” Further, Applicants statement that amendments were made to include descriptive language connecting the recited components does not explain what are “output means.” Ex. 1002, Paper 11, Amendment (7/6/1999), 10.

transistor and a voltage divider that deactivate the self-regulating current conducting network when the converter is switched on, and where the “means for deactivating” is separate and distinct from the “self-regulating current-conducting network.” *Id.* Neither party has challenged the Board’s determination, and we see no reason to change it. *See, e.g.*, PO Resp. 5–6. Accordingly, we adopt the above stated construction of means for deactivating.

#### 4. *Other Claim Terms*

Petitioner proposed a construction for the term “leakage current” in the Petition. Patent Owner maintained in its Preliminary Response that the term did not require construction in order for the Board to resolve the parties’ dispute. Prelim. Resp. 20. We agreed with Patent Owner and did not construe the term. In its Response, Patent Owner provides a construction for the term “leakage current” but does not offer any explanation or reasoning for that construction. Furthermore, we do not see any dispute that necessitates a determination of the scope of this term. Accordingly, we do not construe “leakage current” or any other claim term.

#### B. SCOPE OF PETITIONER’S REPLY

During trial, Patent Owner argued that certain content in Petitioner’s Reply is impermissible argument because it is outside the scope of a proper Reply under 37 C.F.R. § 42.23(b) (“A reply may only respond to arguments raised in the corresponding opposition, patent owner preliminary response, or patent owner response.”). Patent Owner was allowed to file a notice indicating the specific portions in the Reply that it contends exceed the proper scope. Paper 47. Petitioner was allowed to respond by pointing out

to what statements or content in the Patent Owner Response it objected.  
Paper 53.

Our Trial Practice Guide points out that,

[w]hile replies can help crystalize issues for decision, a reply that raises a new issue or belatedly presents evidence will not be considered and may be returned. The Board will not attempt to sort proper from improper portions of the reply. Examples of indications that a new issue has been raised in a reply include new evidence necessary to make out a prima facie case for the patentability or unpatentability of an original or proposed substitute claim, and new evidence that could have been presented in a prior filing.

Office Patent Trial Practice Guide, 77 Fed. Reg. 48756, 48767 (Aug. 14, 2012). With the above guidelines in mind, we are not persuaded that the excerpts of the Reply identified by Patent Owner should not be considered in deciding this matter.

First, Patent Owner points to sections in the Reply that delve into the explanation of Petitioner's contention regarding design choice and the motivations to combine. *See* Paper 47, 2 (identifying Section II.B). We do not find either the materials or the evidence presented to be outside the scope of a proper reply. These sections do not include evidence necessary to make a case of unpatentability as the contentions thereby expanded upon were presented in the Petition and accompanying filings. Nor do we find that this evidence could have been presented earlier given that they are responsive to Patent Owner's arguments that the alleged motivations are deficient or improperly asserted. *See* PO Resp. 12–14.

Second, Patent Owner points to portions of the Declaration of Mr. Tingler as new evidence that should be stricken from the record. Paper 47,



2. For the same reasons as stated above, we do not find the Declaration as espousing evidence that could have been presented in a prior filing. The evidence is responsive to arguments made by Patent Owner and evidence presented regarding the alleged inoperability of Hochstein. The evidence is also responsive to arguments that Philips reduced to practice the '988 patent prior to the critical date of Perry. Neither of these contentions could have been anticipated prior to filing the Petition. Nor do we find that the objected to portions of Mr. Tingler's Declaration are necessary to make out a case of unpatentability.

Accordingly, we consider hereunder the Reply and the supporting Declaration in full.

#### C. PRINCIPLES OF LAW

A claim is anticipated, and, thus, unpatentable, if a single prior art reference discloses each and every element of the claimed invention. *See Schering Corp. v. Geneva Pharm.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003). Additionally, a claim is unpatentable under 35 U.S.C. § 103(a) 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 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) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

D. THE LEVEL OF SKILL IN THE ART

In determining the level of ordinary skill in the art at the time of the invention, we note that various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (quoting *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986)).

Petitioner asserts, through its declarant, Mr. Robert Tingler, that a person of ordinary skill in the art would have had at least,

- (i) a bachelor degree in electrical engineering and/or physics with at least 3 years of industrial experience designing power supply circuitry, or (ii) the equivalent relevant industrial experience, including circuit design experience, for a person lacking a formal degree, which would be about 3-5 years in the industry, or (iii) a person of substantially higher graduate education in optoelectronics, such as a Masters or a Doctoral degree.

Ex. 1006 ¶ 15. Mr. Tingler also opines that a person of ordinary skill in the art would “understand legacy lighting circuits and circuit requirements such as for incandescent lighting control and the corresponding lighting circuitry and requirements for powering LED arrays for the application areas generally covered by the patents at issue,” and would “be familiar with switch mode power supply concepts and their common embodiments at the time.” *Id.*

Patent Owner, through its declarant, Dr. Regan Zane, disagrees with Mr. Tingler that the proffered level of skill is “lower than the level required to be aware of all pertinent art and think along conventional wisdom in the art.” Ex. 2013 ¶ 24. Dr. Zane opines that a person of ordinary skill in the art would have “at least a Bachelor’s degree in Electrical Engineering or related field and at least five years of training or additional work experience in the area of power electronics or a related field. More hands-on and design experience would compensate for less formal education, and vice versa.” *Id.* ¶ 23. Notwithstanding the disagreement, Dr. Zane testified that regardless of which level of ordinary skill in the art was applied, his opinions would not change. Ex. 1024, 18:16–19:6.

We credit the testimony of Mr. Tingler regarding the level of a person of ordinary skill in the art. First, the ’988 patent is directed to circuit arrangement for operating a semiconductor light source. Ex. 1001, 1:10–12. The ’988 patent also describes that “it is necessary for the circuit arrangement to provide retrofit possibilities in respect [to] existing signalling systems.” *Id.* at 1:25–31. Furthermore, the patent alludes to the incorrect outcome of a status test because of leakage current in the non-conducting state of a solid state relay in the control unit that controls the signaling light. *Id.* at 1:32–41. Therefore, we find that the ’988 patent specification and the problem and solution addressed by the claimed circuit arrangement is based on an understanding of legacy lighting circuits and its controls in connection with powering of LED light sources.

The prior art of record also reflects the level of a person of ordinary skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir.

2001); *GPAC*, 57 F.3d at 1579; *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978). For example, the references are directed to circuit arrangements in power supplies for LED arrays. Ex. 1003, [54], Abstract; Ex. 1004, [54], Abstract; *see also* Ex. 1005, [54], 1:6–10 (addressing power supply for a traffic or pedestrian crossing signal for “attenuating the effects of leakage currents when a particular signal is switched to its off state”). The references also refer to the application of the power supplies in traffic signals and the problems arising from the retrofitting of these traffic signals with LED signal lights. *See, e.g.*, Ex. 1003, 1:47–2:9 (describing the problems with prior art “simple circuit topologies” and identifying the benefits of retrofitting incandescent-lamp traffic signals with LED signals); Ex. 1004, 1:27–2:26 (contrasting the LED traffic signal operation with incandescent lamp operation where inclusion of a power supply to drive LEDs adds complexity to the circuitry, and differences in voltage and current monitoring need to be addressed). We find that the pertinent field of the art is in the design and application of power supplies in the lighting industry. The particular problems created by leakage current and the monitoring of the voltage/current modes lead us to the conclusion that the level of skill includes the practical awareness of these effects in the circuit arrangements for lighting applications. Therefore, the level of ordinary skill in the art proffered by Mr. Tingler’s—a bachelor degree in electrical engineering and/or physics with at least 3 years of industrial experience designing power supply circuitry—is applicable here.

We do not credit Dr. Zane’s opinion that the experience is tied to “power electronics or a related field” because this field has not been shown

sufficiently to be relevant to either the '988 patent or the pertinent prior art. Furthermore, to the extent Dr. Zane regards Mr. Tingler's opinion as insufficient because of an assessment that two more years of experience would yield the knowledge of all pertinent art or the conventional wisdom, that assessment is unfounded and without factual support. To be sure, more experience may provide more expertise, but the "ordinary" skill in the art in this case may not require more expertise when the ordinarily skilled artisan has a presumed quantum of knowledge. Indeed, one of ordinary skill is presumed to be aware of all pertinent prior art. *Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 454 (Fed. Cir. 1985).

Accordingly, we find that the level of ordinary skill is defined by a bachelor degree in electrical engineering and/or physics with at least 3 years of industrial experience designing power supply circuitry,<sup>7</sup> with understanding of legacy lighting circuits and circuit requirements such as for incandescent lighting control and the corresponding lighting circuitry and requirements for powering LED arrays for the application areas generally covered by the patents at issue, and familiarity with switch mode power

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<sup>7</sup> It suffices to define the level with the required degree and experience, noting that the requisite knowledge of a person of ordinary skill in the art may be gained without any degree, but with substantial experience, or without any experience, but with an advanced degree. These permutations of the level or ordinary skill in the art, however noteworthy, are not needed for our determination of obviousness. Nevertheless, we credit Mr. Tingler's testimony for the insight as to what those permutations would be. Ex. 1006 ¶ 15.

supply concepts and their common embodiments at the time of the invention.

#### E. OBVIOUSNESS GROUND

Petitioner asserts that claims 1 and 2 are obvious over Hochstein and Hildebrand. Petitioner also relies on declaration testimony of Mr. Tingler, filed as Exhibits 1006 and 1023.<sup>8</sup>

##### 1. Overview of Hochstein (Ex. 1003)

Hochstein relates to a power supply for operating light emitting diode (“LED”) array traffic signals. Ex. 1003, 1:5–8. The Hochstein apparatus provides a boost, buck/boost or buck, switch-mode converter to a power line operated LED signal. *Id.* at 3:34–36. It also includes an adaptive clamp circuit connected to the rectifier input for eliminating leakage current problems. *Id.* at 3:41–43. One embodiment of the Hochstein apparatus is depicted in Figure 5, reproduced below.

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<sup>8</sup> Patent Owner, at oral argument, alluded to Mr. Tingler’s Declaration (Ex. 1023) in support of the Reply as unsworn testimony, and, therefore, entitled to little weight. Tr. 42:8–9. We recognize that under 37 C.F.R. § 1.68 Declarations submitted in our proceedings as testimonial evidence must attest to the truthfulness and be subject to penalty of perjury. We note that no motion to exclude has been filed challenging the procedural or evidentiary sufficiency of the declaration filed as Exhibit 1023. We, therefore, give this Declaration due weight when on balance the opinions expressed therein are confirmed with facts in the record or other sworn testimony, such as the initial Declaration (Ex. 1006) and the cross-examination of Mr. Tingler (Ex. 2015).

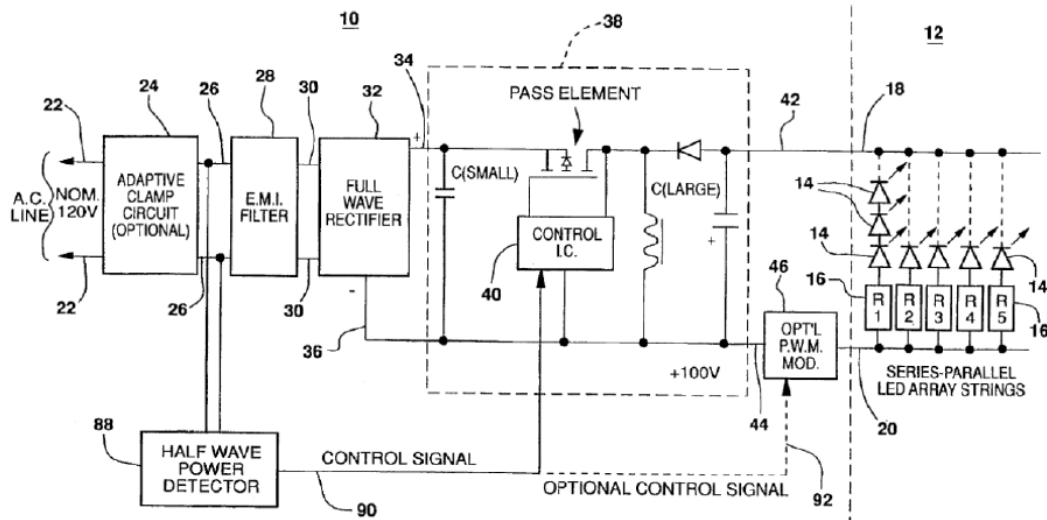


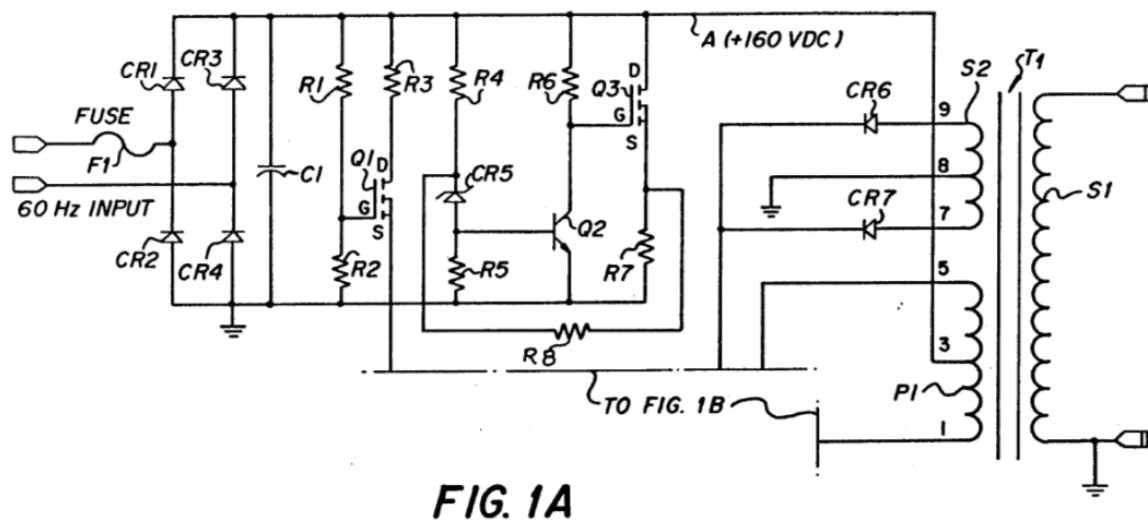
Figure 5 depicts regulated voltage, switch-mode power supply 10 with a pair of input lines 22 and an optional adaptive clamp circuit 24. *Id.* at 5:11–15. The output of adaptive clamp circuit 24 is connected to an input of an electromagnetic interference (“EMI”) filter 28, which keeps conducted interference from feeding back into the power lines where it might cause problems to other circuitry in the line. *Id.* at 5:31–35. Lines 34 and 36 connect to an input of a power factor correction, buck/boost converter 38, which includes a power factor correction (“PFC”) integrated circuit controller 40. *Id.* at 5:41–45. The output voltage of PFC switch-mode converter 38 is fed directly to LED array 12, or alternatively through pulse width modulated (“PWM”) modulator 46. *Id.* at 5:66–6:1.

## 2. Overview of Hildebrand (Ex. 1005)

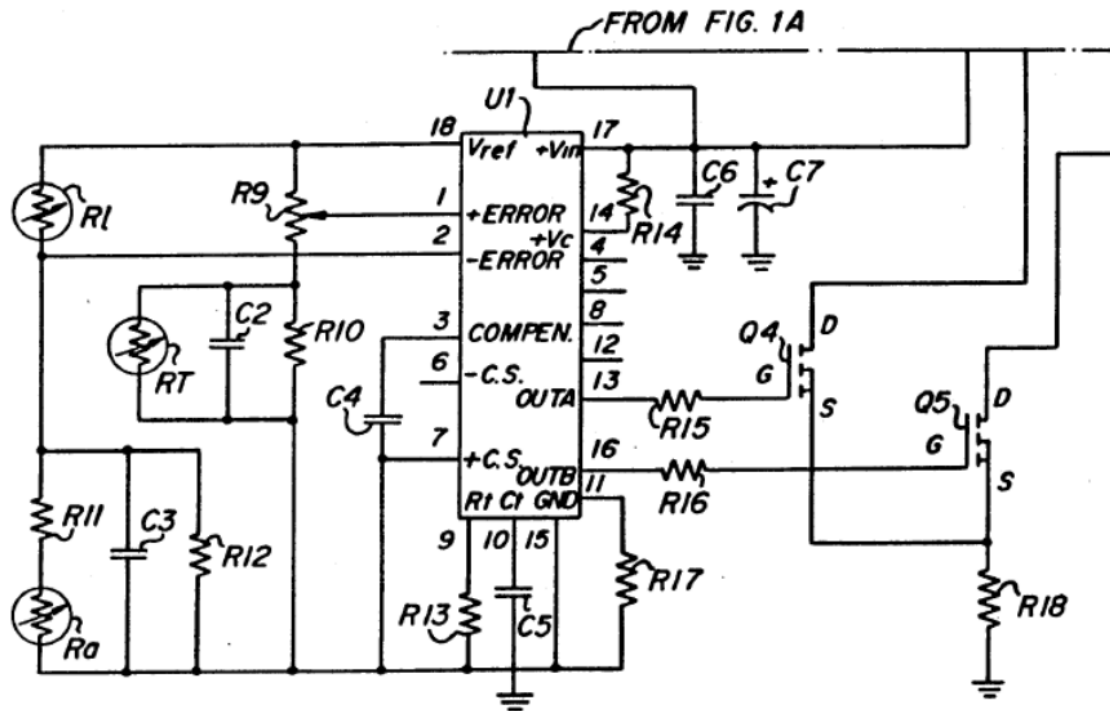
Hildebrand is directed to power supplies for gas discharge lamps, such as fluorescent or neon lamps, used with pedestrian or traffic signals. *See* Ex. 1005, 1:6–20. In particular, Hildebrand describes using fluorescent or neon lamps with switches that exhibit leakage current, which can cause

monitoring circuits associated with the traffic signals to malfunction. *Id.* at 1:28–33.

Figures 1A and 1B, reproduced below, illustrate the Hildebrand power supply, which includes a “dynamic load circuit” that is designed so that the current shunted to ground is high at low input voltages and low at high input voltages. *Id.* at 1:44–46.







**FIG. 1B**

As shown in Figure 1A, Hildebrand discloses that a rectifier bridge—made up of diodes CR1–CR4—is connected to the A.C. line input. *Id.* at 2:23–26. Diodes CR1–CR4, together with capacitor C1, provide a “capacitive filtered DC power supply with nominal output voltage of 160 volts DC” to the “start-up power supply,” which includes transistor Q1 and resistors R1–R3. *Id.* at 2:29–33, 4:1–25. The circuit also includes a “dynamic load circuit,” which includes transistors Q2 and Q3, diode CR5, and resistors R4–R7. *Id.* at 5:51–6:6.

The Hildebrand power supply includes a “switching regulator” circuit, which is designed around integrated circuit U1, shown in Figure 1B. *Id.* at 2:34–36. The fluorescent or neon lamp to be energized is connected to secondary winding S1 of transformer T1, and the output of the switching

regulator is attached to primary winding P1 of the transformer T1. *Id.* at 2:37–41. The switching regulator implements a “push-pull” architecture, which alternatively switches on and off transistors Q4 and Q5. *Id.* at 2:46–55. This architecture provides the A.C. power required by the fluorescent or neon lamps. *See id.* at 2:46–58.

### 3. Discussion of Independent Claim 1

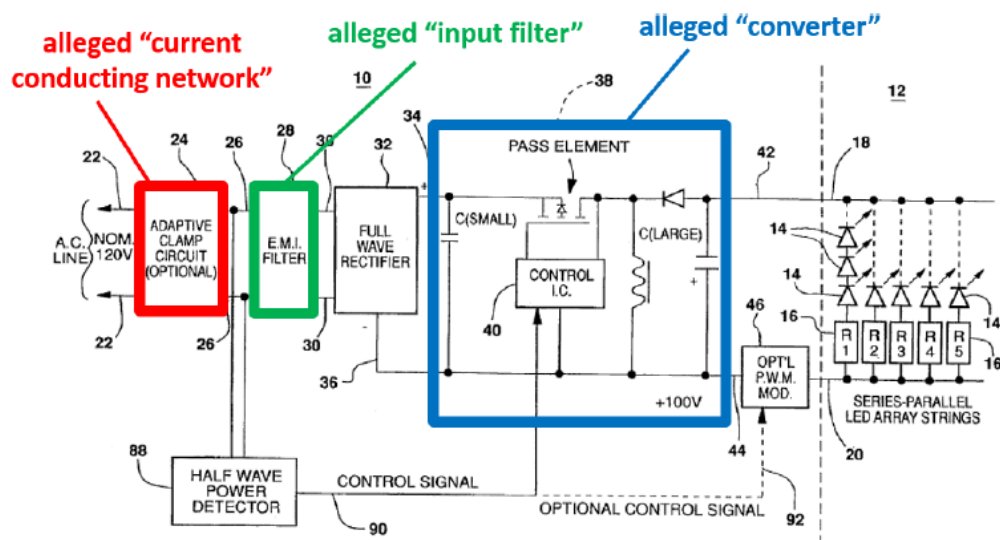
Petitioner asserts that Hochstein discloses the limitations of claim 1 as follows:

- i) Power input lines 22 correspond to the recited “connection terminals” (Pet. 21–22);
- ii) Electromagnetic interference (EMI) filter 28 corresponds to the recited “input filter means” (Pet. 22–24);
- iii) Buck/boost converter 38 with control IC 40 corresponds to the recited “converter comprising a control circuit” (Pet. 24–27);
- iv) Output terminals 42 and 44 disclose the “output terminals” (Pet. 27–28); and
- v) Adaptive clamp circuit 24 corresponds to the recited “self-regulating current-conducting network” (Pet. 29–33).

With regard to the “input filter means,” the claims require that it be coupled to the connection terminals and that the “output means of the input filter means” couples to the converter. Ex. 1001, 5:14–17. The parties do not dispute that Hochstein’s EMI filter is an “input filter means” within the meaning of the term. The issue, however, is that in the Hochstein embodiment with adaptive clamp circuit 24, the EMI filter (“input filter means”) is between that circuit and the buck/boost converter 38, as shown in

Figure 5 of Hochstein (reproduced below with annotations made by Patent Owner (PO Resp. 14)), and not connected directly to terminals 22.

Furthermore, the claims require that the “self-regulating current-conducting network” is coupled “between said filter means and said converter.” Ex. 1001, 5:27–29. So, in Hochstein, as shown in annotated Figure 5 below, adaptive clamp circuit 24 is not shown coupled *between* the EMI filter and buck/boost converter 38.



The annotated Figure 5 of Hochstein shows adaptive clamp circuit 24 coupled to terminals 22, followed by EMI filter 28, full-wave rectifier 32 and buck/boost converter 38. In other words, the difference between the claims-at-issue and Hochstein’s teachings is that the alleged “input filter means” and “self-regulating current-conducting network” are not in the order recited.

The Petition sets forth two contentions regarding the location of the “input filter means.” First, Petitioner contends that Hochstein, without modification, discloses EMI filter 28 coupled to connection terminals 22.

Pet. 23. In particular, Petitioner argues that because adaptive clamp circuit 24 is optional, EMI filter 28 is coupled directly to connection terminals 22. Pet. 23. Petitioner also argues that even with adaptive clamp circuit 24, “a person of ordinary skill in the art would understand that the EMI filter in Hochstein is ‘coupled to the connection terminals,’ as the EMI filter is placed on the input line.” *Id.* Second, Petitioner contends that “it would have been obvious for a person of ordinary skill in the art to swap the position of the EMI filter and the adaptive clamp circuit 24 on the line because the swapped placement would not affect the overall function of the system.” *Id.* Petitioner proffers several reasons for the obviousness of the swap. *Id.* at 23–24, 29–32. We, therefore, turn our attention to determining whether under either of these contentions, Petitioner has met its burden.

a. Whether Hochstein alone discloses the “input filter means” coupled to the connection terminals

Petitioner relies on the following passage of Hochstein as disclosing that EMI filter 28 is coupled connection terminals 22 (Pet. 23):

An output of the adaptive clamp circuit 24 is connected by a pair of clamp circuit output lines 26 to an input of an electromagnetic interference (E.M.I) filter 28. The E.M.I filter 28 keeps conducted interference from feeding back into the power lines where it might cause problems to other circuitry on the line.

Ex. 1003, 5:31–35. Petitioner also relies on Figure 5 of Hochstein. Pet. 23. We agree that Hochstein discloses that adaptive clamp circuit 24 is optional. Ex. 1003, 5:13–15 (“[A]daptive clamp circuit 24 can be connected to the lines 22 as an option.”). We query, therefore, whether Hochstein discloses EMI filter 28 coupled to the power lines when adaptive clamp circuit 24 is

incorporated in Hochstein’s power supply. On this account, Petitioner proffers Mr. Tingler’s testimony that “even with the adaptive clamp circuit 24 in place, a person of ordinary skill in the art would understand that the EMI filter in Hochstein is ‘coupled to the connection terminals,’ as the EMI filter is placed on the input line.” Ex. 1006 ¶ 78.<sup>9</sup> Hochstein does not explain how both adaptive clamp circuit 24 and EMI filter 28 are both “coupled” to terminals 22—assuming that Hochstein’s power supply is not modified from what is shown in Figure 5. To be sure, we do not read the claims to require, nor does either party argue, that the input filter must be directly connected to the terminals. *See* Ex. 1001, 5:12–14 (claims reciting “connecting” and “coupled” for various elements); *but see* 2:61–63, 66–3:3, 19–21 (specification omitting description of “coupling” associated with the input filter, but describing “connections” broadly—some components “connected electrically” and “connected,” albeit not in direct connection).<sup>10</sup>

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<sup>9</sup> The Petition refers to paragraph number 79 of Tingler’s Declaration. But it appears that reference to that paragraph is a harmless typographical error, for the Petition’s content appears *verbatim* in paragraph 78 of Tingler’s Declaration.

<sup>10</sup> Indeed, the claims use the term “coupling” rather loosely, so as to not require direct connection. For example, the output means of the “input filter means” are coupled to the converter. Ex. 1001, 5:15–17. But at the same time, the self-regulating current-conducting network is “coupled between said filter means and said converter.” *Id.* at 5:27–29. That is, the converter must be simultaneously “coupled” to both the input filter means and self-regulating current-conducting network. Because there is an intervening circuit between the input filter and the converter, the term “coupling” must not require that there be no intervening circuits.

We find instructive that Patent Owner’s declarant, Dr. Regan Zane testified on cross-examination that “[t]he EMI filter is still connected to the AC terminals through the adaptive clamp circuit.” Ex. 1024, 67:18–22. This confirms that “coupled to the connection terminals” does not require that the EMI filter be placed first on the circuit connected directly to input lines 22.

Therefore, there is evidence in the record to support the contention that Hochstein discloses the “input filter means” coupled to the connection terminals as recited. Notwithstanding this evidence, the matter of the placement of the “input filter means” is not settled. We turn now to deciding whether it would be obvious to place the “input filter means” such that the “self-regulating current-conducting network” is coupled “between said filter means and said converter,” as recited. Ex. 1001, 5:28–29.

b. Whether it would have been obvious to swap EMI filter 28 and adaptive clamp circuit 24

In order to achieve the claimed circuit arrangement, Petitioner must show that it would have been obvious to couple Hochstein’s adaptive clamp circuit 24 between EMI filter 28 and converter 38. To accomplish this, Petitioner offers several obviousness rationales for why a person of ordinary skill in the art would be motivated to do so. Pet. 23–24, 29–32.

First, focusing on the claims as a whole, Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine Hochstein’s teachings with those of Hildebrand, because both references are directed to solving the same problem: “counteracting leakage current in a traffic light system, and resolving it through similar circuitry.” Pet. 18 (citing Ex. 1006 ¶¶ 64–65). Hildebrand, according to Petitioner, although

directed to traffic lights with lamps (not LEDs), confronts one of the problems addressed by Hochstein: “effects of leakage currents when an input signal is switched to its off state.” Pet. 16 (citing Ex. 1006 ¶¶ 55–64); *see also* Ex. 1003, 3:41–43, 60–62 (Hochstein’s objectives to include an adaptive clamp circuit to eliminate leakage current problems). Hildebrand solves the problem by disclosing a dynamic load circuit “that presents the leakage current with low impedance to ground when the triac switches [which are solid state switches] are off so that no excessive voltage builds up.” *Id.* at 17; Ex. 1006 ¶¶ 55, 58; *see also* Ex. 1005, 1:34–37. Petitioner proffers testimony from Mr. Tingler addressing the operation of Hildebrand, and in particular, that Hildebrand includes an input filter and a dynamic load circuit, where the dynamic load circuit is disclosed between the input filter and the converter. Ex. 1006 ¶¶ 59–60. The testimony also explains that although Hildebrand’s light source is either a neon or fluorescent lamp, Hildebrand and Hochstein have similar circuit arrangements, and that “one of ordinary skill in the art would have been motivated to combine them if confronted with devising a circuit that would be directed to solving the problem of leakage current in traffic lights.” *Id.* ¶ 63.

Patent Owner challenges the above-stated rationale because it is only evidence of knowledge of a problem, not evidence of a motivation to solve the problem. PO Resp. 11–12 (relying on *Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1373 (Fed. Cir. 2008)). According to Patent Owner, the mere reference to leakage current is not a reason why a person of ordinary skill in the art would have been motivated to modify the location of adaptive clamp circuit 24 in Hochstein as Petitioner proposes. *Id.* at 11.

Further, even if addressing leakage current were motivation, each reference teaches its own solution designed for their respective purposes: Hochstein's adaptive clamp circuit 24 and Hildebrand's dynamic load circuit. *Id.* at 12 (citing *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1369 (Fed. Cir. 2012)). We find these arguments unpersuasive.

As stated above, Petitioner has provided evidence of the recognition of a narrow problem with leakage current when using solid state devices in a control unit of a traffic light, where the problem is addressed by an adaptive clamp circuit or dynamic load. Indeed, the solution in both Hochstein and Hildebrand appears to work in similar fashion: a circuit that causes the current to drain when reaching a certain level of voltage. *See* Ex. 1005, 1:34–41, 5:51–56; Ex. 1003, 6:37–49; Ex. 1006 ¶¶ 58–59; Ex. 2015, 67:5–23. We cannot reject the recognition of the problem known in this field as insufficient motivation. The rigid analysis that Patent Owner urges us to adopt contradicts the Supreme Court's decision in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007). There, the Court finds that “[u]nder the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.” 550 U.S. at 420. Indeed, we find instructive that both Hochstein and Hildebrand teach solutions to a leakage current problem that is found when the traffic signals are equipped with a type of light source different from what the control unit anticipates. *See* Ex. 1005, 1:11–33 (describing that usual signals comprise luminescent tubular lamps, but when using neon or fluorescent tubes, the leakage current is sufficient to activate the circuit); Ex. 1003, 1:9–11, 62–64, 3:60–62



(describing incandescent lamp traffic signals retrofitted with LEDs and an objective of the invention to eliminate leakage current problems). These references are thus substantially pertinent to solving precisely the same problem addressed by the '988 patent and show the demand for designs that solve the known problem. *See* Ex. 1001, 1:21–41 (providing retrofit possibilities for signaling lights, and recognizing the leakage current using semiconductor light sources may give rise to an incorrect outcome of the status test); *see also KSR*, 550 U.S. at 418 (“[I]t will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art.”).

Neither *Innogenetics* nor *Kinetic Concepts* (cited by Patent Owner) persuades us to reject Petitioner’s show of a motivation that focuses on the particular problem referenced in Hochstein, Hildebrand, and the '988 patent. In *Innogenetics* the court found that it was proper to exclude the expert report because it stated no motivation. *See* 512 F.3d at 1373–74 (“We cannot conclude that the district court abused its discretion when it precluded [the expert’s] vague and conclusory obviousness testimony which did not offer any motivation for one skilled in the art to combine the particular references he cites in order to practice the claimed [invention].”). The record here articulates more than a vague or conclusory motivation to combine. Specifically, Petitioner argued, with support from its declarant, Mr. Tingler, that the problem addressed in these references are the same as the problem addressed by the '988 patent, and that there are similarities in

the circuits that solve the stated problem. Pet. 17–19; Ex. 1006 ¶ 63.

*Kinetic Concepts* also is not applicable, for there the court left undisturbed a jury verdict of non-obviousness judging that substantial evidence supported that finding. See 688 F.3d at 1366–67.

In short, we are persuaded that if “confronted with devising a circuit that would be directed to solving the problem of leakage current in traffic lights,” a person of ordinary skill in the art would have consulted and applied the teachings in Hochstein and Hildebrand. Ex. 1006 ¶ 63. The inquiry does not end here, however. For even if a person of ordinary skill in the art were motivated by the design needs of solving the leakage current problem, we must determine if that person, after consulting the teachings in Hochstein and Hildebrand, would apply the teachings *as proposed by Petitioner*. See *Ruiz v. A.B. Chance Company*, 357 F.3d 1270, 1277 (Fed. Cir. 2004) (the court, as finder of facts, “weighed the evidence and found that, because the prior art references address the narrow problem of underpinning existing building foundations, a person seeking to solve that exact same problem would consult the references and apply their teachings together”).

As stated above, Petitioner effectively shows that Hildebrand teaches a dynamic load that is between the input filter and the converter. Pet. 31; Ex. 1006 ¶¶ 95–96; Ex. 1005, 5:51–56. In Hochstein, adaptive clamp circuit 24 is described as “monitor[ing] the input voltage feeding the LED array 12 on the input lines 22.” Ex. 1003, 6:36–38; Pet. 30. Hochstein discloses that the output of adaptive clamp circuit is connected to the input of the EMI filter, as is shown in Figure 5. Ex. 1003 at 5:31–33. But Hochstein also

discloses adaptive clamp circuit 24 as being “connected to the rectifier input.” *Id.* at 3:41–43, 13:47–50. From these disclosures, Petitioner argues that Hochstein’s Figure 5 is only illustrative and that Hochstein does not limit the placement of the adaptive clamp circuit with respect to the EMI filter. Pet. 30–31 (“[P]lacement of the adaptive clamp circuit 24 before the EMI filter on the line in Figure 5 is only illustrative.”); Reply 2. Although we agree that Hochstein’s disclosures do not expressly limit the location of adaptive clamp circuit, Hochstein expressly discloses where to place it. And in Figure 5, the location is not between the EMI filter and the converter. Furthermore, even though the adaptive clamp circuit may be connected to the rectifier input, from this disclosure alone we cannot infer that in such an embodiment the adaptive clamp circuit would be *between* the EMI filter and the converter. For example, we find instructive Hochstein’s disclosure that in Figure 5, the half wave power detector circuit “has inputs connected to the inputs of the full wave rectifier 32 at the clamp circuit output lines 26 to monitor the input a.c. power on the power input lines 22 to the power supply 10.” Ex. 1003, 11:16–20. Even though Figure 5 depicts the half-wave power detector tapping the input to the EMI filter, Hochstein describes the detector as connected to the inputs of the full wave rectifier. Therefore, in Hochstein’s power supply, all circuits shown to the left of the full wave rectifier in Figure 5 are described as being connected to the rectifier. This disclosure however has not been shown to suggest that Hochstein contemplated adaptive clamp circuit to be located anywhere.

To achieve the relocation of Hochstein’s adaptive clamp circuit, Petitioner relies on Hildebrand’s teachings of the location of the dynamic

load and Mr. Tingler’s opinion that it would be a matter of design choice to place the adaptive clamp circuit between the EMI filter and the converter. Pet. 18, 31–32; Ex. 1006 ¶ 71; Reply 2–3. Patent Owner argues that Petitioner has failed to meet its burden in this regard because the argument lacks factual support. PO Resp. 12–14.<sup>11</sup> Specifically, Mr. Tingler’s testimony is argued as being conclusory and unsupported by any facts or data, and therefore deserving no weight. *Id.* at 13. We agree that merely asserting placement of adaptive clamp circuit as a “design choice” by itself does not make the claimed invention obvious. Here, however, we have argument and evidence that Hildebrand provides a similar design directed to solving the same problem addressed by Hochstein’s adaptive clamp circuit. Pet 18, 31; Ex. 1006 ¶¶ 71, 95–96. Hildebrand’s design offers the dynamic load coupled between an input filter and the converter. Ex. 1006 ¶ 95. Hildebrand’s input filter contributes a capacitive filtering and is coupled directly to the connection terminals. Pet. 24; Ex. 1005, 2:29–33; Ex. 1006 ¶ 79. The dynamic load follows the input filter and includes resistors R4–R8, a Zener diode CR5, an NPN transmitter Q2, and a MOSFET transistor Q3. Pet. 31; Ex. 1006 ¶ 95; Ex. 1005, 5:57–60. Dr. Zane, Patent Owner’s declarant, opines that the dynamic load in Hildebrand is very different from Hochstein’s adaptive clamp circuit because Hildebrand’s dynamic load is

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<sup>11</sup> Patent Owner also argued that the argument was not presented in the Petition. We disagree. In connection with the proffered motivation to combine the teachings of Hochstein and Hildebrand, Petitioner supported the reliance on counteracting the leakage current problem with testimony from its expert on the issue of design choice. Pet. 18.

sensing a D.C. voltage because it is located after a rectifier circuit. Ex. 2013 ¶¶ 108–109. This distinction, Dr. Zane opines, would not inform a person of ordinary skill in the art to reconfigure the position of Hochstein’s adaptive clamp circuit, because in Hochstein the circuit is before the rectifier. *Id.* ¶ 109. Dr. Zane also opines that due to the design implications involved in the front end of a power supply, the differences between Hildebrand and Hochstein “significantly impact component selection, location, and operation from the A.C. input to the power converter” and a person of ordinary skill in the art would “appreciate that it is not possible to simply reconfigure the Hochstein circuit based on the configuration of the Hildebrand circuit.” *Id.* ¶¶ 99–101.

One problem with Patent Owner’s testimonial evidence is that in view of two references with similar teachings regarding solution to the leakage current problem, the argued distinctions between the two references focus too narrowly on the particular embodiments of the power supply circuitry. Although there is a demand in Hildebrand to design the dynamic load to be responsive to D.C. voltage (as opposed to Hochstein’s A.C. input), there is still evidence that one design parameter followed in Hildebrand is to place the leakage-current solving circuitry after the input filter. The various differences between Hochstein and Hildebrand have not been shown to be of particular relevance to selecting whether to place the adaptive clamp circuit after the EMI filter. For example, with regards to the difference between the references’ rectifiers, we understand that Hildebrand’s dynamic load receives rectified voltage whereas Hochstein’s adaptive clamp circuit does not. *See* Ex. 2013 ¶¶ 90–91. There is no evidence in any of the cited

references, or in the disclosure of the '988 patent, that the location of a rectifier is of particular importance in determining at what location in the circuitry one would drain the leakage current. Hochstein, for example, because it discloses an AC input, places its adaptive clamp circuit before the rectifier. Hildebrand puts its rectifier before the dynamic load. But these are choices based on the needs for rectified voltage at different stages in these circuits, not on whether the leakage current must be drained before or after the voltage is rectified. In short, although the circuits operate differently with regard to A.C. or D.C. conversion, they still disclose the two possible locations for the circuitry that drains the leakage current: either before an input filter or after an input filter.

*i. Hochstein's Intended Purpose*

Faced with evidence of the two possible locations, we now turn to the argument by Patent Owner that Hochstein would not work for its intended purpose if adaptive clamp circuit were to follow the EMI filter. According to Patent Owner, Hochstein “intentionally located adaptive clamp circuit 24 on input lines 22 for several important reasons.” PO Resp. 17. Patent Owner supports this statement citing a multitude of paragraphs in Dr. Zane’s Declaration. *Id.* For the first proffered reason, Dr. Zane opines that the location of adaptive clamp circuit is emphasized in Hochstein by disclosures of it being adapted to connect to A.C. power lines and for the purpose of not degrading the input power factor, which is a primary purpose of Hochstein. *See Ex. 2013 ¶¶ 70–72.* We are not persuaded by Dr. Zane’s opinion in this regard.

We agree that Hochstein discloses that adaptive clamp circuit is coupled to the A.C. input line. We do not agree that its placement as first in the A.C. input line is dictated by Hochstein's disclosure of power factor correction. PO Resp. 20–21. Hochstein states that the advantage of the adaptive clamp circuit is that it “does not influence the power factor reflected at the a.c. input lines 22” because “there are no reactances involved.” Ex. 1003, 8:2–3. For this reason, Hochstein states that its adaptive clamp circuit “can of course be used with other types of power supplies where the addition of reactive elements could degrade the power factor.” *Id.* at 7:51–53. We find from these disclosures that it is not the particular placement of adaptive clamp circuit that is of particular importance, but rather the type of components that it comprises.

We also find unpersuasive Dr. Zane's opinion regarding the role of adaptive clamp circuit. For example, during cross-examination Dr. Zane testified that Hochstein's adaptive clamp circuit is connected to the A.C. input terminals to “maintain high power factor” and that “it's *possible* that moving the adaptive clamp circuit to other locations could impact power factor.” Ex. 1024, 129:2–19 (emphasis added). But we find that Hochstein corrects power factor by including an integrated circuit controller, not by connecting the adaptive clamp circuit to the A.C. input terminals. *See* Ex. 1003, 5:44–50. Indeed, Hochstein describes the adaptive clamp circuit as being designed with a resistor to draw current so it does not interfere with the power factor correction circuit. *Id.* at 6:45–49. On this point, we find unpersuasive Dr. Zane's testimony that relies on a reading of Hochstein alluding to utilizing “reactance free means” as implying that Hochstein

requires a “reactance free path” between the adaptive clamp circuit and the input line. *See* Ex. 1024, 147:8–19, 149:15–150:7. Again, we find that Hochstein, in column 8, lines 2–3, discusses the reactance-free design of the adaptive clamp circuit as the reason for not influencing the power factor reflected at the A.C. input. *See, e.g.*, Ex. 1003, 7:32–38 (Hochstein highlighting that the prior art used a capacitor across the line to short circuit, thereby drawing “reactive power and contributing to a poor power factor”).

Moreover, we do not find persuasive evidence that moving adaptive clamp circuit would impact power factor. Dr. Zane’s statement that it is “possible” is speculative. *See* Ex. 1024, 151:21–152:10. There is no evidence of unexpected reactive power being drawn merely by moving the adaptive clamp circuit. No new reactive components are contemplated in the rearrangement, which is constrained only by Hochstein’s description of the adaptive clamp circuit being connected to the input of the rectifier means. *See* Ex. 1003, 12:6–9, 13:47–50; *see also* Ex. 1023 ¶ 11. And to the extent Dr. Zane characterizes the adaptive clamp circuit as having a role in preventing poor power factor other than by comprising reactance-free devices, given that Hochstein describes it as optional, we are unpersuaded by that characterization. *See* Ex. 2013 ¶ 70 (stating that the adaptive clamp circuit performs a function of providing reactance free means “while preventing poor power factors”). The adaptive clamp circuit could not otherwise *prevent* a poor power factor, when Hochstein contemplates embodiments in which the power-factor-corrected power supply does not include the adaptive clamp circuit. *See* Ex. 1003, 7:17–18 (“optional adaptive clamping circuit 24”).



As for the second proffered reason, Dr. Zane opines that the EMI filter protects the adaptive clamp circuit from malfunction due to noise injected by the converter. Ex. 2013 ¶¶ 73–75. Because the adaptive clamp circuit has no noise-filtering capability, Patent Owner argues that EMI filter 28 must follow adaptive clamp circuit 24 to protect this circuit from the noise caused by buck/boost converter 38. PO Resp. 18–19. Petitioner disputes that the proposed swap would cause a malfunction. Reply 10–11. In particular, Petitioner argues that Hochstein describes the function of EMI filter 28 as protecting circuitry connected to the *AC grid*, not other circuitry in Hochstein’s power supply. *Id.* at 10; Ex. 2051, 33:1–6. Therefore, Hochstein, according to Petitioner, does not teach that its EMI filter protects the adaptive clamp circuit. *Id.* We are persuaded by Petitioner’s argument and evidence.

In particular, Hochstein’s description of its EMI filter aligns with the use of that filter as known to those of ordinary skill in the art. For example, in *Fundamentals of Power Electronics*, an input filter is used to attenuate conducted electromagnetic interference affecting television, radio reception and nearby electronic equipment. Reply 11 (citing Ex. 2003, 1–2); *see also* Ex. 2001, 2 (“The input filter on a switching power supply has two primary functions. One is to prevent electromagnetic interference, generated by the switching source from reaching the power line and affecting other equipment.”). Hochstein refers to this same EMI interference. Ex. 1003, 2:60–63. When Hochstein describes using EMI filter 28 to keep conducted interference from feeding back into the power lines, we find that Hochstein is not referring to protecting adaptive clamp circuit, but rather the electronic

devices susceptible to interference by virtue of their coupling to lines of the power grid. *See, e.g., id.* at 1:58–61 (“[M]any utilities are placing limits on permissible power factor and distortion behavior of electrical devices connected to their lines.”); *see also* Ex. 2015, 82:18–83:15.

Furthermore, on this point, we have considered the motion for observations on the cross-examination of Mr. Tingler. Paper 51. We have also considered Petitioner’s response. Paper 55. At the heart of the parties’ disagreement is a dispute as to the extent to which the adaptive clamp circuit would be affected by noise. *See, e.g.,* Paper 51, Observation #2 (Patent Owner pointing out Mr. Tingler’s cross-examination testimony that adaptive clamp circuit always monitors the voltage on lines 22); Paper 55, Response to Observation #2 (Petitioner responding that testimony is not inconsistent and citing to testimony regarding the operation of adaptive clamp circuit operating that, when the converter is off, switching harmonics from the converter do not affect the operation of the clamp circuit, *see* Ex. 2051, 65:21–66:21). We find that, in the swapped configuration, there is evidence that adaptive clamp circuit is exposed to noise. Ex. 2051, 52:24–53:21. However, we find that there is also evidence in the record that the noise is not a “malfunctioning” noise as Patent Owner asserts. For example, Mr. Tingler testified on cross-examination that the effect of the noise is dependent on the amplitude of the voltages. *Id.* at 53:22–55:14. Also, Mr. Tingler testified that to the extent there is noise generated by the EMI filter, the magnitude of that noise is significantly smaller than the noise generated by the converter. *Id.* at 57:2–58:7, 67:20–69:13. Also, we credit Mr.

Tingler's testimony that these noise variants are identifiable by a person of ordinary skill in the art and can be mitigated. *Id.* at 58:1–7.

The above-described evidence contrasts Dr. Zane's testimony that a person of ordinary skill in the art would not recognize what would be required to have a circuit that works properly in moving the adaptive clamp circuit from Hochstein to other locations. *See* Ex. 1024, 131:8–23, 169:6–170:17 (stating that if a person of ordinary skill in the art makes a swap, “if the only thing they have to work from is Figure 6b, I do believe there are enough questions around how to properly operate this noisy node as well as potential interactions with the EMI filter that for someone of ordinary skill in the art would be beyond their scope”). We are not persuaded by Dr. Zane's testimony.

A person of ordinary skill in the art is not an automaton, lacking creativity and having knowledge restricted to that which is shown in Figure 6b alone. *See KSR*, 550 U.S. at 421 (“A person of ordinary skill is also a person of ordinary creativity, not an automaton.”). The person of ordinary skill in the art is presumed to have knowledge of switch-mode power supplies and their use for lighting incandescent and LED light sources. *See supra*, Section II.D. That knowledge includes the teaching so well put in *Fundamentals of Power Electronics*, that “[i]t is nearly always required that a filter be added at the power input of a switching converter.” Ex. 2003, 3. That filter can be an EMI filter, as taught in Hochstein and further described in *Fundamentals of Power Electronics*. *See id.* at 4 (“To meet limits on conducted EMI, it is necessary to add an input filter to the converter.”). Further, as taught in Hochstein, the job of the EMI filter is to attenuate the

interference caused by the converter. Ex. 2015, 82:2–17. Hochstein does not show the schematics of its EMI filter. Nor does it teach, as discussed above, that its function is further to filter converter noise that may affect the adaptive clamp circuit. Nevertheless, confronted with the problem of leakage current and the need for an EMI filter, we are persuaded that the fundamental placement of that filter at the power input (as stated in *Fundamentals of Power Electronics*)<sup>12</sup> and its operation is part of the knowledge possessed by a person of ordinary skill in the art. And notwithstanding a “possibility” of some noise affecting the adaptive clamp circuit when swapped with the EMI filter, we do not find credible the testimony of Dr. Zane alleging that this noise puts the adaptive clamp circuit at risk of malfunction. *See* Ex. 2013 ¶ 81; Ex. 1024, 178:15–179:7 (“could cause undesirable behavior”). The adaptive clamp circuit is draining the leakage current when the converter is off. Ex. 2015, 67:5–68:17; Reply 12; Ex. 1023 ¶ 7. Otherwise, the adaptive clamp circuit removes the draining resistor (resistor 60). Ex. 1003, 7:53–8:3. From this operation, we deduce that, when the converter is off, any noise from the converter is at its lowest or absent when the adaptive clamp circuit is supposed to sense the threshold voltage in order to drain the current. This supports the contention that noise

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<sup>12</sup> We also find instructive on this point evidence that an input filter in a switching power supply also prevents high frequency voltage on the power line from passing through the output of the power supply. Ex. 2001, 2. Therefore, we find that seeking to protect an adaptive clamp circuit from that high frequency voltage would have motivated one of ordinary skill in the art to place an input filter before the adaptive clamp circuit.

would not affect the threshold voltage to cause malfunction. Accordingly, we conclude that it is highly unlikely that adaptive clamp circuit would be affected by noise, and thus malfunction, as Dr. Zane opined. *See* Ex. 1003, 7:53–8:3; Ex. 1023 ¶ 7; Ex. 1006 ¶ 78 (“the swapped placement would not affect the overall function of the system”). In short, we are not persuaded that a person of ordinary skill in the art would be dissuaded from placing the EMI filter first followed by the adaptive clamp circuit because of an alleged risk of malfunction.

*ii. Motivation Lacking in Hildebrand*

Patent Owner also argues that Petitioner improperly relies for motivation on Hildebrand by using hindsight, because the only relationship between the asserted references is that they both allegedly include an “input filter means.” PO Resp. 23. The argument is not persuasive. Petitioner has not relied on Hildebrand as itself disclosing a motivation to combine its teachings with Hochstein. Nor do we require that Hildebrand itself provide a motivation, as that is not the law. *KSR*, 550 U.S. at 418 (“[T]he [obviousness] analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.”).

As stated above, Petitioner relied on Hildebrand teaching a solution to leakage current where the circuit that solves that problem is not first on the line, but rather, is placed following an input filter. The motivation is not found in the claims, as an application of hindsight would show. Instead, as stated above, the motivation is in the need for a design to solve the leakage

current and there is evidence of a finite number of places to arrange the input filter and the self-regulating current-conducting network. *See KSR*, 550 U.S. at 421 (“When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.”). Furthermore, we found that the Hochstein adaptive clamp circuit and EMI filter would work for the same purposes notwithstanding a swap in their location in Hochstein: to drain the leakage current, when the converter is off, and to protect the circuitry on the AC grid from electromagnetic interference, respectively.

We have rejected above Patent Owner’s argument that the result would render Hochstein inoperable for its intended purpose or that the differences between Hochstein and Hildebrand pose a barrier for a person of ordinary skill in the art to consider the references’ teachings. *See PO Resp.* 23–30. Although a person of ordinary skill in the art would consider the differences, we find that that a person of ordinary skill in the art would not cast Hildebrand totally aside. Nor are we persuaded that Hochstein disparages the rectifier-capacitor disclosed in Hildebrand. *Id.* at 31. Our analysis is not focused on how to incorporate Hildebrand’s circuits into Hochstein or if those particular circuits would work in Hochstein’s design. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.” (citations omitted)).

Instead, we are persuaded, as stated above, that Hildebrand is instructive regarding design considerations for solving the same problem as Hochstein. It teaches a design of a circuit for a dynamic load with a low impedance at low voltage and high impedance at high voltage. Ex. 1005, 5:51–56, 6:9–11. It teaches that the input to that dynamic load is a filtered signal. *Id.* at 2:30–32. Hildebrand’s filtered signal is also rectified as it seeks to monitor the leakage current after conversion to D.C. voltage. *Id.* at 2:22–33. Together with the knowledge that it is “nearly always required that a filter be added at the power input of a switching converter” (Ex. 2003, 3) and that a role of EMI filters is to protect the power supply from high frequency voltage coming from the power lines (Ex. 2001, 2), we find that a person of ordinary skill in the art seeking to solve the problem of leakage currents would be motivated to place the EMI filter were needed (at the input)<sup>13</sup> and to place adaptive clamp circuit coupled to the EMI filter’s output for purposes of draining the leakage current, as described in Hochstein.

*iii. Expectation of Success*

Finally, Patent Owner argues that a person of ordinary skill in the art would have no reasonable expectation of success in modifying Hochstein as proposed by Petitioner. PO Resp. 32–34. First, Patent Owner contends that Petitioner failed to explain “how one of ordinary skill [in the art] would have

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<sup>13</sup> We find this especially persuasive if the person of ordinary skill in the art finds applicable the teaching in Hildebrand of draining the leakage current when dealing with D.C. converted voltage.

a reasonable expectation of success in moving” the adaptive clamp circuit between the EMI filter and the converter in Hochstein. *Id.* at 32. Second, Patent Owner argues that Petitioner proffered an inconsistent theory of unpatentability by proposing two swaps. *Id.* at 32–33. We are not persuaded by Patent Owner’s arguments.

As to the first argument, Petitioner proffered argument and declaration testimony of Mr. Tingler that the swap would not affect the overall function of the system. Pet. 23; Ex. 1006 ¶ 78. We take that to mean, in all but name, that Petitioner argued the predictability of the swapped configuration. Upon review of *KSR*, we determine that this is sufficient to support the conclusion that a person of ordinary skill in the art would have the motivation to swap and that it would not affect the overall operation of the power supply. *KSR*, 550 U.S. at 421 (“When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.”). Both the adaptive clamp circuit and EMI filter would still perform their described functions after the swap. And as stated above, the noise alleged by Patent Owner and allegedly resulting from the swap would not dissuade a person of ordinary skill in the art from pursuing the option.

As to the second argument, Petitioner clarified during oral argument that the challenge of unpatentability contemplates one swap: the EMI filter with the adaptive clamp circuit. Tr. 8:6–10:4. Any other swap indicated in the Petition (at page 26, for example) was in error. *Id.* Accordingly, we see



this argument as being made in error and abandoned during oral argument. Thus, we need not address Patent Owner's allegations concerning it.

#### *4. Conclusion Regarding Obviousness*

Having considered the argument and evidence presented by both parties, including the information presented in Patent Owner's Motion for Observations and Petitioner's Response to Patent Owner's Motion for Observations, we find that Petitioner has demonstrated by a preponderance of the evidence that claim 1 would have been obvious over Hochstein and Hildebrand, for the reasons stated above. We have credited to a large extent the testimony of Mr. Tingler as discussed above. And we find that Petitioner presented sufficient evidence of a reason to combine the teachings of Hochstein and Hildebrand as discussed above.

With regard to claim 2, which depends from claim 1, Petitioner asserts that Hochstein describes a transistor and a voltage divider, thereby disclosing the further limitation of "the circuit arrangement comprises means [f]or deactivating the self-regulating current-conducting network [w]hen the converter is switched on." Pet. 34–35; Ex. 1003, Fig. 6b, 6:63–7:16; Ex. 1006 ¶ 102. We agree with Petitioner that Hochstein discloses the limitation. Accordingly, we determine that Petitioner has demonstrated by a preponderance of the evidence that claim 2 would have been obvious over Hochstein and Hildebrand.

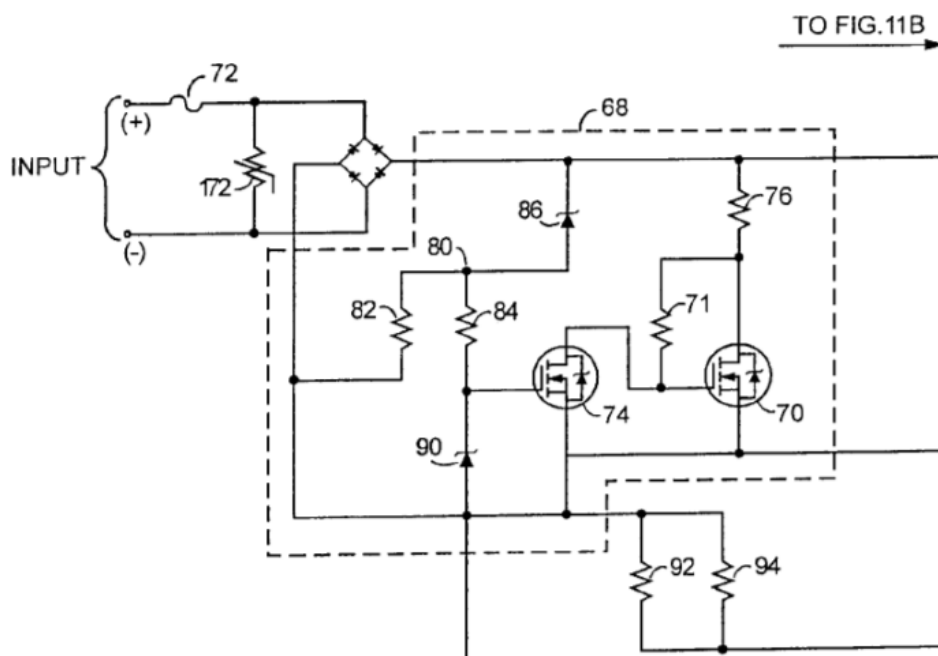
#### F. ANTICIPATION GROUND

Petitioner asserts that claim 1 is anticipated by Perry. Pet. 35–45. Patent Owner argues that Perry (1) is not prior art; and (2) does not disclose

the input filter means. PO Resp. 34–59. We agree with Patent Owner that Perry does not disclose the input filter means. First, we review a summary of Perry.

1. Overview of Perry (Ex. 1004)

Perry is directed to a circuit for interfacing between a conventional traffic signal's control monitor and a plurality of LEDs. Ex. 1004, [57], Abstract. Perry's circuit includes a power factor corrected current source for driving the LEDs. *Id.* at 2:55–56. It also includes a circuit that short circuits incoming current that is below a certain value, indicating signal light turn off, and that opens up when the incoming current exceeds this value, indicating signal light turn on. *Id.* at 2:54–67, 7:58–59. Figure 11A, shown below, illustrates switching circuit 68.



As shown in Figure 11A above, Perry addresses voltage surges on the input line by providing line fuse 72 and metal oxide varistor (MOV) 172.

*See id.* at 9:61–63, Fig. 11A. Perry explains further,

The MOV 172 can react to over voltage situations in a few nanoseconds to absorb an energy spike of up to 42 joules. If the over voltage situation lasts for very long, fuse 72 will open. Thus, in the case of short term spikes, MOV 172 acts as a clamp to protect the remaining circuitry. If this spike is of sufficient duration, fuse 72 will open before MOV 172 reaches its maximum energy dissipation.

*Id.* at 9:63–10:3.

## 2. Discussion

Our construction of “input filter means” requires that the filter reject or transmit a signal as a function of the frequency of that signal. *See supra* Section II.A. Perry discloses metal oxide varistor (“MOV”) 172, which Petitioner asserts as disclosing the “input filter means.” Pet. 37–38 (“A varistor is a filter. . . . [It] is used in Perry for suppression of voltage surges.”). Petitioner argues that Perry’s varistor is designed to “reject high frequency spikes of voltage surges.” *Id.* at 38 (citing Ex. 1006 ¶ 112). Petitioner also proffers further evidence that persons of ordinary skill would consider a varistor as a filter. Reply 22–23 (providing a Littelfuse application note stating that varistors are used for filtering, and a Philips patent that includes a varistor as part of an input filter).

Patent Owner offers a contrary view of Perry. Specifically, Patent Owner counters that a varistor is a “voltage dependent” resistor, suppressing voltage based on voltage amplitude, not as a function of frequency. PO Resp. 52. Put simply, the varistor clips the input signal when the voltage exceeds a certain threshold, but otherwise, allows the input signal to be transmitted through unchanged. *See* PO Resp. 53–54. Neither the clipping nor the transmission has been shown to be performed selectively on any

frequency interval. Nor is it performed as a function of frequency. The only signal parameter operating on whether the varistor will behave as a “filter” is the voltage amplitude. Based on these findings, we reject Petitioner’s contention that Perry discloses the “input filter means.”

Furthermore, the evidence presented by Petitioner is unpersuasive. A varistor is used to divert transients from the load by clamping the voltage. *See, e.g.*, Ex. 1014, 1 (describing transient suppressor devices). The varistor, however, does not attenuate transients. *See id.* (“Attenuating a transient . . . is accomplished with filters . . . [which is] generally of the low pass type, attenuates the transient (high frequency) and allows the signal of power flow (low-frequency) to continue undisturbed.”). The clamping occurs because of the rise of voltage drop due to the increased current. *Id.* Although there may be capacitance associated with a varistor (*id.* at 7–8), Perry makes no mention of its use or contribution to the disclosed circuit, and Petitioner does not describe Perry other than to attribute suppression of voltage spikes to the varistor.

As for the Philips patent (Ex. 1013), we find that the varistor described there does not alter our findings above. Exhibit 1013 at column 3, lines 26–20 describe the varistor as part of an input filter. Other components are listed which also perform filtering (rectifier and  $\pi$  filter). Therefore, we do not credit Exhibit 1013 with a persuasive disclosure of Philips referring to a varistor as an “input filter means,” within the meaning given in the ’988 patent.

Because we find that Perry does not disclose the “input filter means,” we determine that Petitioner has not demonstrated by a preponderance of the

evidence that Perry anticipates claim 1 of the '988 patent. Accordingly, we need not determine whether Perry antedates the '988 patent.

#### G. MOTION TO EXCLUDE

Petitioner seeks to exclude statements in declarations proffered by Patent Owner in support of its contention that the '988 patent was reduced to practice before the critical date of Perry. Paper 45. In particular, Petitioner seeks to exclude statements in the Declaration of John De Clercq, Exhibit 2040, as hearsay. Paper 45, 1–7. Patent Owner filed an opposition (Paper 50) and Petitioner replied (Paper 54).

The Motion to Exclude is denied as moot, because that evidence is not relied upon in reaching our determination that claims 1 and 2 of the '988 patent are unpatentable.

#### III. CONCLUSION

For the foregoing reasons, we conclude that Petitioner *has shown* by a preponderance of the evidence that claims 1 and 2 of the '988 patent are unpatentable as obvious over Hochstein and Hildebrand. We determine that Petitioner has not shown by a preponderance of the evidence that claim 1 of the '988 patent is anticipated by Perry. Petitioner's Motion to Exclude is denied as moot.

IPR2015-01287  
Patent 6,013,988

ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1 and 2 of the '988 patent are unpatentable;  
and

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

IPR2015-01287  
Patent 6,013,988

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