

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICROCHIP TECHNOLOGY INC.,
Petitioner,

v.

APTIV TECHNOLOGIES AG,
Patent Owner

IPR2024-00229
Patent No. 9,645,962

APTIV TECHNOLOGIES AG'S NOTICE OF APPEAL

via P-TACTS
Patent Trial and Appeal Board

via Email
Director of the United States Patent and Trademark Office
c/o Office of the General Counsel
efileSO@uspto.gov

via CM/ECF
United States Court of Appeals for the Federal Circuit

INTRODUCTION

Aptiv Technologies AG’s (“Aptiv”) appeal stems from the Patent Trial and Appeal Board’s Final Written Decision (Paper 54) (the “Final Written Decision”), entered on July 11, 2025, in the above-captioned *inter partes* review of United States Patent No. 9,645,962 (“the ’962 patent”). Aptiv requested Director Review of the Final Written Decision, and Director Review was denied on September 18, 2025 (Paper 62). This notice is timely filed within 63 days of denial of Director Review of the Final Written Decision. 37 C.F.R. §§ 90.3(a)(1), 42.75(e)(3).

APTIV TECHNOLOGIES AG’S APPEAL

Please take notice that—under 35 U.S.C. §§ 141(c), 142, 319; 37 C.F.R. §§ 90.2(a), 90.3(a), 42.75(e)(3); and Federal Rule of Appellate Procedure/Federal Circuit Rule 15—Aptiv hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision and all underlying decisions and orders in this action on which that decision is based.

APTIV TECHNOLOGIES AG’S ISSUES ON APPEAL

Aptiv’s issues on appeal include at least (37 C.F.R. § 90.2(a)(3)(ii)):

- (1) the Board’s conclusion that challenged claims 1-19 of the ’962 patent had been proven unpatentable;
- (2) any findings, analysis, or determinations supporting or related to that issue, including but not limited to (a) the Board’s analysis of the Petition and prior

art, and its determination that the Petition set forth, with particularity and adequate evidentiary support, an operable combination that met the requirements of the challenged claims; (b) the Board's analysis and determinations of motivation and reasonable expectation of success; and (c) the Board's analysis of nexus and secondary considerations of non-obviousness, and its decision not to apply the presumption of nexus; and

(3) all other issues decided adversely to Aptiv in any orders, decisions, rulings, or opinions in this action.

Simultaneously with this submission, Aptiv is filing a true and correct copy of this Notice of Appeal with the Director of the United States Patent and Trademark Office and a true and correct copy (or copies) of the same, along with the required filing fee, with the Clerk of the United States Court of Appeals for the Federal Circuit as set forth in the accompanying Certificate of Filing.

Dated: November 17, 2025

Respectfully submitted,

By: /s/ Alex S. Yap

Alex S. Yap

Reg. No. 60,609

MORRISON & FOERSTER LLP

707 Wilshire Blvd., Suite 6000

Los Angeles, California 90017

Email: AYap@mofo.com

Tel: 213-892-5200

Counsel for Patent Owner

CERTIFICATE OF FILING

The undersigned hereby certifies that, in addition to being electronically filed through P-TACTS, a true and correct copy of the above APTIV TECHNOLOGIES AG'S NOTICE OF APPEAL is being filed via email with the Director on November 17, 2025, at efileSO@uspto.gov, the email address indicated on the United States Patent and Trademark Office's web page for the Office of the General Counsel.

The undersigned also hereby certifies that a true and correct copy (or copies) of the above APTIV TECHNOLOGIES AG'S NOTICE OF APPEAL and the filing fee is being filed via CM/ECF with the Clerk's Office of the United States Court of Appeals for the Federal Circuit on November 17, 2025.

Dated: November 17, 2025

Respectfully submitted,

By: /s/ Alex S. Yap
Alex S. Yap
Reg. No. 60,609
MORRISON & FOERSTER LLP
707 Wilshire Blvd., Suite 6000
Los Angeles, California 90017
Email: AYap@mofo.com
Tel: 213-892-5200

Counsel for Patent Owner

CERTIFICATE OF SERVICE

The undersigned hereby certifies that on November 17, 2025, the above
APTIV TECHNOLOGIES AG'S NOTICE OF APPEAL was served in its entirety
via electronic mail on the following:

Travis Jensen (Reg. No. 60,087)
tjensen@orrick.com
T61PTABDocket@orrick.com
Jeremy Jason Lang (Reg. No. 73,604)
jlang@orrick.com
PTABDocketJL2@orrick.com
ORRICK, HERRINGTON & SUTCLIFFE LLP
1000 Marsh Road
Menlo Park, CA 94025-1015

Counsel for Petitioner

Dated: November 17, 2025

Respectfully submitted,

By: /s/ Alex S. Yap
Alex S. Yap
Reg. No. 60,609
MORRISON & FOERSTER LLP
707 Wilshire Blvd., Suite 6000
Los Angeles, California 90017
Email: AYap@mofo.com
Tel: 213-892-5200

Counsel for Patent Owner

PUBLIC VERSION

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICROCHIP TECHNOLOGY INC.,
Petitioner,

v.

APTIV TECHNOLOGIES AG,
Patent Owner.

IPR2024-00229
Patent 9,645,962 B2

Before JEAN R. HOMERE, TERRENCE W. McMILLIN, and
JOHN D. HAMANN, *Administrative Patent Judges*.

McMILLIN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)
Denying Patent Owner's Motion to Strike
37 C.F.R. § 23(b)
Denying Petitioner's Motion to Exclude
37 C.F.R. § 42.64(c)

Microchip Technology Inc. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1–19 (“the challenged claims”) of U.S. Patent No. 9,645,962 B2 (Ex. 1005, “the ’962 patent”). Aptiv Technologies AG (“Patent Owner”) filed a Preliminary Response (Paper 9, “Prelim. Resp.”). With our authorization, Petitioner filed a Preliminary Reply to Patent Owner’s Preliminary Response (Paper 10) and Patent Owner filed a Preliminary Sur-reply (Paper 11). We instituted the petitioned review (Paper 12, “Inst. Dec.”).

Patent Owner filed a Patent Owner Response (Paper 24, “PO Resp.”) to oppose the Petition. Petitioner filed a Reply (Paper 29, “Pet. Reply”) to the Patent Owner Response. Patent Owner filed a Sur-reply (Paper 39, “PO Sur-reply”) to the Reply. We conducted an oral hearing on April 16, 2025. A transcript has been entered into the record (Paper 53, “Tr.”).¹

We have jurisdiction under 35 U.S.C. § 6(b)(4) and § 318(a). This Decision is a final written decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of claims 1–19 of the ’962 patent. We determine Petitioner has shown by a preponderance of the evidence that claims 1–19 of the ’962 patent are unpatentable.

I. BACKGROUND

A. *Real Parties-in-Interest*

Petitioner identifies itself and its subsidiaries as the real parties-in-interest. Pet. 90. Patent Owner identifies itself and Aptiv Services US, LLC as the real parties-in-interest. Paper 4, 2.

¹ The oral argument in this proceeding was consolidated (*see* Paper 40) with the oral argument in IPR2024-00228, IPR2024-00230, and IPR2024-00495 that involve the same parties, the same or related patents, and the same prior art. *See* section I.B. (Related Matters) (next page).

B. Related Matters

Petitioner identifies the following proceedings related to the '962 patent or patents in the same family (Pet. 90–91):

Aptiv Technologies AG v. Microchip Technology Inc., Case No. 1:23-cv-00307-JDW (D. Del. March 20, 2023);

Microchip Technology Inc. v. Aptiv Technologies AG, IPR2024-00228 (PTAB filed December 27, 2023);

Microchip Technology Inc. v. Aptiv Technologies AG, IPR2024-00230 (PTAB filed December 27, 2023); and

Microchip Technology Inc. v. Aptiv Technologies AG, PGR2024-00011 (PTAB filed December 27, 2023).

Patent Owner identifies the four proceedings above as well as the proceedings below (Paper 7, 1–2):

Microchip Technology Inc. v. Aptiv Technologies AG and Aptiv Technologies Limited, IPR2024-00494 (PTAB filed February 27, 2024);

Microchip Technology Inc. v. Aptiv Technologies AG and Aptiv Technologies Limited, IPR2024-00495 (PTAB filed February 27, 2024);

Microchip Technology Inc. v. Aptiv Technologies AG and Aptiv Technologies Limited, IPR2024-00496 (PTAB filed February 27, 2024); and

Microchip Technology Inc. v. Aptiv Technologies AG and Aptiv Technologies Limited, IPR2024-00558 (PTAB filed February 27, 2024).

C. The '962 Patent

The '962 patent relates to a system to “enable a vehicle’s embedded USB (Universal Serial Bus) host system to connect to multiple mobile devices through a USB hub, regardless of whether the mobile devices are configured to act as USB hosts or USB devices,” without USB On the Go

(OTG) controllers or additional vehicle wiring or inhibiting the functionality of any consumer devices. Ex. 1005, code (57).

The '962 patent explains

USB protocols require a point-to-point connection in which one end is the USB host or master, and the other end is a USB device or slave. In this way, the flow of messages between the two devices is managed and controlled, whereby the USB device responds to messages initiated by the USB host.

Id. at 1:38–43. The patent further describes that in vehicle systems that employ USB connections, the vehicle is typically the USB host and the USB host function is often embedded into a component of the vehicle infotainment system, such as into the radio or other control module. *Id.* at 1:49–61.

As described in the patent, leading mobile device manufacturers and system designers began designing their mobile device products (such as smartphones) to support both USB host and USB device roles. *Id.* at 2:60–66. In other words, a phone may configure itself such that it can function as a USB device or as a USB host. *Id.*

If a phone acts as a USB host, then the vehicle system will not function because, by USB convention, two USB hosts cannot directly connect with each other. *Id.* at 3:8–20. The '962 patent states that existing solutions to this problem such as On the Go (OTG) technology and dynamic swapping of ports have disadvantages. *Id.* at 3:21–4:3.

The '962 patent summarizes the invention as follows:

According to an embodiment of this invention, a Universal Serial Bus (USB) hub module is provided. The USB hub module includes an upstream USB port configured to be interconnected to a USB host and a plurality of downstream

USB ports configured to be interconnected to a plurality of USB enabled consumer devices. The USB hub module also includes a USB hub that is interconnected to the upstream USB port and the plurality of downstream USB ports. The USB hub is configured to broadcast data from the upstream USB port to each downstream USB port and to transmit data from each downstream USB port to the upstream USB port. The USB hub module further includes a USB bridge interconnected to the USB hub that is configured to connect the upstream USB port to a USB host and a USB routing switch interconnected to the USB bridge, the USB hub, and the plurality of downstream USB ports. The USB routing switch is configured to connect a first downstream USB port of the plurality of downstream USB ports to the upstream USB port through the USB bridge when a consumer device connected to the first downstream USB port is the USB host. The USB routing switch is further configured to initiate bidirectional communication with the upstream USB port. The USB routing switch is configured to connect the first downstream USB port directly to the USB hub when the consumer device connected to the first downstream USB port is configured to only respond to communication from the upstream USB port, thereby rendering the consumer device compatible with a device connected to the upstream USB port.

Id. at 4:16–45.

Figure 4, reproduced below, illustrates an embodiment wherein a USB hub, a USB bridge, and a switching device are provided as discrete components. *Id.* at 6:33–36.

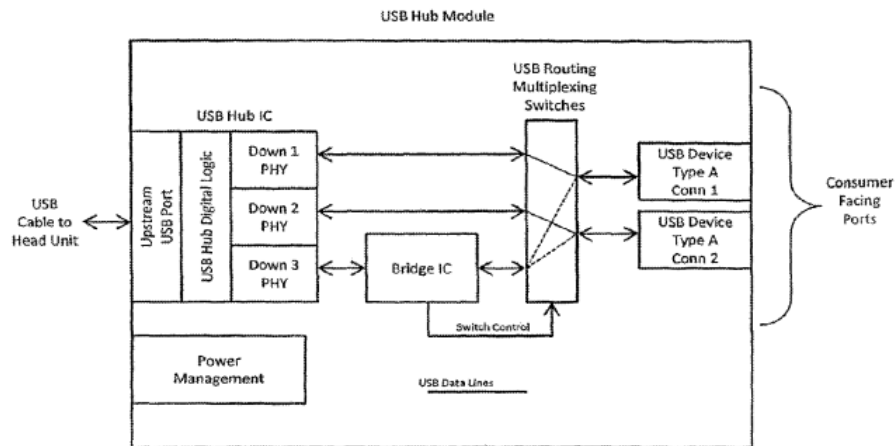


Figure 4 depicts a system configured to render a vehicle's embedded USB host compatible with consumer devices configured to act as a USB host or as a USB device. *Id.* at 6:62–8:16. The system is in the form of a USB hub module having a USB hub IC (integrated circuit), a USB bridge IC, and a switching device having switches. *Id.* The USB hub IC is configured to be connected (via an upstream USB port) to a vehicle's embedded USB host (such as a USB host in a head unit) via vehicle internal wiring. *Id.*

The USB hub IC also includes three downstream USB ports, one of which is connected to the USB bridge IC. *Id.* The other two downstream USB ports of the USB hub IC are connected directly to the switches, such as multiplexing switches. *Id.* The switches are connected to two USB ports in the vehicle, for connection to a consumer device. *Id.* The USB bridge effectively controls the switches. *Id.* The USB hub module is configured such that signals received from a USB port are received by the switching device, and the switching device routes the signals to the USB bridge or the USB hub. *Id.*

In the case where the consumer device is acting as a USB host, the USB bridge IC processes the USB packets from the consumer port and

provides them to the USB hub IC, thereby rendering the consumer device compatible with the vehicle's embedded USB host. *Id.* The bridge may be bidirectional and pass USB traffic between two USB hosts. *Id.* at 9:10–16. In the case where the consumer device is acting as a USB device, the USB bridge IC controls the switching device such that the switching device provides the USB signaling directly to the USB hub, bypassing the bridge. *Id.* at 7:28–32.

“The architecture illustrated is capable of handling both the operation and data paths associated with the USB bridge 414 and the USB hub 412 at the same time, thus allowing concurrent operation of consumer devices operating in USB device mode with consumer devices operating in USB host mode.” *Id.* at 10:17–22.

D. Illustrative Claim

Of the challenged claims, claims 1 and 14 are independent. Claims 2–13 and 15–19 directly or indirectly depend from claims 1 and 14, respectively. Claim 1 is reproduced below with Petitioner’s annotations added to identify each limitation.²

1. [**Preamble**] A Universal Serial Bus (USB) hub module,
comprising:
 - [**1a**] an upstream USB port;
 - [**1b**] a plurality of downstream USB ports;
 - [**1c(i)**] a USB hub interconnected to the upstream USB port and the plurality of downstream USB ports, [**1c(ii)**] said USB hub configured to broadcast data from the upstream USB port to each downstream USB port and to transmit data

² For clarity, we have modified the format of Petitioner’s annotations. We have retained the paragraph formatting from the issued patent.

from each downstream USB port to the upstream USB port;

[1d] a USB bridge interconnected to the USB hub and configured to connect the upstream USB port to a USB host; and

[1e] a USB routing switch interconnected to the USB bridge, the USB hub, and the plurality of downstream USB ports, [1f(i)] wherein the USB routing switch is configured to connect a first downstream USB port of the plurality of downstream USB ports to the upstream USB port through the USB bridge when a consumer device connected to the first downstream USB port is the USB host and [1f(ii)] is configured to initiate bidirectional communication with the upstream USB port, and [1g(i)] wherein the USB routing switch is configured to connect the first downstream USB port directly to the USB hub [1g(ii)] when the consumer device connected to the first downstream USB port is configured to only respond to communication from the upstream USB port, [1g(iii)] thereby rendering the consumer device compatible with a device connected to the upstream USB port.

Ex. 1005, 11:21–48.

E. Cited Art

Petitioner relies on the following references:

U.S. Patent Application Publication No. 2006/0206650 A1, filed August 16, 2005, published September 14, 2006 (Ex. 1014, “Chang”);

U.S. Patent Application Publication No. 2009/0268743 A1, filed May 22, 2008, published October 29, 2009 (Ex. 1015, “Chang II”); and

Cypress AN96527 - Designing USB Type-C Products
Using Cypress's CCG1 Controllers (Ex. 1064, "AN96527").³

F. Asserted Grounds

Petitioner challenges claims 1–19 (all claims) of the '962 patent based on the following grounds (Pet. 5):

Ground	Claims Challenged	35 U.S.C. §	References
1	1–10, 14–17	103 ⁴	Chang, Chang II
2	11–13, 18–19	103	Chang, Chang II, AN96527

II. OBVIOUSNESS ANALYSIS

A. Legal Standards

Petitioner bears the burden of persuasion to prove unpatentability of the claims challenged in the Petition, and that burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioner must establish by a preponderance of the evidence that the challenged claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d).

A claim is unpatentable under 35 U.S.C. § 103 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

³ Petitioner contends the effective filing date for claims 11–13 and 18–19 is September 6, 2016 (Pet. 4 n.2) and AN96527 was publicly available by December 21, 2015 (Pet. 4 n.5).

⁴ The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102 and 103. Because the '962 patent is based on a provisional application filed after March 16, 2013 (the effective date of the relevant amendments), the AIA versions of §§ 102 and 103 apply.

made to a person having ordinary skill in the art to which said subject matter pertains. *See 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 skill in the art; and (4) where in evidence, so-called secondary considerations. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

We also recognize that prior art references must be “considered together with the knowledge of one of ordinary skill in the pertinent art.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)).

Even “[i]f all elements of the claims are found in a combination of prior art references,” the factfinder “should further consider whether a person of ordinary skill in the art would [have been] motivated to combine those references, and whether in making that combination, a person of ordinary skill would have [had] a reasonable expectation of success.” *Merck & Cie v. Gnosis S.P.A.*, 808 F.3d 829, 833 (Fed. Cir. 2015). The “motivation to combine” and “reasonable expectation of success” factors are subsidiary requirements for obviousness subsumed within the *Graham* factors. *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1361 (Fed. Cir. 2007).

Our reviewing court has explained that “[a]ssessing obviousness is based on an ‘expansive and flexible approach’ that ‘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.’” *Janssen Pharms., Inc. v. Teva Pharms. USA, Inc.*, 97 F.4th 915, 925 (Fed. Cir. 2024) (quoting *KSR*,

550 U.S. at 415, 418); *cf. Updated Guidance for Making a Proper Determination of Obviousness*, 89 Fed. Reg. 14,449, 14,451 (Feb. 27, 2024) (“Updated Guidance”) (“Federal Circuit case law since *KSR* confirms that the flexible approach to obviousness encompasses not only how to understand the scope of prior art, but also how to provide a reasoned explanation to support a conclusion that claims would have been obvious.”). As the Supreme Court has noted, “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.” *KSR*, 550 U.S. at 420. These include “market forces; design incentives; the ‘interrelated teachings of multiple patents’; ‘any need or problem known in the field of endeavor at the time of invention and addressed by the patent’; and the background knowledge, creativity, and common sense of the person of ordinary skill.” *Plantronics, Inc. v. Aliph, Inc.*, 724 F.3d 1343, 1354 (Fed. Cir. 2013) (quoting *KSR*, 550 U.S. at 418–21). Importantly, “[t]he motivation-to-combine inquiry asks whether a skilled artisan ‘not only could have made but would have been motivated to make the combinations . . . of prior art to arrive at the claimed invention.’” *Auris Health, Inc. v. Intuitive Surgical Operations, Inc.*, 32 F.4th 1154, 1158 (Fed. Cir. 2022) (quoting *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015)).

B. Level of Ordinary Skill in the Art

We review the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the invention (“POSITA”). *Graham*, 383 U.S. 13, 17. In assessing the level of ordinary skill in the art, 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) (citing *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962–63 (Fed. Cir. 1986)). “In a given case, every factor may not be present, and one or more factors may predominate.” *Id.*

The entire section of the Petition directed to level of ordinary skill in the art states:

The '962 patent pertains generally to the field of USB connectivity (*e.g.*, USB systems/architectures/communications), though other technical fields may be relevant. *See* EX1005, 1:18-20. A POSITA at the time of the alleged invention would have been well-versed in USB standards (including the USB 2.0 and 3.0 Specifications the OTG Supplement, and the USB Power Delivery Specifications) and the design/deployment of USB hosts, USB devices, and USB hubs, including suitable environments for USB systems. A POSITA would also have had a working understanding of network/communication architectures (*e.g.*, master/slave) and components (*e.g.*, host-to-host bridges), computer hardware and peripherals, computer programming, and the design/implementation of communication software/firmware/drivers in standard operating systems (*e.g.*, Windows and Linux) and embedded systems. Welch, ¶¶45-49.

A POSITA would have had at least a four-year degree in electrical engineering, computer engineering, computer science, or a related field and substantial experience (*e.g.*, several years) designing USB systems, including USB hosts, USB hubs, and USB devices. A relevant advanced degree may substitute for some work experience. Welch, ¶¶45-49.^[5] Similarly, relevant work experience may substitute for formal education. *Id.*

⁵ The Welch Declaration states that “A POSITA would have had . . . four years of experience designing USB systems, including USB hosts, USB hubs, and USB devices,” rather than “substantial experience (*e.g.*, several

Pet. 23–24 (footnote omitted). Petitioner cites the Declaration of Eric Welch, paragraphs 45–49 (Ex. 1013 ¶¶ 45–49), but there is no explanation or reasoning provided in the Petition or in the cited declaration supporting Petitioner’s definition of the level of skill in the art.

Patent Owner contends:

At the time of the invention, a POSITA would have had a bachelor’s degree in computer science, electrical engineering, or an equivalent, and two years of professional experience working with computer network protocols such as USB. (EX2019, ¶26.) Lack of work experience can be remedied by additional education, and vice versa. (EX2019, ¶26.)

PO Resp. 4. Patent Owner cites paragraph 26 of the Supplemental Declaration of Henry Houh (Ex. 2019 ¶ 26⁶) and argues against adopting

years)” as stated in the Petition. *Compare* Ex. 1013 ¶ 47 *with* Pet. 24. We also note that, although the Petition cites paragraphs 45–49 of the Welch Declaration (Ex. 1013), the material set forth in the Petition is found (almost verbatim) entirely in paragraph 47. *Compare* Pet. 23–24 *with* Ex. 1013 ¶¶ 45–49.

⁶ In its Preliminary Response, Patent Owner set forth an identical contention as to the level of skill in the art, but cited to paragraph 26 of the Declaration of Henry Houh (Ex. 2001 ¶ 26). Both Houh Declarations contain this identical paragraph supporting Patent Owner’s contention:

My opinions regarding the level of ordinary skill in the art are based on, among other things, my industry experience hiring and managing technical personnel in the computer networking field, and my understanding of the basic qualifications that would be relevant to an individual tasked with investigating methods and systems in the relevant area, and my familiarity with the backgrounds of colleagues, both past and present.

Petitioner’s proposed level of skill in the art. *Id.* at 4–5. Specifically, Patent Owner argues:

Petitioner proposes an elevated and specific level of ordinary skill that requires fluency with specialized documents and technologies, including particular USB standards documents, and with “the design/deployment of USB hosts, USB devices, and USB hubs, including suitable environments for USB systems.” (Petition, 23-24.) Petitioner also proposes that the POSITA would have a “working understanding” of specific technologies, including “host-to-host bridges.” (Petition, 23-24.)

Petitioner’s artificially heightened definition of the level of ordinary skill should be rejected. Petitioner’s proposal does not reflect the actual level of ordinary skill, but instead inflates the scope of the “POSITA Knowledge” on which the Petition relies to fill evidentiary gaps left by the prior art. (EX2019, ¶28.) Petitioner’s definition lacks evidentiary support, relying only on conclusory statements from its expert, who concedes—contrary to Petitioner’s insertion of specific required USB documents and systems into its definition—that the challenged patents pertain “generally” to the field of USB connectivity, and that “other technical fields may be relevant.” (EX1013, ¶47)

The Board should adopt Patent Owner’s definition of the level of ordinary skill, as it did in the Decision on Institution.^[7] Patent Owner’s definition is supported by Dr. Houh’s testimony and, as the Board recognized, is “consistent with what is reflected by the content of the applied prior art

Ex. 2001 ¶ 27; Ex. 2019 ¶ 29. In contrast, Petitioner’s expert does not state the basis of his opinion on the level of ordinary skill in the art. *See* Ex. 2013 ¶¶ 45–49.

⁷ Patent Owner’s reliance on our Decision on Institution is not well-placed. The Decision on Institution stated, “No matter how designated in this Decision, any determination (except our decision to institute trial) is preliminary and non-binding. We wish to have the full record as developed during trial before rendering any binding determination, finding, or conclusion.” Inst. Dec. 47 n.10.

references.” (DI (Paper 12), 11 (citing *Okajima v. Bourdeau*, 261 F.3d 1350, 1354-55 (Fed. Cir. 2001)).)

Id. Patent Owner’s criticism of Petitioner’s contention has merit especially as to the lack of evidentiary support in the Petition for Petitioner’s definition of the level of ordinary skill in the art. Particularly, there is no evidence that, or explanation why, a POSITA “would have been well-versed in USB standards (including the USB 2.0 and 3.0 Specifications, the OTG Supplement, and the USB Power Delivery Specifications) and the design/deployment of USB hosts, USB devices, and USB hubs, including suitable environments for USB systems;” “would also have had a working understanding of network/communication architectures (*e.g.*, master/slave) and components (*e.g.*, host-to-host bridges), computer hardware and peripherals, computer programming, and the design/implementation of communication software/firmware/drivers in standard operating systems (*e.g.*, Windows and Linux) and embedded systems;” and “substantial experience (*e.g.*, several years) designing USB systems, including USB hosts, USB hubs, and USB devices.” *See* Pet. 24. Accordingly, we reject these aspects of Petitioner’s proposed definition because they lack evidentiary support.

In its Reply, Petitioner suggests that we need not resolve the dispute between the parties as to the definition of level of skill in the art because “Petitioner agrees the Challenged Claims are unpatentable under either articulation.” Pet. Reply 2; *see also id.* at 3 (“To the extent P[atent]O[wner]’s more generic statement encompasses the same substantive knowledge base, little difference exists between the parties’ definitions and

the prior art analysis is substantially the same.”) *and id.* at 4 (“[E]ven under P[atent]O[wner]’s definition, the Challenged Claims are unpatentable.”).

The parties and their declarants agree, and we find, that a POSITA would have at least a bachelor’s degree in electrical engineering or computer science and at least two years of professional experience related to working with computer network protocols such as USB. *Compare* Pet. 23–24 *with* PO Resp. 3. And, the parties and their declarants also agree that a relevant advanced degree or additional education may take the place of at least some work experience and that work experience may take the place of some formal education. *Id.*

After considering the arguments and evidence on this issue, we adopt the Patent Owner’s definition of the level of ordinary skill in the art. Thus, we find that, at the time of the invention, a person of ordinary skill in the art would have had a bachelor’s degree in computer science, electrical engineering, or an equivalent, and two years of professional experience working with computer network protocols such as USB. And, a lack of work experience can be remedied by additional education, and vice versa.

Petitioner contends that a POSITA would have more familiarity and experience with USB related documents and systems than contended by Patent Owner. If a POSITA was considered to have the additional work experience with USB systems and familiarity with USB standards as proposed by Petitioner and the level of ordinary skill was enhanced, our decision that the challenged claims are unpatentable would be further supported. However, our decision on obviousness is supported by either of the definitions offered by the parties.

C. Claim Construction

In an *inter partes* review, the claim construction standard is the same as that of a district court. *See* 37 C.F.R. § 42.100(b). Under the standard applied by district courts, claim terms are generally given their plain and ordinary meaning, as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). “There are only two exceptions to this general rule: 1) when a patentee sets out a definition and acts as his own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012).

Petitioner states “that no terms need construction for this proceeding.” Pet. 25. Similarly, “Patent Owner does not contend that any claim construction is required.” PO Resp. 5.

We agree with the parties and determine that no claim terms require express construction. *See, e.g., Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))). We apply the plain and ordinary meaning to all the claim terms.

D. Declaration of Dr. Houh

Petitioner argues “Dr. Houh’s testimony should be given no weight because he: (1) copied his declaration; and (2) lacks the qualifications/knowledge of a POSITA and is not credible.” Pet. Reply 4. In particular,

Petitioner contends that “Dr. Houh copied his prior art analysis word-for-word from the POR.” *Id.* at 5 (citing Ex. 2019 ¶¶ 52–130; Ex. 1091).

According to Petitioner, “copycat declarations--like Dr Houh’s – are entitled to little/no weight.” *Id.* at 5 (citing *Xerox Corp et al. v. Bytemark, Inc.*, IPR2022-00624, Paper 12, 5 (PTAB Aug. 24, 2022) (precedential)).

Petitioner further argues Dr. Houh “is simply not an expert (or POSITA) in the USB technology here.” *Id.* According to Petitioner, because Dr. Houh lacks USB experience to render any opinions under Petitioner’s standards, his testimony should be afforded little to no weight as the PTAB has done in previous IPRs involving Dr. Houh. *Id.* at 5–6.

Regarding argument (1), we decline to delve into how Dr. Houh’s declaration testimony was prepared. Regarding argument (2), Petitioner’s reliance in part on Dr. Houh’s deposition testimony on page 80, lines 9–19 and page 82, line 14,⁸ to page 83, line 12 is of little relevance because it relates to whether Dr. Houh qualifies as a POSITA under Mr. Welch’s definition, which we do not adopt. *Id.* Further, Dr. Houh testifies that his Ph.D. in networking substitutes for professional experience working with USB. *Id.* As discussed above, under Patent Owner’s definition of a POSITA, which we adopted for the purpose of this Decision, we find that Dr. Houh’s testimony should be considered in light of his advanced studies in networking coupled with his experience in the field. On this record, we find that Dr. Houh possesses, at a minimum, a working knowledge and understanding network protocols including USB standards and systems to adequately render a learned opinion about the facts before us. Additionally,

⁸ Page 82, line 14, appears to be a typographical error because line 14 is in the middle of an answer.

because the facts in the related IPRs cited by Petitioner are not before us, we decline Petitioner's invitation to rely upon these non-related cases to impugn the validity of Dr. Houh's testimony in the present proceeding.

Accordingly, we are not persuaded by Petitioner's argument that Dr. Houh's testimony should be given no weight.

E. Obviousness Based on Chang and Chang II

Petitioner contends that claims 1–10 and 14–17 would have been obvious over Chang in view of Chang II and POSITA knowledge. Pet. 5, 34–80. Patent Owner argues that “[a]ll claims of the '962 patent are not unpatentable, as the grounds in the Petition are meritless.” PO Resp. 1.

We provide summaries of the cited art, Chang and Chang II. We then address the arguments and evidence relating to whether the cited art teaches or suggests the limitations of the claims and whether a motivation existed to combine the relevant teachings of the cited art with a reasonable expectation of success. We also analyze the arguments and evidence related to the secondary considerations of non-obviousness. Although it is necessary to divide up these arguments and the related evidence for purposes of setting forth our analysis, our determination as to the unpatentability of the challenged claims is based on consideration of all the arguments and evidence as a whole.

1. Chang

Chang relates to “a hub and more particularly to a hub with a host-to-host transmission function.” Ex. 1014 ¶ 1. Figure 2 illustrates a conventional USB hub and is reproduced below. *Id.* ¶ 13.

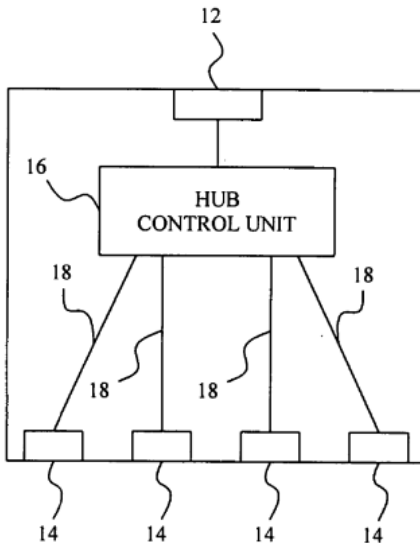


Figure 2 depicts a USB hub including uplink port 12 for being linked to a host, downlink ports 14 for being linked to other devices, and hub control unit 16. *Id.* ¶ 18. In the USB hub, several transmission paths 18 may be established such that uplink port 12 can communicate with each downlink port 14 such that uplink port 12 can communicate with devices linked to each downlink port 14 via hub control unit 16. *Id.*

Chang summarizes the invention as:

a hub with a host-to-host transmission function comprises a hub control unit, an uplink port connected to the hub control unit for being linked to a first host, a host port for being linked to a second host, and a bridge connected between the host port and hub control unit for the first and second hosts to communicate with each other.

Id. ¶ 5. Figure 3 illustrates a hub according to the Chang invention and is reproduced below. *Id.* ¶ 19.

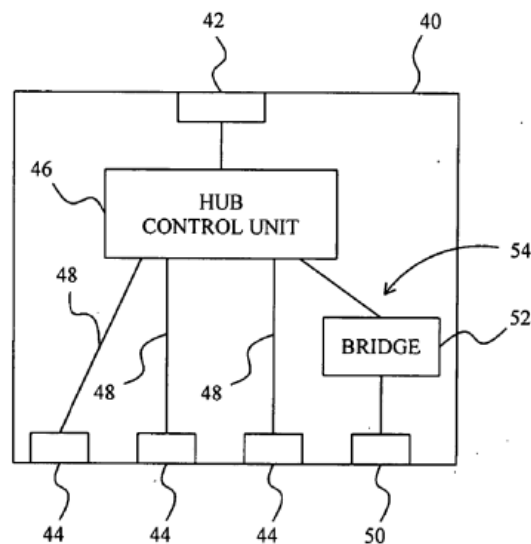


Figure 3 depicts hub 40, uplink port 42 for being linked to a host, several downlink ports 44 for being linked to devices, and hub control unit 46 for establishing several transmission paths 48 between uplink port 42 and downlink ports 44 such that the host linked to uplink port 42 can communicate with the devices linked to downlink ports 44. *Id.* Hub 40 further comprises host port 50 for being linked to a host, and bridge 52 connected between hub control unit 46 and host port 50. *Id.* ¶ 20. Bridge 52 provides a function for host-to-host communications, and may be implemented with a bridge chip, for example, OTi2108 of Ours Technology Inc. or other host-to-host transmission chip. *Id.* ¶¶ 20, 22, 24.

2. Chang II

Chang II relates to “a bridge device for transmitting data; and more particular to a data transmission bridge device and control chip thereof for transmitting data that adopts USB specification, and can utilize switching to bridge between two host devices for transmitting data.” Ex. 1015 ¶ 2.

Chang II states that the invention:

solve[s] the technical limitation of the prior art, by designing a data transmission bridge device and control chip thereof for transmitting data between two nearby hosts; wherein the device would automatically detect the connecting device type and accordingly switch between different transmission paths, which would not only allow for support of data transfer between a host device and a slave device, but also can directly support data transfer between two host devices.

Id. ¶¶ 11, 12.

Figure 1 is a schematic diagram for a data transmission bridge device and control chip thereof for transmitting data according to the Chang II invention and is reproduced below. *Id.* ¶ 15.

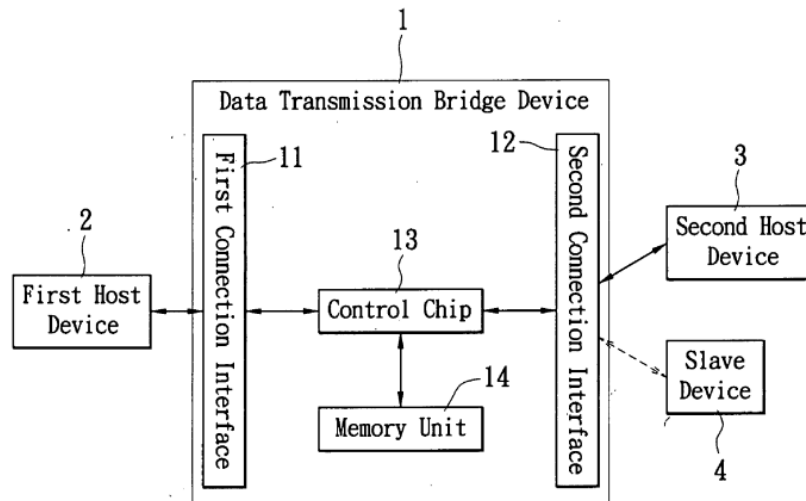


Figure 1 depicts data transmission bridge device 1 including first connection interface 11 for connecting to first host device 2, second connection interface 12 for connecting to second host device 3 or slave device 4, control chip 13 enabling connection to a detected host/slave device, and memory unit 14 for storing control data. *Id.* ¶¶ 22, 23.

Figure 5 is a schematic diagram for a control chip 13 within data transmission bridge device 1 for transmitting data according to the Chang II invention and is reproduced below. *Id.* ¶¶ 19, 34.

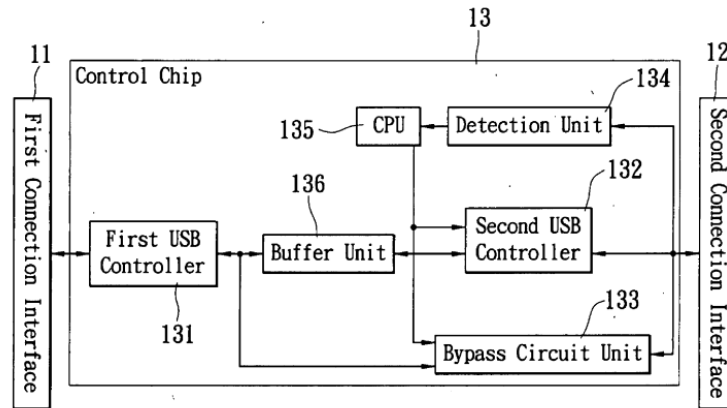


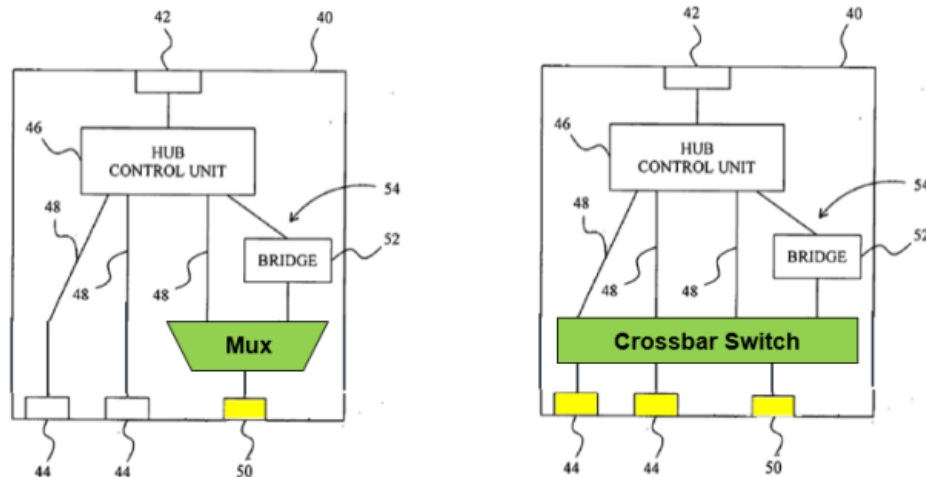
FIG. 5

Figure 5 depicts control chip 13 for data transmission bridge device 1. *Id.* ¶ 34. Chip 13 includes first USB controller 131, second USB controller 132, bypass circuit unit 133, detection unit 134, central processing unit (CPU) 135, and buffer unit 136. *Id.* The data transmission bridge device “by automatically detecting the type of connected device to switch between the proper transmission path, can not only support data transmission between a host device and a slave device, but can also directly support data transmission between two host devices.” *Id.* ¶ 46.

3. Claim 1

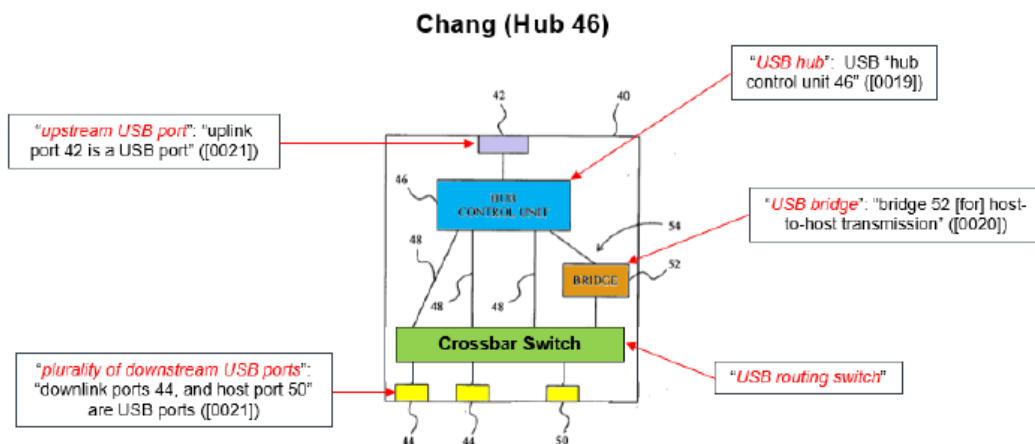
a. Overview of Petitioner’s Showing

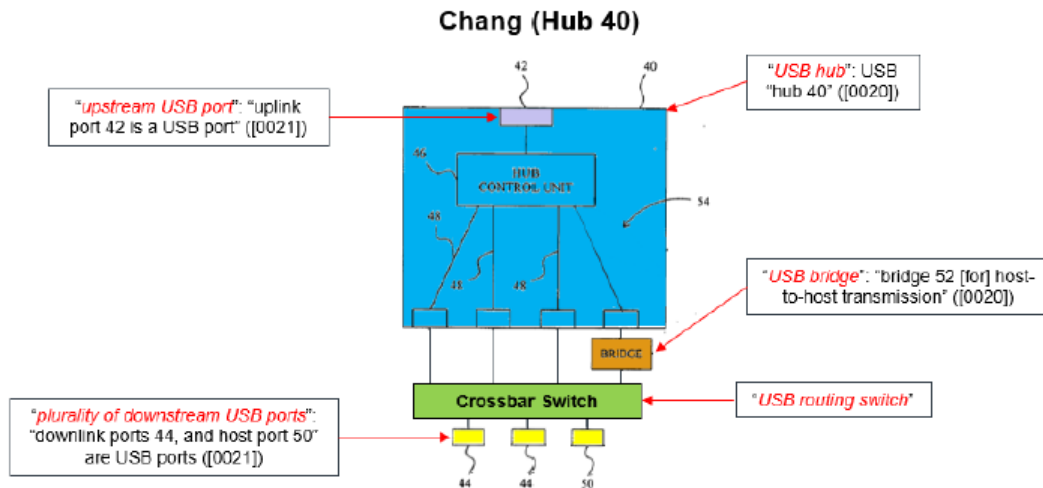
Petitioner contends that there are two obvious implementation options for modifying Chang’s Figure 3 that are shown in the figures reproduced below. Pet. 38–40.



As depicted in the figure on the left, above, an added 2:1 multiplexer (Mux) serves as a switch (directing signals to bridge 52 or bypassing bridge 52) and port 50 serves as a dual-role port 50. *Id.* As depicted in the figure on the right, above, an added crossbar switch serves as a switch (directing signals to bridge 52 or bypassing bridge 52) and each of ports 44 and 50 serves as a dual-role port. *Id.*

Petitioner argues the right-hand crossbar implementation comes in two variations. Pet. 43–44. In one version (Chang (Hub 46)) the crossbar is inside hub 40 and in another version (Chang (Hub 40)) the crossbar is outside hub 40. *Id.* The Chang (Hub 46) implementation and the Chang (Hub 40) implementation are reproduced below.





The Chang (Hub 46) implementation and the Chang (Hub 40) implementation are depicted above along with Petitioner's mapping of claim 1 to each implementation. Pet. 46–47.

Patent Owner argues that "Petitioner's proposed combination—including all three implementations—is incompletely described in the Petition; and is technically unsound and would not be operable in the manner set forth in the Petition." PO Resp. 20 (citing Ex. 2019 ¶ 73). Specifically, Patent Owner argues that "[g]enerating the detection signal requires that the detection unit 134 (and thus the bridge) communicate with the downstream port" (*id.* at 26 (citing Ex. 2019 ¶ 84)) "[b]ut in the proposed combination, the detection unit (in Chang's bridge 52) is *separated* from the downstream ports (*i.e.*, 44, 50) by the routing switch—*i.e.*, a crossbar" (*id.* at 27 (citing EX2019 ¶ 85)). Patent Owner explains:

When the bridge device is bypassed by the crossbar, it is thus electrically disconnected from the downstream USB ports coupled to the crossbar. (EX2019, ¶89.) Because the bridge device cannot send or receive signals (*e.g.*, "inquire signals") from a downstream USB port in this state, the bridge device is rendered incapable of detecting whether a device is in host or device mode, such as described above for FIG. 6 of Chang II; and, accordingly, prevents the bridge device generating the

bridging detection signal, or otherwise providing control signals to the crossbar. (See Petition, 29, 60-61 n.18; EX1013, ¶¶80, 159, 243; EX2019, ¶89.) Consequently, once the USB hub module in the proposed combination switches to the device mode, it is *incapable* of directing the crossbar to perform any further switching operations—including connecting or reconnecting any downstream ports to the bridge 52 or to the hub control unit 46 (e.g., in response to a connected device switching to a host or device mode). (See Petition, 29; EX1013, ¶¶80, 159, 243; EX2019, ¶89.)

Id. at 33. Patent Owner misunderstands the combination of teachings asserted by Petitioner. Accordingly, Patent Owner’s argument is not well-founded and not persuasive.

As acknowledged by Patent Owner, in Petitioner’s combination as presented in the Petition (*see, e.g.*, Pet. 60–62) and testified to by Petitioner’s expert declarant, the detection unit must be connected to the downstream ports. See PO Resp. 1 (“As Petitioner’s expert, Mr. Welch, cautions: ‘the detection unit *must connect* to the downstream port to detect the mode, as shown in Chang II.’” (citing Ex. 1013 ¶ 193 (emphasis added by Patent Owner))); *see also id.* at 27, 56 (same quote from Welch repeated). Patent Owner does not meaningfully challenge this testimony. The premise of Patent Owner’s argument—in the combination asserted in the Petition with support from an expert declarant, the detection unit is disconnected from the downstream ports—is faulty.⁹ Patent Owner’s conclusory assertion without adequate support lacks merit.

⁹ Petitioner contends that “[t]he P[atent] O[wner] R[esponse] manufactures a purported ‘structural flaw’ only by misstating the operation of Petitioner’s proposed combination.” Paper 35, 1.

Patent Owner contrives this faulty premise by surmising that because, in Chang II, the detection unit is in the control chip of the bridge that, in Petitioner's combination, the detection unit must be located in the bridge. *See* PO Resp. 25. This argument is based upon the substitution of Chang II's control chip 13 including detection unit 134 for Chang's bridge 52. *Id.* (“[T]he proposed combination relies on installing Chang II's detection unit 134 in Chang's bridge 52 to provide the control signals that cause the crossbar to route the downstream ports through the appropriate transmission path.”). However, the proper test for obviousness is not whether the references may be physically combined or one prior art device may be bodily incorporated into another, but is whether the teachings of the cited art would have been combined by a skilled artisan in the manner recited in the claims. *Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016); *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985 (en banc) (explaining that the test for obviousness is “not whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole”); *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; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.”).

And, Patent Owner's argument improperly ignores, and, thus, fails to address, Chang II's clear teachings that the detection unit 134 is directly connected to the downstream port. *See* Ex. 1015, Fig. 5 (reproduced below).

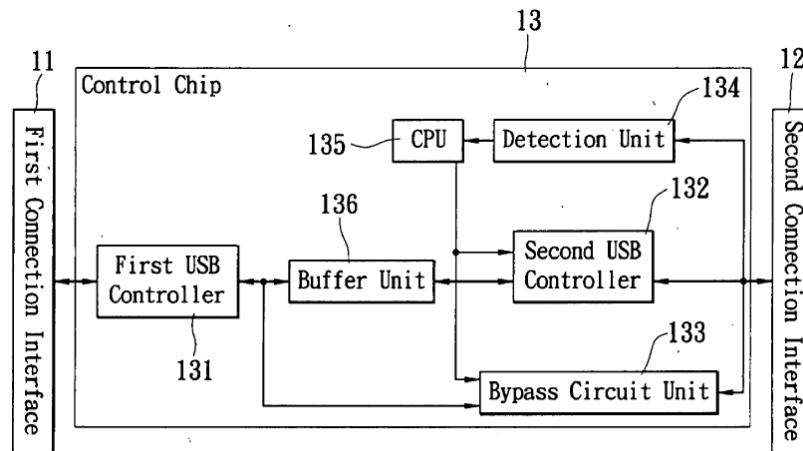


FIG. 5

Figure 5 depicts detection unit 134 directly connected to second connection interface 12. And, the detailed description of Figure 5 provides: “The Detection unit 134 is also connected to the second connection interface 12, and the detection unit 134 will automatically operate to switch between a virtual host state and a virtual slave state, wherein the states are used to determine the type of device currently connected with the second connection interface 12, and a detection signal (bridging detection signal or slave detection signal) is produced accordingly.” *Id.* ¶ 38.

Patent Owner’s arguments are otherwise misplaced. None of the claims of the ’962 patent recite a detection unit and, thus, the challenged claims are not construed as being limited to requiring a detection unit in any particular location or to requiring a detection unit connected in any particular manner.¹⁰ Independent claim 1 in the preamble recites, “[a] Universal Serial

¹⁰ The claims in US Patent No. 11,681,643 B2 (Ex. 1011) that is owned by Patent Owner and challenged by Petitioner in co-pending PGR2024-00011 recite, “a signal detection circuit for receiving USB signals from the consumer USB device via the second USB port” (*id.* at 9:21–23 (independent claim 1)), and “the USB routing switch includes the signal detection circuit” (*id.* at 9:44–45 (dependent claim 4)). *See also id.* at 9:51–

Bus (USB) hub module, comprising” (Ex. 1005, 11:21) and dependent claim 3 recites, “[t]he USB hub module according to claim 1, wherein the USB hub module is **configured to recognize** whether the consumer device connected to the first downstream USB port is configured to act as the USB host or as a USB device and control the USB routing switch accordingly” (*id.* at 11:61–65 (emphasis added)). None of the claims recite how the configuration or recognition is achieved and the ’962 patent does not provide any details regarding these functions. No claim is limited to any particular structure, location, or connection scheme for the recited recognition that is only described in functional terms.¹¹ And, the specific recitation of this recognition limitation in dependent claim 3 indicates that independent claims 1 should not be so limited.¹²

Patent Owner argues that the Petition lacks particularity with regard to how the detection unit in the proposed combination would be implemented (*see* PO Resp. 20–24), but any such lack of particularity is understandable as

52 (independent claim 5 reciting “a signal detection circuit”), 10:16–17 (dependent claim 9 reciting “the signal detection circuit”).

¹¹ The ’962 patent’s specification does not describe a detection unit. *See* Ex. 1005, 7:48–49 (“The detection and enumeration processes are defined by USB standards and not explained here in detail.”). The specification of a patent can make plain what a patentee did and did not invent. *Phillips*, 415 F.3d at 1315. Moreover, neither party offers a claim construction or any other argument that the claims of the ’962 patent are limited to any particular structure, location, or connection scheme for a detection unit.

¹² A limitation in the dependent claim can give rise to a presumption that the limitation is not present in the independent claim. *See Liebel -Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed. Cir. 2004) (citing cases discussing “the presumption that an independent claim does not have a limitation that is introduced for the first time in a dependent claim.”).

the claims also lack particularity as to the detection unit. Stated differently, the fundamental flaw in this argument is the claims do not recite a detection unit and it was unnecessary for Petitioner to be particular as to the detection unit in order to establish unpatentability. As shown below, the Petition is particular as to the limitations recited in the challenged claims.

b. Limitation-by-Limitation Analysis

[Preamble] *A Universal Serial Bus (USB) hub module, comprising*

Petitioner does not take a position as to whether the preamble of claim 1 is limiting. Pet. 47 (“If the preamble is limiting, Ground 1 satisfies it.”). On the current record, we need not determine if the preamble is limiting. Even if the preamble is limiting, the showing in the Petition establishes that the cited art teaches or suggests “[a] Universal Serial Bus (USB) hub module”¹³ as recited in claim 1. *See* Pet. 47–48. Patent Owner does not address whether the preamble is limiting or whether the prior art teaches the preamble. *See generally* PO Resp.

[1a] *an upstream USB port*

Petitioner relies on uplink port 42 of Figure 3 of Chang for teaching “an upstream USB port” as recited. *See* Pet. 49. The detailed description of Figure 3 states, “FIG. 3 shows . . . an uplink port 42 for being linked to a host” (Ex. 1014 ¶ 19) and “uplink port 42 is a USB port” (*id.* at ¶ 21). Patent Owner acknowledges that Chang teaches that “a USB host device

¹³ The Federal Circuit has held that “module” is a well-known nonce word (*Rain Computing, Inc. v. Samsung Electronics America, Inc.*, 989 F.3d 1002, 1006 (Fed. Cir. 2021)) and “simply a generic description of software or hardware that performs a specified function” (*Fintiv, Inc. v. PayPal Holdings, Inc.*, 134 F.4th 1377, 1382 (Fed. Cir. 2025)).

(such as a computer) can connect to a dedicated host port” and “a host device connected to the uplink port.” PO Resp. 6–7 (citing Ex. 1014 ¶¶ 19, 20, Fig. 3; Ex. 2019 (Supplemental Houh Declaration) ¶¶ 52, 53).

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches this limitation.

[1b] *a plurality of downstream USB ports*

Petitioner asserts that “Chang discloses ‘a plurality of downstream USB ports.’” Pet. 49 (citing Ex. 1013 ¶¶ 226–228). Petitioner identifies downlink ports 44 and host port 50 of Figure 3 of Chang as teaching the recited plurality of downstream USB ports. *See id.* at 49–51 (citing Ex. 1014 ¶¶ 19–21, Fig. 3). Relying on its declarant, the Petition states that “[a] POSITA would understand Chang’s ‘downlink’ USB ports are ‘downstream’ USB ports.” *Id.* at 50 (citing Ex. 1013 ¶ 231). The detailed description of Figure 3 states, “FIG. 3 shows . . . several downlink ports 44 for being linked to devices” (Ex. 1014 ¶ 19) and “the hub 40 further comprises a host port 50 for being linked to a host” (*id.* at ¶20). Patent Owner acknowledges that Chang teaches “a USB host device (such as a computer) can connect to a dedicated host port (50), and communicate via a bridge (52) and hub control unit (46) to another USB host device—such as a second computer—connected to an uplink port (42)” and “[t]he Chang hub also comprises a number of downlink ports (44) for linking devices connected to the downlink ports to the uplink port.” PO Resp. 6–7 (citing Ex. 1014 ¶¶ 19, 20, Fig. 3; Ex. 2019 (Supplemental Houh Declaration) ¶¶ 52, 53).

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches this limitation.

[1c] [1c(i)] a USB hub interconnected to the upstream USB port and the plurality of downstream USB ports, [1c(ii)] said USB hub configured to broadcast data from the upstream USB port to each downstream USB port and to transmit data from each downstream USB port to the upstream USB port

With regard to limitation 1c(i), Petitioner identifies hub 40 and hub control unit 46 of Figure 3 of Chang as teaching “a USB hub interconnected to the upstream USB port and the plurality of downstream USB ports” as recited. *See* Pet. 51–54 (citing Ex. 1014 ¶¶ 19–21, Fig. 3). Paragraph 19 of Chang provides:

FIG. 3 shows a hub 40 according to the present invention, which has, as a conventional hub, an uplink port 42 for being linked to a host, several downlink ports 44 for being linked to devices, and a hub control unit 46 for establishing several transmission paths 48 between the uplink port 42 and downlink ports 44 such that the host linked to the uplink port 42 can communicate with the devices linked to the downlink ports 44.

Ex. 1014 ¶ 19.

With regard to limitation 1c(ii), the Petition provides that “Chang discloses that its hub (either hub 40 or hub control unit 46) simultaneously broadcasts from upstream port 42 to each downstream port.” Pet. 55 (citing Ex. 1014 ¶ 23). Figure 4 of Chang is reproduced below.

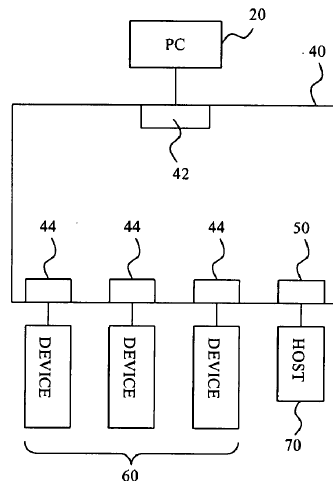


FIG. 4

Figure 4 of Chang depicts a computer (PC 20) connected to upstream port 42 and three devices 60 and host 70 connected to downstream ports 44 and 50 through hub 40. Paragraph 23 of Chang states:

FIG. 4 shows an application of the hub 40 according to the present invention. The hub 40 in FIG. 4 is a USB hub, and the uplink port 42, downlink ports 44, and host port 50 are all USB ports. Via the USB hub 40, the personal computer 20 linked to the uplink port 42 can reach to several devices 60 linked to the downlink ports 44 in addition, such as flash disk, MP3 player, digital camera, personal digital assistant, mouse, keyboard, and other USB devices, it can further communicate with a host 70 linked to the host port 50. Particularly, the communications between the personal computer 20 and host 70 via the USB hub 40 do not need to be established based on a local area network, i.e., there is no need for any knowledge and setting regarding to local area network hereof.

Ex. 1014 ¶ 23.

Patent Owner acknowledges:

Chang . . . discloses a USB hub for implementing host-to-host USB transmission through a dedicated host port connected to a bridge. . . . In Chang's hub, a USB host device

(such as a computer) can connect to a dedicated host port (50), and communicate via a bridge (52) and hub control unit (46) to another USB host device—such as a second computer—connected to an uplink port.

. . . .

The Chang hub also comprises a number of downlink ports (44) for linking devices connected to the downlink ports to the uplink port. . . . The downlink ports allow for host-to-device transmission between USB devices (in a device mode) connected to the downlink ports and a host device connected to the uplink port.

PO Resp. 6–7 (citing Ex. 1014, code (57) (Abstract), ¶¶ 19, 20, Fig. 3; Ex. 2019 (Supplemental Houh Declaration) ¶¶ 52, 53).

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches this limitation.

[1d] *a USB bridge interconnected to the USB hub and configured to connect the upstream USB port to a USB host*

With regard to this limitation, the Petition provides that “Chang discloses a ‘bridge 52’ that ‘provides a function for host-to-host communications’ between the upstream host (attached to port 42) and downstream host (attached to port 50).” Pet. 56 (citing Ex. 1014 ¶ 20). Paragraph 20 of Chang provides:

the hub 40 further comprises . . . a bridge 52 connected between the hub control unit 46 and host port 50 . . . With the hub control unit 46 and bridge 52, a host-to-host transmission path 54 may be established such that uplink port 42 may communicate with the host port 50. As such, the host linked to the uplink port 42 can communicate with the host linked to the host port 50.

Ex. 1014 ¶ 20. Patent Owner acknowledges that “[i]n Chang’s hub, a USB host device (such as a computer) can connect to a dedicated host port (50), and communicate via a bridge (52) and hub control unit (46) to another USB host device—such as a second computer—connected to an uplink port.”
See PO Resp. 6 (citing Ex. 1014 ¶ 20).

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches this limitation.

[1e] *a USB routing switch interconnected to the USB bridge, the USB hub, and the plurality of downstream USB ports*

As noted above, Petitioner proposes to modify the teachings of Chang to include components and functionality for switching between two transmission paths (bypass path and bridge transmission path) as taught by Chang II. Pet. 57–58 (“Ground 1 modifies Chang to include dual-role USB ports and routing capabilities (*e.g.*, crossbar switch) to provide host-to-host and host-to-device connection paths,”). Petitioner shows that “Chang II’s ‘main feature’ is providing ‘two different transmission paths.’” *Id.* at 58 (citing Ex. 1015 ¶ 21). Paragraph 21 of Chang II states:

The present Invention designed a data transmission bridge device for transmitting data between two devices (host-host or host-slave) through simple hardware structure, **the main feature is the provision of two different transmission paths**, so that by automatically detecting the type of device connected (host or slave) the present invention can **switch** to the proper transmission path, thus not only can host-slave operation between the host device and the slave device be supported, but direct bridging between two host device[s] for data transfer is also possible. Further more [sic] the present invention adheres to USB specification by design, so that "plug and play" works

properly. Thus the goal of allowing users to conveniently bridge between a host device and any other device (host or slave) for data transfer is achieved.

Ex. 1015 ¶ 21 (emphasis added). Petitioner identifies the “bypass” and “bridge transmission” paths as described in paragraph 24 of Chang II as the two transmission paths. Pet. 58. Paragraph 24 of Chang II states:

Furthermore, the above mentioned two transmission paths included in control chip 13 can be a bridge transmission path or a bypass path. The control chip 13 will **automatically and periodically switch** the second connection interface 12 to a virtual host state and a virtual slave state, wherein the states are used to determine whether the type of device connected with the second connection interface 12 is the second host device 3 or the slave device 4, so that the control chip 13 can respectively **switch** to the bridge transmission path or the bypass path.

Ex. 1015 ¶ 24 (emphasis added). Petitioner argues that, “[i]n view of these teachings, it would have been obvious to employ, for example, a crossbar switch in Chang to switch between the bridge path (when a host connects) or bypass path (when a device connects).” Pet. 58 (citing Ex. 1013 (Welch Decl.) ¶¶ 237–238).¹⁴ Patent Owner argues that Petitioner fails to show that the cited art teaches a USB routing switch as “switching elements are absent

¹⁴ In addition to these teachings, Petitioner also argues that switching between two transmission paths is repeatedly disclosed in Chang II. Pet. 29 (“The fundamental concepts of (1) host/device detection and (2) selecting between two transmission paths (for host-to-host or host-to-device communication) are repeated throughout Chang II,” 33 (“The fundamental concepts of (1) detecting host/device type and (2) selecting/switching between two transmission paths are repeated extensively throughout the specification.”). Chang II supports this contention.

from Chang and Chang II.” PO Resp. 20. Patent Owner describes the Petition’s description of switching as “evidence-starved.” *Id.* at 24; *see also id.* at 2, 54 (arguing that the Petition lacks “reasoned analysis and evidentiary support” for the USB routing switch limitation). This is not correct. Petitioner has shown that Chang II repeatedly teaches switching elements and highlights the importance of detecting the type of connected device and selecting or switching to the proper transmission path. *See, e.g.,* Pet. 27–33 (“Chang II Summary”). This section of the Petition provides:

“Chang II discloses ‘a data transmission bridge device and control chip thereof for transmitting data that adopts USB specification, and can utilize switching to bridge between two host devices for transmitting data.’ EX1015, [0002]; *see generally* Welch, ¶¶153-168.”

....

“The ‘data transmission bridge device ... automatically detect[s] the connecting device type and accordingly switch[es] between different transmission paths,’ which supports “data transfer between a host device and a slave device” and ‘between two host devices.’ EX1015, [0011].”

....

“EX1015 . . . [0046] (‘automatically detect[s] the type of connected device to switch between the proper transmission path’).”

....

“Chang II explains that ‘detection unit 134 ... will automatically operate to switch between [states] ... to determine the type of device currently connected.’ EX1015, [0038]; *see also id.*, [0028]. This allows the control chip to

‘switch to the bridge transmission path or the bypass path.’ *Id.*, [0024].”

....

“Chang II discloses ‘*two different transmission paths, so that by automatically detecting the type of device connected (host or slave) the present invention can switch to the proper transmission path*, thus not only can host-slave operation between the host device and the slave device be supported, but direct bridging between two host device[s] for data transfer.’ EX1015, [0021] (emphasis added).”

....

“To choose between transmission paths, CPU 135 controls a switching function: ‘the detection signal will be received by the CPU, and the CPU will accordingly control the second USB controller (host-to-host data transfer) or the bypass circuit unit (host-to-slave data transfer) for the appropriate operation.’ EX1015, [0013]; *see also id.*, [0023], [0038]-[0040]. A POSITA would have understood this functionality to be implemented by some type of switch, mux, or crossbar. Welch, ¶165.”

“To recap, Chang II’s ‘main feature is the provision of two different transmission paths, so that by automatically detecting the type of device connected (host or slave) the present invention can switch to the proper transmission path.’ EX1015, [0021]. The fundamental concepts of (1) detecting host/device type and (2) selecting/switching between two transmission paths are repeated extensively throughout the specification. *See id.*, [0012]-[0013] (‘detecting the device ... [and] decide on one of the two transmission paths’), [0045].”

Id. (bracketed material in original).¹⁵ In the Petition, Chang II’s teachings relating to switching are applied to the claims in the element-by-element analysis. *See id.* at 46–85.

Patent Owner acknowledges that Chang II teaches a USB routing switch. In its Response, Patent Owner acknowledges that “Chang II already includes as its ‘main feature,’ circuitry for switching between two transmission paths.” PO Resp. 61 (citing Ex. 1015 ¶ 21); *see also id.* at 59 (referencing “Chang II’s principle of operation: utilizing its switching circuitry to switch to the appropriate transmission path”) (citing Ex. 2019 ¶ 126), 62 (referencing “Chang II’s existing switching circuitry”) (citing Ex. 2019 ¶ 131). At oral argument, Patent Owner’s counsel acknowledged that Chang II’s detection circuit is a switch. Tr. 65:18–22. Patent Owner’s expert, Dr. Houh, testified that Chang II teaches a routing switch. Ex. 1084, 205–207.

Applying the plain and ordinary meaning to the term “a USB routing switch” (*see* Section II. C. (Claim Construction)), Patent Owner’s argument that Chang II does not disclose “a USB routing switch” falls flat. A form of the word “switch” (i.e., switch, switches, switching, or switched) is used 38 times in Chang II to describe selecting one of the two transmission paths. *See generally* Ex. 1015. Patent Owner fails to consider that the skilled

¹⁵ We also note that claim 1 of Chang II is directed to “[a] data transmission bridge device, which adopts USB specification for data transmission, comprising: . . . a control chip . . . including two transmission paths, wherein the control chip is used for detecting the device connected with the second connection interface and accordingly **switching** to one of the two transmission paths to use for data transmission.” Ex. 1015, 11–12 (claim 1) (emphasis added).

artisan is not an automaton so that “the inferences and creative steps that a person of ordinary skill in the art would employ” must be taken into account. *See KSR*, 550 U.S. at 418. Given all the disclosure in Chang II of switching between transmission paths, we determine that Patent Owner’s argument that the cited art does not teach a routing switch is unavailing. “A reference must be considered for everything it *teaches* by way of technology and is not limited to the particular *invention* it is describing and attempting to protect.” *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1076 (Fed. Cir. 2015) (quoting *EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 907 (Fed. Cir. 1985)).

With regard to this limitation and the preceding limitation, Patent Owner also argues that the crossbar implementations relied on in the Petition “do not meet the required relationship between the components of the USB hub module” as claim 1 requires “a USB Bridge *interconnected* to the USB Hub” (limitation 1d) “a USB routing switch *interconnected* to the USB Bridge, the USB Hub, and the plurality of downstream USB Ports” (limitation 1e). PO Resp. 38. This argument lacks merit because it is not well-supported by the language of the claims or the Petitioner’s showing based on the crossbar implementations. In both crossbar implementations set forth in the Petition, the USB bridge is clearly depicted as connected to the USB hub (limitation 1d) and the crossbar switch (labelled as the “USB routing switch”) is depicted as connected to the USB bridge, the USB hub, and three USB ports (collectively labelled as the “plurality of downstream USB ports”) (limitation 1e). *See* Pet. 46–47. With regard to the Petition’s Chang (Hub 46) implementation, Patent Owner contends that Chang’s hub control unit 46 is not a USB hub, because “Chang expressly identifies USB Hub 40—not its subcomponent, Hub Control Unit 46—as its USB hub.” PO

Resp. 38. Petitioner counters that “[t]his is semantics” and cites the testimony of Patent Owner’s expert on the meaning of “hub.” Pet. Reply 18. Patent Owner’s expert, Dr. Houh, testified that “[a] hub is a device that routes multiple downstream ports to a single upstream port” (Ex. 2001 ¶ 36) and “the basic functionality of a USB hub [is] broadcasting data from an upstream port to all enabled downstream ports and passing data from each downstream port to the upstream port” (Ex. 2019, 98). This is how Petitioner depicts and describes the Hub Control Unit 46 in its Chang (Hub 46) implementation (*see* Pet. 52-68) and is supported by paragraph 19 of Chang which provides, “a hub control unit 46 for establishing several transmission paths 48 between the uplink port 42 and downlink ports 44 such that the host linked to the uplink port 42 can communicate with the devices linked to the downlink ports 44.”

Patent Owner also argues that the Petition’s crossbar implementations cannot meet these limitations based on the meaning of “interconnected.” PO Resp. 39. Although Patent Owner neither offers a construction nor a plain or ordinary meaning of “interconnected,” Patent Owner argues Petitioner and its expert agree that an internal component of a hub cannot be interconnected to the hub. *See id.* And, Patent Owner argues that, with regard to both crossbar implementations, Petitioner alleges that an internal component is interconnected to the hub. *Id.* In response to this argument, Petitioner points out that Patent Owner’s argument is based on a faulty premise. Pet. Reply 18–19. The Petitioner states:

P[atent]]O[wner] argues Chang’s hub 40 cannot be ***interconnected to a bridge and routing switch*** because Chang’s bridge 52 and crossbar are inside hub 40. POR, 39. P[atent]]O[wner] conflates Petitioner’s “hub control unit 46” embodiment (mapping Chang’s hub control unit 46 to ***hub***) and

Petitioner’s alternative “hub 40” embodiment (mapping Chang’s hub 40 to **hub**). Pet., 52-54. Nowhere does Petitioner assert the **hub** is **interconnected to** either a **bridge** (Chang’s bridge 52) or **routing switch** (crossbar) inside the **hub**. *Id.*, 56-60.

Id. In both crossbar implementations set forth in the Petition, the USB bridge is clearly depicted as outside of the USB hub (limitation 1d) and the crossbar switch (labelled as the “USB routing switch”) is depicted as outside of the USB bridge, the USB hub, and three USB ports (collectively labelled as the “plurality of downstream USB ports”) (limitation 1e). *See* Pet. 46–47. This argument is not persuasive.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches this limitation.

[1f] [If(i)] wherein the USB routing switch is configured to connect a first downstream USB port of the plurality of downstream USB ports to the upstream USB port through the USB bridge when a consumer device connected to the first downstream USB port is the USB host and [1f(ii)] is configured to initiate bidirectional communication with the upstream USB port

As discussed in relation to the previous limitations, Chang II discloses in paragraph 21 that by “automatically detecting the type of device connected (host or slave) the present invention can switch to the proper transmission path” and provide “direct bridging between two host device[s] for data transfer.” And, Chang II discloses in paragraph 24 that “the control chip 13 can . . . switch to the bridge transmission path.”

In its Response, citing Chang II and its own declarant, Dr. Houh, Patent Owner acknowledges, that “Chang II’s ‘main feature’ is providing two different transmission paths, automatically detecting whether a host or

‘slave’ USB device is connected to the second connection interface, and selecting one of two different transmission paths between the first and second connection interfaces accordingly.” PO Resp. 9 (citing Ex. 1015 ¶ 21; Ex. 2019 ¶ 55).

With regard to limitation 1f(ii), Petitioner contends that “Ground 1’s host-to-host communication is bidirectional because each host is a standard USB host that may initiate host communications.” Pet. 63 (citing Ex. 1013 (Welch Decl.) ¶ 245; Ex. 1014 ¶ 20; Ex. 1015 ¶ 26). Patent Owner acknowledges that “Universal Serial Bus (‘USB’) is a ubiquitous communication protocol” and a USB “host must initiate all communication.” Prelim. Resp. 2–3.

The Petition contains a showing supported by evidence, including both Chang (Ex. 1014) and Chang II (Ex. 1015), that this limitation is taught by the cited art. *See* Pet. 62–65. Figure 3 of Chang (Ex. 1014) is reproduced below.

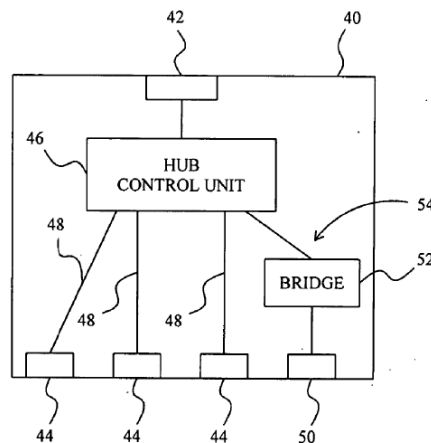


FIG. 3

Figure 3 of Chang depicts “an application of a USB hub.” Ex. 1014 ¶ 15. Cited paragraph 20 of Chang is a passage from the detailed description of Figure 3 and provides (emphasis added):

However, the hub 40 further comprises a host port 50 for being linked to a host, and a bridge 52 connected between the hub control unit 46 and host port 50. The bridge 52 provides a function for *host-to-host communications*, and may be implemented with a bridge chip for example OTi2108 of Ours Technology Inc. or other host-to-host transmission chip. With the hub control unit 46 and bridge 52, *a host-to-host transmission path 54 may be established such that the uplink port 42 may communicate with the host port 50*. As such, *the host linked to the uplink port 42 can communicate with the host linked to the host port 50*. The host-to-host transmission mechanism is a prior art, and is not described in detail hereof.

In the section of the Petition relating to the “bidirectional communication” limitation, paragraph 26 of Chang II is also cited. *See* Pet. 63. Figure 1 of Chang II is reproduced below.

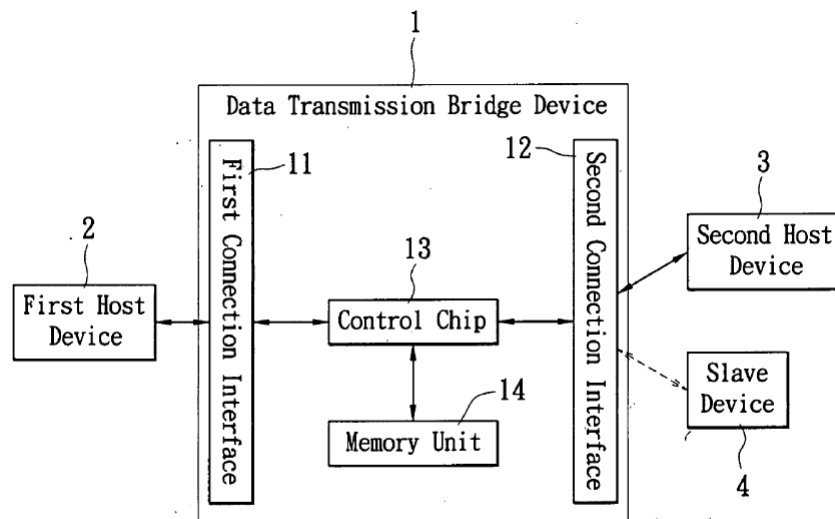


FIG. 1

Figure 1 of Chang II depicts “a data transmission bridge device and control chip thereof for transmitting data.” Ex. 1015 ¶ 15. Paragraph 26 of Chang II provides:

Similarly, when a current user is connecting the second host device 3 with the second connection interface 12, and the control chip 13 is switched to the virtual slave device state for the second connection interface 12, there will also be an inquire signal produced by the control chip 13 to the second host device 3, then once the second host device 3 responses, by the response confirmation can be made that the device connected to the second connection interface 12 is also a host, so that ***the control chip 13 will switch the transmission path to the bridge transmission path***, in order to successfully complete the bridging between the first host device 2 and the second host device 3, ***so that data transfer can proceed between the two host devices***.

Id. ¶ 26 (emphasis added).

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches this limitation.

[1g] [1g(i)] wherein the USB routing switch is configured to connect the first downstream USB port directly to the USB hub **[1g(ii)]** when the consumer device connected to the first downstream USB port is configured to only respond to communication from the upstream USB port, **[1g(iii)]** thereby rendering the consumer device compatible with a device connected to the upstream USB port.

As noted above, Petitioner proposes to incorporate Chang II’s teaching of a USB routing switch into the circuit disclosed in Chang’s Figure 3. In addition, with regard to this limitation, the Petition states that “Chang discloses host-to-device communication through ‘several

transmission paths 48.” Pet. 66 (citing Ex. 1014 ¶¶ 19–20). These connections or paths are shown in Figure 3 of Chang. *See also id.* at 66–67.

With regard to limitation 1g(ii). Petitioner contends that “[i]t was well-known that USB devices only respond to host communication (EX 1025, 1:17-20).” Pet. 65. With regard to limitation 1g(iii), Petitioner contends that “Chang discloses that the upstream host may bypass the bridge and communicate with a downstream device through the hub (*i.e.*, traditional USB host-to-device connection). *Id.* at 67 (citing Ex. 1014 ¶¶ 19, 23).

In the “Background” section of the ’962 patent, it is acknowledged that in “[h]istorical[],” “commonly available, familiar to the end user, cost effective and ubiquitous” USB technology:

USB protocols require a point-to-point connection in which one end is the USB host or master, and the other end is a USB Device or slave. In this way, the flow of messages between the two devices is managed and controlled, whereby the USB Device responds to messages initiated by the USB host.

Ex. 1003, 1:30–43.

In its Response, Patent Owner argues that “[t]he Petition’s proposed combination fails to meet the limitations of claim 1.” PO Resp. 35. Patent Owner contends that claim 1 “require[s] a USB routing switch configured according to specific requirements.” *Id.* With regard to these specific requirements, Patent Owner argues:

For example, the claimed USB routing switch is configured to connect a first downstream USB port to the upstream USB port through the USB bridge when a consumer device connected to the first downstream USB port is the USB host and is configured to initiate bidirectional communication with the upstream USB port. Further, the USB routing switch is configured to connect the first downstream USB port directly to the USB hub when the consumer device connected to the first

downstream USB port is configured to only respond to communication from the upstream USB port, thereby rendering the consumer device compatible with a device connected to the upstream USB port. (EX1005, claim 1.)

Id. at 35–36. This argument is directed to limitations 1e, 1f, and 1g. discussed above. Patent Owner’s argument does not directly address the showing in the Petition as to these limitations in claim 1 and the clear teachings in the cited art related to these limitations. *See* PO Resp. 35–39. Moreover, Patent Owner fails to reconcile its argument with what Patent Owner acknowledges the cited art teaches. Accordingly, we determine that Patent Owner’s argument lacks support and merit. Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches the limitations of claim 1.

4. Claim 2

Claim 2 recites:

The USB hub module according to claim 1, wherein the USB routing switch is configured to connect the first downstream USB port to the USB hub through the USB bridge when a first consumer device connected to the first downstream USB port is acting as the USB host, and wherein the USB routing switch is configured to simultaneously connect a second downstream USB port of the plurality of downstream USB ports directly to the USB hub when a second consumer device connected to the second downstream USB port is acting as a USB device, thereby rendering the first and second consumer devices compatible to communicate simultaneously with the upstream USB port.

Ex. 1005, 11:49–60. Petitioner relies on Chang for teaching two consumer devices (one host and one device) simultaneously communicating with the upstream host USB port. Pet. 68–70. The Petition provides:

To begin, simultaneously connecting multiple downstream products to an upstream host is a primary purpose of conventional hubs. . . . And simultaneously connecting both a downstream host and downstream device is a primary purpose of Chang. EX1014, Fig. 3, [0019]-[0020]. Indeed, Chang Fig. 4 (a further example of Fig. 3) shows three downstream devices 60 and one host device 70 simultaneously connected to an upstream host. *Id.*, [0023].

Id. at 68. Figure 4 of Chang is reproduced below.

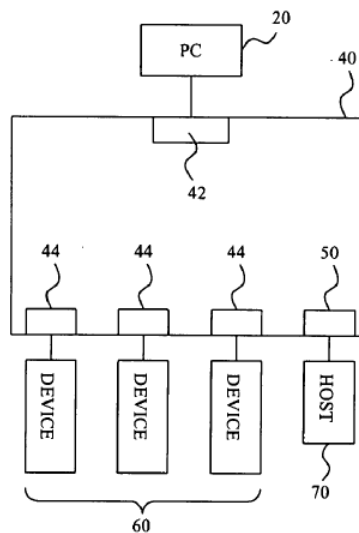


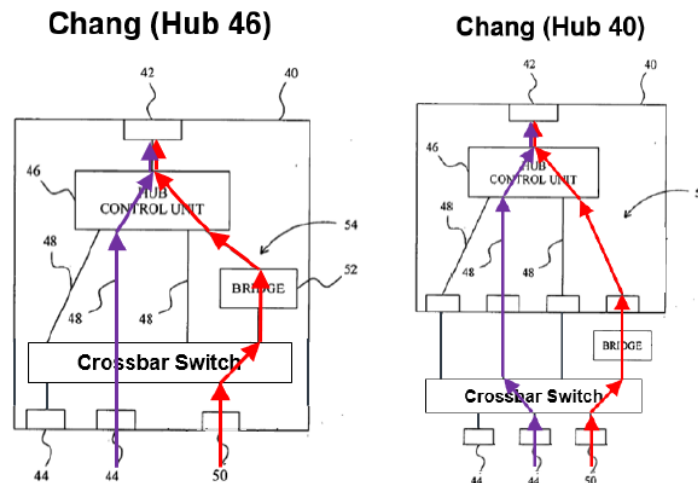
FIG. 4

Figure 4 depicts host 70 linked to host port 50 and “several devices 60 linked to the downlink ports 44 in addition, such as flash disk, MP3 player, digital camera, personal digital assistant, mouse, keyboard, and other USB devices.” Ex. 1014 ¶ 23.

Petitioner contends, “[b]oth Crossbar Implementations render claim 2 obvious” and provides:

The crossbar can route each consumer port (including all at the same time) directly to the hub or route any particular port to the hub through the bridge. Welch, ¶257. Because Chang’s upstream port 42 is always host, this maintains connections to other downstream device ports when establishing a host-to-host connection. Compare EX1014, [0020], [0023] with EX1005, 3:55-67; Welch, ¶¶256-257.

Pet. 69. Petitioner also provides modified and annotated versions of Chang’s Figure 3 of both crossbar implementations which are reproduced below.



Id. at 70. According to Petitioner, these figures depict that “the crossbar satisfies claim 2 by simultaneously (1) connecting the **downstream host** through the bridge to establish a host-to-host connection (red arrows); and (2) directly connecting the **downstream device** to the hub to establish a host-to-device connection (purple arrows).” *Id.*

Patent Owner argues that “the Petition’s proposed combination cannot meet [the] limitation[] of claim[] 2 . . . requiring that the USB routing switch be configured to connect *multiple simultaneous* downstream USB devices to the USB hub.” PO Resp. 39–40 (citing Ex. 2019 ¶ 100). However, in opposing Petitioner’s showing as to claim 2, Patent Owner

ignores Chang’s clear teachings relating to simultaneous connection and makes no effort to distinguish these clear teachings from the subject matter of claim 2. *Id.* at 39–41. And, Patent Owner acknowledges that “[t]he Chang hub . . . comprises a number of downlink ports (44) for linking devices connected to the downlink ports to the uplink port.” PO Resp. 7 (citing Ex. 1014 ¶ 19; Ex. 2019 ¶ 53). This argument fails to meet the substance of the showing in the Petition. Patent Owner’s argument is not persuasive.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claim 2.

5. Claim 3

Claim 3 recites:

The USB hub module according to claim 1, wherein the USB hub module is configured to recognize whether the consumer device connected to the first downstream USB port is configured to act as the USB host or as a USB device and control the USB routing switch accordingly.

Ex. 1005, 11:61–65. With regard to claim 3, the Petition provides:

[H]ost/device detection for dual-role ports was routine and well-known, and a POSITA would have been motivated with a high expectation of success to implement detection functionality for dual-role products in this Ground. Welch, ¶259–262. For example, Chang II discloses a “Detection Unit” 134

Chang II’s “detection unit” “automatically operate[s] to . . . determine the type of device currently” connected” to the port. EX1015, [0038]. Applying these teachings to Ground 1, the detection results would control the crossbar control signals, similar to the MAX4989 “Control Input[s].” See EX1063, 7; Welch, ¶261.

The detection unit would be in the “hub module,” e.g., forming part of the hub, bridge, switch, or a separate component. *See, e.g.*, EX1015, Fig. 5 (detection unit part of bridge “control chip”). Chang discloses its bridge could be part of the hub. EX1014, [0022]. A POSITA would naturally integrate detection functionality into the hub, bridge, or switch to utilize an existing encasing and leverage existing logic or CPU functionality. Welch, ¶259–262.

Pet. 71–72 (bracketed material in original).

For claim 3, Patent Owner relies on arguments discussed above that we determine are not persuasive for reasons already given. PO Resp. 41–42.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claim 3.

6. Claim 4

Claim 4 recites:

The USB hub module according to claim 1, wherein the USB hub module is configured to dynamically switch operation of the plurality of downstream USB [ports¹⁶] between a USB device mode and a USB host mode.

¹⁶ Patent Owner contends that there is an “understanding” between the parties and their expert declarants that the language of claim 4 should be corrected to include “ports” here. PO Resp. 43 n.3. The Response provides:

Petitioner and Patent Owner, and their respective experts, all understand this claim language to inadvertently omit the word “ports” after “plurality of downstream USB,” such that claim 4 requires that “the USB hub module is configured to dynamically switch operation of the plurality of downstream USB [ports] between a USB device mode and a USB host mode.” (*See* Petition, 72-73; EX1013, ¶267; EX2019, ¶107.)

Id. We analyze claim 4 as including this correction.

Ex. 1005, 11:66–12:2. With regard to claim 4, the Petition provides:

Chang II discloses “automatically detect[ing] the connecting device type and accordingly switch between different transmission paths.” EX1015, [0011]; *see also id.*, [0021], [0038]. Further, recall that consumer products dynamically switch between host/device mode. EX1005, 3:21–58; *see also* §III.B. Thus, this Ground renders obvious dynamically switching operation of downstream ports between device/host mode, namely, detecting a mode change (*e.g.*, during an active session) and making the corresponding connection to either the bridge or direct-to-hub path through a crossbar. *See* analysis under limitations 1[f]–1[g], and claim 2 (crossbar supports routing multiple downstream products); Welch, ¶¶264–267.

A POSITA would have found it obvious in view of Chang II (and numerous dual-role products at the time) to route USB communications according to the product’s operative mode. Welch, ¶¶265–267; §VII.A.1. A POSITA would have been motivated to support this functionality to improve the user experience and avoid unplugging/replugging products to change modes. Welch, ¶266.

Pet. 72–73 (bracketed material in original). Paragraph 24 of Chang II provides:

Furthermore, the above mentioned two transmission paths included in control chip 13 can be a bridge transmission path or a bypass path. The control chip 13 will **automatically and periodically switch** the second connection interface 12 to a virtual host state and a virtual slave state, wherein the states are used to determine whether the type of device connected with the second connection interface 12 is the second host device 3 or the slave device 4, so that the control chip 13 can respectively switch to the bridge transmission path or the bypass path.

Ex. 1015 ¶ 24 (emphasis added).

Patent Owner argues that “Chang II only describes ‘automatically and

periodically’ switching between a virtual host state and a virtual slave state at stages S603 and S615 of the process in FIG. 6.” PO Resp. 46 (citing Ex. 1015 ¶ 24). This is untrue. Figure 6 and stages S603 and S615 are described in paragraphs 42–44 of Chang II. Paragraph 24 is related to the schematic circuit diagrams of Figures 1 and 2 and is a more general description of when and how the described invention switches transmission paths. Patent Owner’s argument is not persuasive.

Patent Owner also relies on arguments discussed above that we determine are not persuasive for reasons already given. PO Resp. 42–48.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claim 4.

7. Claim 5

Claim 5 recites:

The USB hub module according to claim 1, wherein the USB routing switch is configured to connect the consumer device to either the USB bridge or the USB hub based on whether the consumer device attached to each downstream USB port in the plurality of downstream USB ports is configured to act as the USB host or a USB device.

Ex. 10035, 12:3–8. The Petition provides:

As . . . element 1[d], and claim 2 analysis demonstrate, it would have been obvious to implement all Chang’s downstream ports as dual-role ports and include crossbar routing for routing each port (including all at the same time) directly to the hub or to route any particular port to the hub through the bridge. Of course, doing so requires detecting each downstream product’s host/device status, but such detection was well-known and obvious (*see* §III.B.1). Indeed, a POSITA would have found it obvious and been motivated to reuse/share

detection circuitry among downstream ports to minimize costs. Welch, ¶269. Accordingly, Ground 1 renders claim 5 obvious.

Pet. 73–74.

For claim 5, Patent Owner relies on arguments discussed above that we determine are not persuasive for reasons already given. PO Resp. 48–49.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claim 5.

8. Claim 6

Claim 6 recites:

The USB hub module according to claim 1, wherein the USB routing switch comprises a plurality of USB analog multiplexing switches.

Ex. 1005, 12:9–11. The Petition provides:

Multiplexers and crossbars typically assume two forms: analog (which pass analog signals) or digital (which pass digital values). Welch, ¶271. Passing analog voltages is important for USB functions such as voltage measurement to, *e.g.*, determine host/device status. EX1030, 5:13-37; EX1060; Welch, ¶271.

Analog USB multiplexers and crossbars were common off-the-shelf components prior to the earliest '962 patent priority date. *See* §III.B.2; EX1060; EX1063, 7 (“The MAX4989 is ideal for routing USB data lines and ... switching between multiple USB hosts or devices.”). Crossbars are frequently built from multiplexers which renders claim 6 obvious. *See, e.g.*, EX1041, 1:31-36 (“FIG. 2 shows a multiplexer implementation of the crossbar switch.”); Welch, ¶¶88-96, especially ¶94. Moreover, it would have been obvious to use off-the-shelf USB analog multiplexers to construct a crossbar for the Crossbar Implementations. *See* EX1060; §III.B.2; Welch, ¶¶272-273. Thus, Ground 1 renders claim 6 obvious.

Pet. 74.

Patent Owner argues that Petitioner has failed to establish that claim 6 would have been obvious. PO Resp. 49–50. The Patent Owner’s Response provides:

Claim 6 depends from claim 1 and requires that the claimed USB routing switch comprise a plurality of analog multiplexing switches. In addition to the reasons described above for the parent claim 1, claim 6 is not rendered obvious because the Petition’s proposed combination fails to disclose any such plurality. (EX2019, ¶115.)

The Petition acknowledges that multiplexers and crossbars assume one of two forms: analog or digital. (Petition, 74.) And the Petition, relying on Mr. Welch’s testimony, asserts that “common off-the-shelf components” such as the MAX4989 (EX1063) and FSUSB63 (EX1060) were *analog* multiplexing switches that could have been used in the proposed combination. (Petition at 74 (citing EX1013, ¶271); EX2019, ¶116.) However, with respect to claim 10, the Petition and Mr. Welch characterize the crossbar control signals and the MAX4989 and FSUSB63 switches as “*digital* routing logic”—contradicting their description of those same components as analog for claim 6. (Petition, 79 (citing EX1013, ¶¶287-288); EX2019, ¶116.) (EX1013, ¶287.) Further, Mr. Welch asserts that such digital routing signals are “typical of most (*if not all*) multiplexer and crossbar switches”—undermining his own testimony with respect to claim 6. (EX1013, ¶287; EX2019, ¶116.) The Board should give no weight to Mr. Welch’s contradictory testimony, or to the Petition that relies on it, for either claim 6 or claim 10.

Moreover, even if analog multiplexers were “common off-the-shelf components,” Petition at 74, the Petition fails to identify any plurality of analog multiplexers that could be combined with the combination’s admitted digital signals—including Chang II’s CPU 135, which “receives the host/device detection signal to control[] switching,” (*see* EX1013, ¶288)—or how the POSITA would be motivated to make any such

combination of these two disparate types with any reasonable expectation of success. (EX1015, [0039]; EX2019, ¶117.) The Petition fails with respect to claim 6 for these additional reasons.

Id. In response, Petitioner argues that Patent Owner’s argument is based on a misunderstanding of the technology. Pet. Reply 20. The Petitioner’s Reply says:

P[atent]O[wner]’s claim 6 argument (POR, 49-50) fails because P[atent]O[wner] does not understand the nature of *analog multiplexing switch*. Analog muxes pass analog voltages, while digital muxes pass digital values. Pet., 74. But mux datasheets show digital select lines control both. *E.g.*, EX1068, 2 (truth table). Thus, no “contradicti[on]” exists in Petitioner’s analysis of claim 6 (*analog multiplexing switch*) and claim 10 (*digital routing logic*). They are entirely compatible and were common in the industry. *E.g.*, EX1059, EX1063, EX1068.

P[atent]O[wner]’s “plurality” argument fails as Mr. Welch explains how a crossbar is built from multiple muxes (Welch, ¶¶94, 273) and how USB muxes are themselves built from multiple switches (*viz.*, one each for D+ and D- data lines) (Welch Reply, ¶¶58-61).

Id. Patent Owner does not respond to Petitioner’s contentions as to why its arguments relating to claim 6 fail. *See generally* PO Sur-reply. We agree with Petitioner and determine that Patent Owner’s arguments relating to claim 6 lack merit.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claim 6.

9. Claim 7

Claim 7 recites:

The USB hub module according to claim 1, wherein the USB bridge is configured to control the USB routing switch.

Ex. 1005, 12:12–13. The Petition provides:

Ground 1 renders this limitation obvious. Chang II discloses that its bridge chip controls routing. Specifically, Fig. 1’s “Bridge Device 1” includes “control chip 13” (shown in Fig. 5), which includes detection unit 134 and CPU 135. EX1015, [0022]-[0023], [0034]. The detection unit and CPU control switching; namely, the detection unit “determine[s] the type of device currently connected” (host/device) and sends the CPU a “detection signal” used to switch (connect) the appropriate path. EX1015, [0038]-[0039]. Applying this teaching to Chang, Chang’s bridge would be configured to control the crossbar’s control inputs. Welch, ¶¶275-276; *see also* EX1063, 7 (“control logic inputs, C0, C1, and C2, [] control the switch connections.”); EX1060, 1 (multiplexer select lines); EX1055, 284-288. Indeed, Chang’s bridge would have been understood to include a controller, CPU, or similar logic (like Chang II) to control routing (and certainly it would have been obvious and advantageous to use existing logic to save costs). Welch, ¶¶275-276.

Pet. 75.

Patent Owner does not argue claim 7 separately. *See generally* PO Resp.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claim 7.

10. Claim 8

Claim 8 recites:

The USB hub module according to claim 1, wherein the USB bridge comprises a bridge controller as well as endpoint buffers.

Ex. 1005, 12:14–16. The Petition provides:

Chang II, however, discloses a host-to-host bridging “control chip” with buffer unit 136 that “buffer[s] and stor[es] temporary data that passes between the two controllers” to avoid data loss. EX1015, [0041]. . . .

It was well-known to POSITAs that such transmission chip buffering includes, and certainly would be obvious to include, endpoint buffers. For example, GL620USB-A’s “single-chip solution” USB bridge provides endpoint buffers (*e.g.*, “8 Byte FIFO[s]”) . . . EX1031, 6. The 8 Byte FIFOs link endpoints to form a pipe: “Left 8-byte FIFO: provide a pipe to link left endpoint 0 and right endpoint 3.” *Id.* The USB interfaces, microprocessor, USB registers, and FIFO Control elements enabling USB communications via pipes constitute a “*bridge controller*.” EX1031, 6; Welch, ¶¶278-279.

Additionally, digital logic (like Chang II’s CPU and controllers 131/132) would operate as Ground 1’s “*bridge controller*,” as they enable USB messaging, and further would create pipes. EX1015, [0034]-[0036]; Welch, ¶¶279-281.

A POSITA would have been highly motivated to implement endpoint buffers and pipes because they were part and parcel of USB 2.0 message flows. EX1018, §5.3.1 (endpoints are “uniquely identifiable portion[s] of a USB device that is the terminus of a communication flow between the host and device.”). A USB pipe “is an association between an endpoint on a device and software on the host. Pipes represent the ability to move data between software on the host via a memory buffer and an endpoint on a device.” *Id.*, §5.3.2; *see also id.*, §4.4.

Thus, when implementing a bridge—which includes one device interface for each host—the device interfaces typically include endpoints to allow the host to transfer data to/from the bridge according to the USB standard. EX1031, 4; *see also* EX1054, 1. This allows both hosts to follow standard USB protocols when transferring data to/from the bridge. Accordingly, it would have been obvious to a POSITA for the USB bridge to comprise “*a bridge controller*” with “*endpoint*

buffers” that are “configured to support a USB data connection pipe.” Welch, ¶¶277-282.

Pet. 76–78.

Patent Owner does not argue claim 8 separately. *See generally* PO Resp.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claim 8.

11. Claim 9

Claim 9 recites:

The USB hub module according to claim 8, wherein the endpoint buffers are configured to support a USB data connection pipe between an infotainment system and the consumer device.

Ex. 1005, 12:17–20. The Petition provides:

Ground 1 renders this limitation obvious. The “*endpoint buffers [] configured to support a USB data connection pipe*” limitation is discussed *supra* claim 8. What remains is that the connection be between “*an infotainment system*” and the downstream “*consumer device.*” The “*consumer device*” as host has been discussed extensively, and having an “*infotainment system*” as Chang’s upstream host would have been obvious to a POSITA. Welch, ¶285. Indeed, the ’962 patent admits “[t]he USB Host function is often embedded into a component of the vehicle infotainment system.” EX1005, 1:51-53. Moreover, the “USB In Automotive: Not Just For PCs Anymore!” article explained “the car has become a PC on wheels” and states USB hosts can be located in “the portable consumer device or the infotainment system.” EX1049, 1; *see also* EX1050, Fig. 17 (showing “media center” connected to USB hub upstream port). Thus, Ground 1 renders claim 9 obvious. Welch, ¶¶284-285, 100-104, 180.

Pet. 78–79.

Patent Owner argues that Petitioner has failed to establish that claim 9 would have been obvious. PO Resp. 50–53. The Patent Owner’s Response provides:

Neither Chang nor Chang II disclose or relate to infotainment systems, or to vehicles; the Petition’s citations to generic descriptions of infotainment systems for vehicles thus fail to support that a POSITA would have modified the Petition’s proposed combinations to incorporate such systems in a manner that meets the claim limitations. (Petition, 78-79; EX2019, ¶119.) Moreover, even if the proposed combinations could be modified to include an infotainment system, the Petition makes no attempt to show that the modification would meet endpoint buffers configured to support the claimed USB data connection pipe. (Petition, 78- 79; EX2019, ¶119.)

The POSITA would have recognized that infotainment systems present unique difficulties for hubs with host-to-host functionality. (EX2019, ¶120.) At the time the ’962 patent was filed in 2013, the POSITA would understand automotive infotainment systems with USB support to require more functionality than a radio, CD or cassette player; they were also expected to support mapping, video, and screen mirroring functionality. (*See e.g.*, EX1005, 1:56-61 (describing vehicle infotainment systems as accessing “streaming music, video and other services” provided by consumer devices, such as smartphones); EX2019, ¶120.) If the data for these functions is being provided by a USB device—as described in the specification—it must be transferred in real-time, i.e. streamed, to the head unit for display. (EX2019, ¶120.)

As the POSITA would recognize, a USB data connection pipe between such infotainment systems and consumer devices would have specific and heightened requirements for latency and bandwidth; however, the Petition makes no attempt to establish that such requirements are met by the proposed combination. (EX2019, ¶121.) The USB specification itself recognizes the unique challenges presented by streaming data

and has defined a specific type of data transfer pipe— isochronous or “ISO”—which is capable of transferring constant-rate, time-critical data that, unlike the other types of USB data transfers, is not retried if there is an error. (EX1018, 4.7.4; EX2019, ¶ 121.) But none of the prior art USB bridges identified by Petitioner support such isochronous data transfer pipes. (EX1035, 1 (“Supports USB Full/High Speed Control/Interrupt/Bulk Endpoints Transfer”); EX1036, 14 (listing only control, bulk, and interrupt endpoints); EX1037, 1 (same); EX2019, ¶121.) Instead, because those bridges were not designed to handle the time-sensitive transfers required in the streaming context, those bridges include only control, interrupt, and bulk data transfers. (*Id.*)

The Petition offers no attempt to explain how the proposed combination could be modified to support the isochronous transfers required by infotainment systems, or how a POSITA would have been motivated to make such a modification with any reasonable expectation of success. (EX2019, ¶122.) The proposed combination accordingly fails to meet claim 9.

Id. at 51–53. In response, Petitioner argues that Patent Owner’s argument lacks merit. Pet. Reply 20–21. The Petitioner’s Reply says:

P[atent]O[wner] implicitly construes infotainment system to require “real-time” data transfer, “streaming” services, and “mapping, video, and screen mirroring functionality” (POR, 50-52), but cites permissive “such as” and “may” specification language. EX1005, 1:56-61. P[atent]O[wner]’s “isochronous” argument (POR, 52) fails as the Challenged Patent says nothing about this. Regardless, the USB standard discloses isochronous transfer and renders it obvious in 2013. EX1018, §§4.7.4, 5.6. Moreover, Dr. Houh admitted “it was common for automotive companies to use USB” (EX2001, ¶37) and “USB was a known method for connecting a mobile phone to a vehicle’s infotainment system” (*id.*, ¶52), which defeats P[atent]O[wner]’s arguments.

Id. Patent Owner responds to Petitioner's contentions as to why its arguments relating to claim 9 fail, as follows:

Claims 9 [sic] requires that the endpoint buffers of the USB bridge be configured to support a USB data connection pipe between an infotainment system and the consumer device. Petitioner denies this requires isochronous data support. (Reply, 20.) Yet, the unrebutted evidence confirms a POSITA would recognize the need for real-time streaming from a mobile device to the head unit. (EX2019, ¶ 100.) Arguing otherwise undermines Petitioner's motivation to create the proposed combination. (Petition, 42; EX1013 ¶¶ 176-181.) Supporting host control while excluding audio/video streaming would be of little use to an infotainment system.

Petitioner also asserts that because the USB standard includes isochronous transfers, using them in a host-to-host bridge would have been obvious. (Reply, 20-21.) But as the POR and USB specification explain, isochronous transfers pose a unique USB challenge. (POR 50-53; EX1018, 4.7.4; EX2019, ¶ 121.) No prior art bridge devices identified by Petitioner supported this, nor has Mr. Welch claimed awareness of any that did. (POR, 50-53; EX2019, ¶ 121.)

PO Sur-reply 27–28.

We agree with Petitioner and determine that Patent Owner's arguments relating to claim 9 lack merit. Patent Owner's argument depends on reading limitations into claim 9 that are not recited.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claim 9.

12. Claim 10

Claim 10 recites:

The USB hub module according to claim 1, wherein the USB routing switch comprises digital routing logic.

Ex. 1005, 12: 21–22. The Petition provides:

Ground 1 renders this limitation obvious. A POSITA would understand that the crossbar control signals are digital routing logic. Welch, ¶¶287-288; *see also* EX1063, 7 (discussing “control logic inputs, C0, C1, and C2”); EX1059 and EX1060, 1 (multiplexer select lines SEL[0] and SEL[1]); EX1055, 284-288 (“control lines” for switching); EX1015, [0038] (“CPU 135” receives the host/device detection signal to “control[]” switching).

Pet. 79.

Patent Owner argues that Petitioner has failed to establish that claim 10 would have been obvious. PO Resp. 53. The Patent Owner’s Response provides:

Claim 10 depends from claim 1 and recites that the USB routing switch comprises digital routing logic. Claim 10 is not met for at least the reasons described above for the parent claim. In addition, as discussed above for claim 6, Mr. Welch’s testimony is incoherent with respect to the switching elements of the proposed combination, and whether those switching elements are analog or digital. (EX2019, ¶123.) For example, Mr. Welch characterizes the MAX4989 and FSUSB63 switches as analog switches with respect to claim 6 (which recites analog switches); but characterizes those same components instead as digital switches with respect to claim 10 (which recites digital switches). (Petition at 74, 79; EX1013, ¶¶271, 287-288; EX2019, ¶123.) Moreover, to the extent the Petition’s switches are analog switches, neither Mr. Welch nor the Petition offers any indication of how they would be combined with digital signals from, *e.g.*, Chang II’s CPU 135 to meet the limitations of claim 10. (*See* EX1013, ¶288; EX2019, ¶123.) As with claim 6, Mr. Welch’s contradictory and self-serving testimony is unreliable and should be given no weight; absent reliable expert support, the Petition fails to establish how claim 10 is met. (EX2019, ¶123.)

Id. In response, Petitioner argues that Patent Owner’s argument lacks merit. Pet. Reply 20. The Petitioner’s Reply says, “no ‘contradicti[on]’ exists in Petitioner’s analysis of claim 6 (*analog multiplexing switch*) and claim 10 (*digital routing logic*). They are entirely compatible and were common in the industry. *E.g.*, EX1059, EX1063, EX1068.” *Id.*

Patent Owner does not respond to Petitioner’s contentions as to why its arguments relating to claim 10 fail. *See generally* PO Sur-reply. We agree with Petitioner and determine that Patent Owner’s arguments relating to claim 10 lack merit.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claim 10.

13. Claims 14–17

Petitioner contends claims 14–17 are substantially similar to claims 1, 2, 5, and 7 and contends that claims 14–17 are unpatentable for the same reasons as claims 1, 2, 5, and 7. *See* Pet. 80. To the extent Patent Owner contests the showing as to these claims, Patent Owner relies on arguments discussed above that we determine are not persuasive for reasons already given.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claims 14–17.

13. Motivation to Combine Chang and Chang II

With regard to combining the teachings of Chang and Chang II, Petitioner argues:

Chang discloses a hub with dedicated downstream device ports (for host-device connections) and a dedicated downstream host port (for a host-host connection through a bridge). It would have been obvious to modify Chang in view of Chang II and a POSITA's knowledge to include dual-role port(s)^[17] and a switch to route the ports to the appropriate transmission path.

Pet. 34 (citing Ex. 1013 ¶¶ 175–202). Patent Owner challenges Petitioner's showing on motivation to combine. *See* PO Resp. 56–65.

With regard to motivation to modify Chang to include dual-role ports, Petitioner contends that “[a]s the ’962 patent admits, consumer products (*e.g.*, smartphones and other mobile device[s]) with dual-role USB capabilities were gaining popularity before the 2013 priority date” and “it would be impractical, and inconvenient at best, to require consumers to understand when to switch connections between host- and device-ports when using a dual-role product.” Pet. 34–35. Thus, according to Petitioner, “a POSITA would have been motivated to combine Chang's dedicated device- and host-ports to create one or more dual-role ports.” *Id.* at 35 (citing Ex. 1013 (Welch Decl.) ¶ 177). The Specification of the ’962 patent provides support for this argument in this passage:

[L]eading mobile device manufacturers and system designers have begun designing their mobile device products (*i.e.* smart phones, tablets, etc.) to support both USB host and USB device roles. In other words, the phone may configure itself such that

¹⁷ Petitioner describes a dual-role port as “a port supporting products that could operate in either host or device mode.” Pet. 2. Patent Owner describes dual-role ports as “ports designed to accommodate a device regardless of whether it was operating in device or host mode.” Prelim. Resp. 24 (citing Ex. 2001 ¶ 46). Patent Owner acknowledges that dual-role ports and dual-role devices were known as of 2001 (12 years prior to the claimed priority date of the ’962 patent). Tr. 50:5–9.

it can function as a USB device when it needs to be, or as a USB host when it needs to be.

Ex. 1005, 2:60–66. We determine that this contention is reasonable and supported in view of the market demands acknowledged in the Specification. *KSR*, 550 U.S. at 418 (“Often, it will be necessary for a court to look to . . . the effects of demands known to the design community or present in the marketplace . . . to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.”).

Petitioner also contends that “modifying Chang to include dual-role ports would further its express goal of ‘easily establishing a connection between a computer and another computer.’” Pet. 35 (citing Ex. 1014 ¶ 3). And, Petitioner relies on the acknowledgement in the ’962 patent that “prior art smartphones dynamically operated as either device or host, with host operation resulting from the fact that smartphones had effectively become personal computers.” *Id.* (citing Ex. 1005, 2:44–50). The Petition states:

[A] POSITA would have been motivated to include dual-role port(s) to further Chang’s goal of connecting the upstream computer to the downstream phone acting as a computer. Welch, ¶178. Specifically, dual-role ports would allow consumer products, such as smartphones, that operate as computers (in host mode) to “easily establish[] a connection” (EX1014, [0005]) to the upstream host; the smartphone would plug into the dual-role port and automatically connect to the upstream host (through the bridge) when the smart phone switches to host mode . . . without requiring the user to switch between dedicated host- and device-ports. Welch, ¶¶178-179.

Pet. 35–36. According to Petitioner with supporting testimony of its declarant, “[t]his avoids the inconvenience, hassle, and confusion of consumers having to keep track of (1) what mode their phone is operating in

and (2) what mode(s) are supported by individual hub ports.” *Id.* at 36 (citing Ex. 1013 (Welch Decl.) ¶ 179). Here again, we determine that this reasoning provides rational underpinning, supported by evidence, that a skilled artisan would have been motivated to modify the USB hub module teachings of Chang to include dual-role ports as taught in Chang II.

And, Petitioner still further contends that “[o]ne common-sense reason it was desirable and obvious to a POSITA to make all downstream ports dual-role is user convenience (*viz.*, users need not know or recall which port to use for host-mode operation or keep track of whether their product is in device- or host-mode)” (Pet. 40 (citing Ex. 1013 ¶ 179)) and “[m]oreover, it was well-known and obvious to include multiple dual-role hub ports” (*id.* (citing Ex. 1013 ¶¶ 195–197)). In support of the contention that including dual-role hub ports was well-known and obvious, Petitioner cites two references. *Id.* at 40–42 (citing Ex. 1016 ¶¶ 5, 24, 27 (products on ports may act as device or host), Fig. 2 (depicting five ports); Ex. 1017 ¶¶ 55–56 (ports support host and device modes), Fig. 6)).¹⁸ We determine that this reasoning also supports with evidence modifying the teachings of Chang to include dual-role ports as taught by Chang II.

Petitioner contends that “[a] POSITA would have had a high expectation of success in modifying Chang to include dual-role ports.” Pet. 36. In support of this contention, Petitioner argues:

¹⁸ Exhibit 1016 also discloses a “port switching device” attached to its multiple ports (*see* Pet. 41) and Exhibit 1017 also discloses a “Port Router” attached to its multiple ports (*see* Pet. 42 (Exhibit 1017 “discloses that ‘Port Router’ may be a ‘crossbar switch for assigning each physical port to the respective port handler.’”))).

[D]ual-role ports (*viz.*, interfaces for connecting dual-role products) and host/device detection were already well-known, and merely involved using commercially available components and well-understood signaling. *See also* EX1025, 3:10-32, 3:40-4:8, 7:34-40; EX1052, 3:21-50. Again, the '962 patent admits several solutions for supporting dual-role ports in USB systems were readily available. EX1005, 3:21-59; *see also* Welch, ¶183.

Id. And, Petitioner also argues:

A POSITA would have been motivated to implement each of Chang's downstream consumer ports as dual-role ports with a high expectation of success. Indeed, the typical consumer product was often a dual-role product, the implementation was well-known and routine, and doing so reduced the cost and footprint of the hub and was more convenient to the user.

Pet. 43 (citing Ex. 1013, ¶¶ 69–73, 194–199).

With regard the motivation to modify Chang to include a switch to route the transmissions to and from a dual-role device attached to a downstream port through an appropriate transmission path to and from the upstream port with an attached host device, Petitioner relies on similar arguments and reasoning. The Petition states that “[w]hen multiple ports are dual-mode, it was well-known and obvious to a POSITA to include basic switching functionality to route each port to the appropriate transmission path.” Pet. 42.

Petitioner contends that “[a] POSITA would have recognized that Chang effectively provides a roadmap to implement the switching to support dual-role ports.” Pet. 36. In support of this contention, Petitioner points to Chang's teachings of “separate transmission paths for host-to-host (‘host-to-host transmission path 54’) and host-to-device connections (‘transmission

paths 48’))” (*id.* at 36–37 (citing Ex. 1014 ¶¶ 19–20, Fig. 3)) and Chang II’s teachings of “switching functionality to select the appropriate transmission path depending on the consumer product operating mode, *e.g.*, ‘host-to-host transmission path 54’ or ‘transmission paths 48’” (*see id.* at 37; Ex. 1015 ¶¶ 2, 11, 21, 24). Petitioner also contends that “switching transmission paths was highly predictable, being both well-known and routine to implement using readily available off-the-shelf components.” Pet. 58 (citing Ex. 1013 ¶¶ 237–238; Ex. 1059, Ex. 1060, Ex. 1063, 7–8; Ex. 1068, 2; *see also* Ex. 1017 ¶ 57, Fig. 1; Ex. 1040, 4:39–5:29; Ex. 1041, 1:20–36; Ex. 1052, 3:7–20, Fig. 1; Ex. 1053 ¶¶ 31–34, Fig. 1; Ex. 1055, 284–288). Based on this reasoning and evidence, Petitioner argues that:

Accordingly, in the context of Chang, a POSITA would have been motivated to implement dual-role ports by including a switch (*e.g.*, multiplexer or crossbar) that connects the dual-role port(s) directly to the hub’s upstream port (when the consumer product is configured as a device, *i.e.*, path 48) or to the hub through the bridge (when the consumer product is configured as host, *i.e.*, path 54).

Id. at 37–38 (citing Ex. 1013 ¶¶ 182–187). Petitioner’s argument that a skilled artisan would have been motivated to modify the teachings of Chang to include switching functionality as taught by Chang II and supported by other substantial evidence is well-reasoned and well-supported.

Petitioner argues that “[a] POSITA would have been further motivated to improve Chang in view of Chang II, because Chang II expressly states its relevance to USB hubs.” Pet. 38 (citing Ex. 1013 ¶ 181; Ex. 1015 ¶¶ 27, 40). And, Petitioner argues that “while Chang discloses little regarding its bridge (EX1014, [0020]), Chang II details various aspects

of its bridge (EX1015, Title, Figs. 1-2 and 5).” *Id.* In support of this argument, the Petition provides:

Importantly, Chang II further details exemplary switching for either a host- or device-product: “the main feature is the provision of two different transmission paths, so that by automatically detecting the type of device connected (host or slave) the present invention can switch to the proper transmission path.” EX1015, [0021]. In other words, Chang II describes “switch[ing]” to connect a “bridge” transmission path (when the product is host) or “bypass” path (when the product is device). *Id.*, Figs. 1, 5, [0013]. And Chang II further discloses “detection unit 134” for detecting whether the consumer product is host or device. *Id.*, [0038].

Id. (footnote omitted). Petitioner contends that “[a]ccordingly, a POSITA would have been motivated, with a high expectation of success, to route the dual-role ports (and products attached thereto) to the appropriate path using a switch.” *Id.* at 38–39 (footnote omitted). We determine that this contention is well-reasoned and well-supported.

Patent Owner challenges on several grounds the showing regarding the motivation to combine the relevant teachings of Chang and Chang II. PO Resp. 56–65. Patent Owner argues that “[t]he Petition’s proposed combination . . . relies on hindsight reconstruction—a process employed by Petitioner’s expert.” *Id.* at 56 (citing Ex. 2021, 9:15–10:10, 64:24–65:17). The cited testimony does not establish that the Petition or Petitioner’s expert relied on hindsight reconstruction. In the first passage (Ex. 2021, 9:15–10:10), Petitioner’s expert, Mr. Welch, testified that he “start[ed] with and focus[ed] on the language of the patents in question;” that the first thing that he did was read the patents and read the claims; and that his “analysis started

with the claims of the patents.”¹⁹ In the second passage (Ex. 2021, 64:24–65:17), Petitioner’s expert again testified that he started his analysis with the patent and the claims and then he looked at the cited art, Chang and Chang II to “see whether they taught or made obvious what was in the claims.” This criticism of the Petition and Petitioner’s expert is not valid. Mr. Welch’s process of first focusing on the patent and the claims and then looking at the prior art was quite reasonable and logical. We determine that Petitioner and its expert have not relied on impermissible hindsight based on this evidence. Petitioner responds to this argument with:

P[atent] O[wner] also argues hindsight because Mr. Welch read the patent before the prior art. POR, 57. Experts routinely do this to determine if they are comfortable/qualified in the patented subject matter and has nothing to do with hindsight. Moreover, P[atent] O[wner]’s own expert follows the same approach P[atent] O[wner] criticizes. EX1084, 28:12-29:23.

Pet. Reply 21. It does appear that Petitioner’s and Patent Owner’s declarants both started with reviewing the patents and the claims and then looked at the prior art. We do not believe this was improper or contrary to the law of obviousness.

Patent Owner argues that “[t]his hindsight analysis improperly fails to consider evidence of how the POSITA would not have been motivated to make the proposed combination.” PO Resp. 57. However, as shown above, Petitioner (and its declarant, Mr. Welch) provide several well-articulated reasons that are well-supported by cited evidence to establish that a skilled

¹⁹ The witness refers to “patents” because his testimony related to five pending *inter partes* reviews (see Ex. 2021, 1 (caption)) challenging claims in four of Patent Owner’s patents. See section I.B. (Related Matters).

artisan would have been motivated to make the combination of teachings alleged in the Petition. Nonetheless, in considering motivation to combine and obviousness, we take care to avoid “the distortion caused by hindsight bias and” are “cautious of arguments reliant upon *ex post* reasoning.” *KSR*, 550 U.S. at 421.

Patent Owner also relies upon its argument discussed above (*see* section II.E.3.a.) that Petitioner’s combination would be inoperable. PO Resp. 58 (“But[,] as described above, the Petition’s proposed combination would be unable to ‘automatically detect’ the type of device once the hub module has been placed into device mode, and to switch to the appropriate transmission path accordingly (*e.g.*, from a device mode back to a host mode.)”). We reject this argument for the reasons discussed above. *See* section II.E.3.a.

Patent Owner also argues that “the proposed combination would introduce unnecessary complexity, redundancy, and additional costs.” PO Resp. 61 (capitalization and bolding removed from heading). Here again, Patent Owner bases these contentions on a mischaracterization of the proposed combination of teachings of the cited references. *See id.* at 61–65. Petitioner counters, “But Petitioner ‘appl[ied] Chang II’s teachings and [POSITA’s knowledge]’ to Chang, not bodily incorporation.” Pet. Reply 21 (alterations in original). Modifying Chang to include dual-role ports and a USB router switch would have added steps and components, but also would have increased the usefulness and provided benefits to the Chang system. As discussed above, Petitioner, and its expert declarant, articulate well-supported reasoning as to why the proposed modifications to Chang, based on teachings in Chang II, would increase usefulness and provide benefits.

See Pet. 34–46. Even if modifying Chang as proposed would have somewhat complicated Chang’s design, “precedent . . . does not require that the motivation be the *best* option, only that it be a *suitable* option from which the prior art did not teach away.” *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197–1198 (Fed. Cir. 2014) (emphasis in original). We have considered these arguments and we find that Petitioner’s proposed modifications to Chang (dual-role ports and a USB routing switch) would not have been “wasteful and inefficient” as contended by Patent Owner. *See* PO Resp. 61.

In summary, we give much more weight to Petitioner’s substantial argument and evidence relating to motivation to combine than Patent Owner’s contrary weak and insubstantial argument and evidence.

F. Obviousness Based on Chang, Chang II, and AN96527

Petitioner contends that claims 11–13, 18, and 19 would have been obvious over Chang in view of Chang II, AN96527, and POSITA knowledge. Pet. 5, 80–85. Patent Owner argues that “[a]ll claims of the ’962 patent are not unpatentable, as the grounds in the Petition are meritless.” PO Resp. 1. With specific regard to claims 11–13, 18, and 19, Patent Owner relies on arguments discussed (and rejected) above. PO Resp. 65–66. Patent Owner’s Response states:

Ground II challenges dependent claims 11-13, which depend from claim 1; and claims 18-19, which depend from claim 14. Ground II fails to render obvious any of these claims for at least the reasons discussed in Section VII with respect to Ground I and parent claims 1 and 14. (EX2019, ¶135.) The addition of the AN96527 reference, which is an application note describing implementations of USB Type-C, cannot correct the deficiencies of the Chang and Chang II references, in view of the POSITA’s knowledge. (*See* EX1064; EX2019, ¶135.) This

is at least because the AN96527 reference is silent regarding USB routing switches, let alone the particular configuration of a USB routing switch recited in claims 1 and 14 and not taught by the remaining references, as described above. (EX2019, ¶135.)

Id. Patent Owner’s argument is misdirected as Petitioner does not rely on AN96527 for teaching a USB routing switch or any of the other limitations of claims 1 and 14.

1. AN96527

AN96527 is a Cypress Semiconductor Corporation application note which describes “technological advances introduced by the USB-IF Type-C Specification and the Power Delivery Specification^[20] and how they can be designed into practical products.” Ex. 1064, 1, 31. The application note describes power delivery, including that “advanced features such as power delivery can be negotiated,” as well as hub designs. *Id.* at 5–6, 9, 25–26.

2. Claims 11 and 18

Claim 11 recites:

The USB hub module according to claim 1, wherein the USB hub module further comprises a logic circuit configured to provide data handshaking to negotiate electrical power transfer from the USB hub module to a first consumer device connected to the first downstream USB port, and wherein the USB hub module further comprises a power supply circuit configured to provide electrical power from the USB hub module to the first consumer device.

Ex. 1005, 12:23–30. Claim 18 recites:

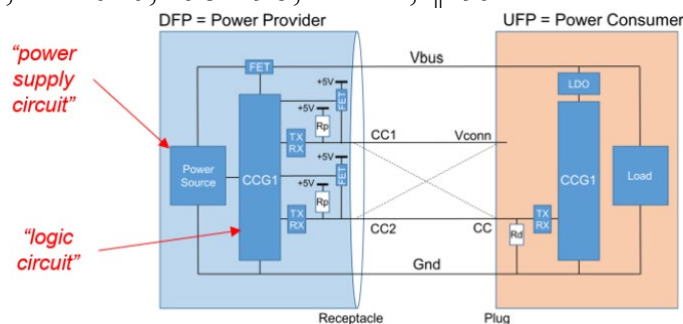
²⁰ AN96527 references “USB Power Delivery (PD) Specification Revision 2.0, Version 1.1.” Ex. 1064, 1.

The integrated circuit according to claim 14, wherein the integrated circuit further comprises a logic circuit configured to provide data handshaking to negotiate electrical power transfer from the USB hub module to a first consumer device connected to the first downstream USB port.

Ex. 1005, 13:17–21. The Petition provides:

AN96527 discloses a “logic circuit,” namely the configuration control block (CCG1) as shown in Fig. 5. AN96527 explains that “Power Delivery parameters are exchanged between CCG1 devices by passing messages” (“provide data handshaking to negotiate electrical power transfer from the USB hub module to a first consumer device connected to the first downstream USB port”). EX1064, 10-12; see also *id.*, Fig. 21 (illustrating “Flow of CC Messages in Power Delivery Example” between DFP and UFP (i.e., between upstream and downstream ports)); EX1020, 96, 195-196, Welch, ¶¶297-299.

AN96527 discloses a “Power Source” to deliver the power subject to the above negotiation (“comprises a power supply circuit configured to provide electrical power from the USB hub module to the first consumer device”). EX1064, 6, Fig. 5; EX1020, 195-196; Welch, ¶299.



EX1064, Fig. 5 (annotated).

Pet. 82–83 (claim 11), 84–85 (claim 18).

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claims 11 and 18.

3. *Claims 12 and 19*

Claim 12 recites:

The USB hub module according to claim 11, wherein the logic circuit includes a communication control stack.

Ex. 1005, 12:31–32. Claim 19 recites:

The integrated circuit according to claim 18, wherein the logic circuit includes a communication control stack.

Ex. 1005, 13:22–23. The Petition provides:

A POSITA would have understood, and at least found it obvious, that AN96527’s CCG1 firmware included “a *communication control stack*,” because the USB-PD standard expressly teaches a “communication stack.” EX1020, 59 (“communication stack seen in Figure 2-3”); EX1064, 11 (designers need not know messaging details “because the CCG1 device implements the Power Delivery . . . messages in firmware”). Naturally, this stack includes a physical layer (for transmit/receive blocks as discussed at AN96527, §2.3) and higher layers for, e.g., effectuating messaging, policies, and configurations. *Id.*; Welch, ¶¶301-302.

Pet. 83–84 (claim 12), 84–85 (claim 19).

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claims 12 and 19.

4. *Claim 13*

Claim 13 recites:

The USB hub module according to claim 11, wherein the power supply circuit includes adjustable voltage power supplies.

Ex. 1005, 12:33–35. The Petition provides:

As AN96527 discloses configuring power delivery from “5V@900mA, 12V@3A, 13V@3A and 20V@3A” (EX1064, 18), it would have been understood, and certainly obvious, that “*the power supply circuit includes adjustable voltage power supplies*” to deliver power within this range—indeed, adjustable power supply was part of the USB-PD standard. Ex. 1020, 195-196; EX1064, 1 (USB-PD “details how a USB link can be transformed from a 4.5-W power source (900mA at 5V) to a 100-W power source or consumer (up to 5A at 20V).”); Welch, ¶304.

Pet. 84.

Based upon our review of the entire record, we find that Petitioner has demonstrated by a preponderance of the evidence that the cited art teaches all the elements of claim 13.

5. *Motivation to Combine Chang, Chang II, and AN96527*

With regard to combining the teachings of Chang, Chang II, and AN96527, Petitioner argues that “[a] POSITA would have been motivated to further include AN96527 adjustable power delivery teachings (and the underlying USB-PD standard) in Ground 1 with a high expectation of success.” Pet. 80–81 (citing Ex. 1013 ¶¶ 210–214). First, Petitioner contends that “a POSITA would have been motivated to include AN96527’s teachings in Ground 1’s hub to enable better and more convenient charging capabilities.” *Id.* at 81 (citing Ex. 1013 ¶ 211). Specifically, Petitioner refers to the following teachings regarding charging:

AN96527 explains that “[a]ll USB products, at all speeds, can take advantage of Power Delivery as a power provider, power consumer, or sometimes both Up to 100W can be distributed on a Type-C cable, meaning that even a tablet or notebook can be bus-powered.” EX1064, 1. This eliminates the need for separate wall-socket chargers and reduces the number of cables. *Id.*, 13 (“The result is a single Type-C cable serving all three functions of power, USB data and display.”).

Id. (alterations in original).

Second, Petitioner contends, “if power requirements change, the system can respond, providing flexible as-needed power capabilities.” Pet. 81 (citing Ex. 1013 ¶ 212). In support, Petitioner refers to “AN96527 and USB-PD teach[ing] a swappable and adjustable power supply delivery system as shown, for example, in AN96527 (EX1064) Fig. 21 (flow chart showing ‘power role swap’ where ‘5V@900mA, 12V@3A, 13V@3A and 20V@3A’ are all available options).” *Id.*

Third, Petitioner contends, “AN96527 teaches that ‘[a] hub now plays a much more important role because it can manage and distribute up to 100W of power for each Type-C port,’ making it feasible ‘to power and/or charge a laptop’ or other USB product using the USB data cable” (Pet. 81 (citing Ex.1064, 25) and “[a] POSITA would be motivated to apply USB-PD’s variable power teachings to Ground 1’s hub to obtain this benefit” (*id.* at 81–82 (citing Ex. 1013 ¶ 213)).

With regard to expectation of success, the Petition provides:

A POSITA would have had a high expectation of success incorporating AN96527’s (and underlying USB-PD teachings) into Ground 1’s hub. Welch, ¶214. Indeed, AN96527 provides “[w]orking prototype reference designs . . . for each application area” (EX1064, 1) and “includ[es] full schematics and application software” (*id.*, 26). Moreover, AN96527 expressly teaches its applicability to USB hubs. *See, e.g., id.*, 6 (“Figure 4 shows the power delivery signals of a downstream facing port (DFP), which would be a host **or a hub.**”) (emphasis added).

Pet. 82 (alterations in original).

Patent Owner challenges Petitioner’s showing on motivation to combine. *See* PO Resp. 66. However, Patent Owner relies on its arguments set forth with regard to Ground 1. *Id.* Patent Owner’s Response states:

The POSITA would not have been motivated to modify Chang in view of Chang II, AN96527, and the POSITA’s knowledge to meet the claim limitations for at least the same reasons discussed above for Ground 1. (EX2019, ¶136.) That is, the proposed combination of Ground II suffers from the same defects discussed for Ground 1—*e.g.*, improper hindsight bias, rendering the prior art inoperable for its intended use, and introduction of complexity, redundancy, and additional costs—and the introduction of yet another reference, AN96527, is irrelevant to and does nothing to mitigate those defects. (EX2019, ¶136.) Ground II fails for at least these reasons. (EX2019, ¶136.)

Id. We reject these arguments for the reasons discussed above with regard to Ground 1.

Petitioner has articulated well-supported reasoning for combining the teachings of Chang, Chang II, and AN96527 with an expectation of success. In contrast, Patent Owner’s contrary arguments lack merit.

G. Secondary Considerations of Non-Obviousness

When presented, secondary considerations “must always . . . be considered in the overall obviousness analysis.” *Adapt Pharma Operations Ltd. v. Teva Pharms. USA, Inc.*, 25 F.4th 1354, 1372 (Fed. Cir. 2022). However, “a strong showing of obviousness may stand even in the face of considerable evidence of [secondary considerations].” *Id.* Based on the evidence of record and findings discussed above, we determine that any evidence of secondary considerations would need to be given substantial

weight in order to determine that the claims have not been shown to be unpatentable by a preponderance of the evidence.

In order for secondary considerations to be awarded “substantial weight” “in an obviousness analysis,” the Federal Circuit has advised that the “secondary considerations must have a nexus to the claims.” *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) (internal quotations omitted). The Federal Circuit has instructed that “[t]he patentee bears the burden of showing that a nexus exists.” *Id.* (quoting *WMS Gaming Inc. v. Int’l Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999)). And, the Federal Circuit instructs that “[t]o determine whether the patentee has met that burden, we consider the correspondence between the objective evidence and the claim scope.” *Id.* (quoting *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332 (Fed. Cir. 2019)).

Petitioner challenges Patent Owner’s showing as to nexus between the claimed invention and the evidence relating to secondary considerations. Pet. Reply 23–25. Patent Owner’s argument and evidence relating to nexus is quite limited. *See* PO Resp. 81–82. Patent Owner’s Response provides:

In the present case, the challenged claims are tied to [Patent Owner]’s commercial “dual-role hub” containing its Boston-2 chip. The combination of a host-to-host USB bridge with USB routing switches helped enable the dual role hub to provide CarPlay support on each downstream port without the need for a second upstream connection with the head unit and without interrupting USB connectivity on the non-CarPlay downstream ports. (EX2042, 201:19-202:13.) It was therefore the specific arrangement claimed in the patent that provided a solution to the “vexing problem” facing automakers and their suppliers and which ultimately drove demand for Aptiv’s product. (*Id.*, 202:14-22.) As a result, [Patent Owner] is both entitled to a presumption of nexus between the claims and the dual-role hub and has independently established that the

secondary considerations are the “direct result of the unique characteristics of the claimed invention”—particularly as to claims 2 and 15 of the ’962 Patent, which are directly tied to the persistent downstream USB connectivity desired by automakers. *Fox Factory* at 1373.

The requisite nexus between the claimed invention and [Patent Owner]’s product is supported by the Supplemental Declaration of Dr. Houh, who provides on a per-limitation basis how [Patent Owner]’s Dual Role Hub meets all limitations of at least claims 2 and 15. (EX2019, ¶155.)

Id. Patent Owner’s argument on nexus makes only conclusory statements without providing any developed showing. And, the evidence cited is weak and does not support the conclusions drawn from it.

Specifically, with regard to the evidence cited, Patent Owner cites to testimony but, in the Response, fails to identify the witness or the proceeding in which the testimony was given. *See* PO Resp. 81. And, the cited testimony provides no indication that this unidentified witness is discussing Patent Owner’s “commercial ‘dual-role hub’ containing its Boston-2 chip.” *See* Ex. 2042, 201:19–202:22.²¹ And, there is no testimony that any of Patent Owner’s products included a “host-to-host USB bridge,” “a USB routing switch,” or “the specific arrangement claimed in the [’962] patent.” *Id.*

The only other evidence cited by Patent Owner in support of its nexus contention is a single paragraph from the Supplemental Declaration of Dr.

²¹ This same witness testified that Patent Owner had “hundreds and hundreds of models of the dual role hub” and that Patent Owner did not know if they were used to provide CarPlay. Ex. 2042, 196:1–197:24. This witness also testified that CarPlay cannot be done with just the dual role hub. *Id.* at 198:1–7.

Houh. *See* PO Resp. 82 (citing Ex. 2019 ¶ 155). Patent Owner contends that the cited paragraph “provides on a per-limitation basis how [Patent Owner]’s Dual Role Hub meets all limitations of **at least claims 2 and 15**” (*id.* (emphasis added)), but the cited paragraph is limited to providing an analysis of only claim 2 of the ’962 patent. *See* Ex. 2019, 90 (containing first sentence of ¶ 155 that states, “I provide an analysis of how [Patent Owner]’s dual role hub embodies each limitation of **Claim 2** of the ’962 Patent.” (emphasis added)). Moreover, Dr. Houh supports his testimony with documentation (Exhibits 2022, 2023, and 2024) with no showing or explanation that the cited documentation relates to any of Patent Owner’s products.²² Because Patent Owner fails to provide sufficient, persuasive evidence that any of its products are the invention claimed in the challenged claims of the ’962 patent or that “the secondary considerations are the ‘direct result of the unique characteristics of the claimed invention’” (*see* PO Resp. 81), we reject Patent Owner’s contention that it is entitled to a presumption of nexus or has shown a nexus between its secondary considerations evidence and the claimed invention.

With regard to evidence of secondary considerations, Patent Owner argues that there existed “long-felt but unsolved needs.” PO Resp. 67–69. Petitioner counters that there was no long-felt need. Pet. Reply 25–26. Petitioner argues that Patent Owner ties the alleged need to Apple CarPlay that “was not announced until 2013 . . . mere months before the ’962 patent’s earliest priority date” and “[t]hat is the opposite of ‘long-felt’ need.”

²² Patent Owner’s declarant, Dr. Houh, rendered no opinion as to whether the alleged evidence of secondary considerations overcame the alleged showing of obviousness in the Petition. *See* Ex. 1084, 53:23–56:5.

Id. at 25. We find that Patent Owner fails to establish that there existed a long-felt but unsatisfied need for the invention claimed in the '962 patent. Not only does Patent Owner fail to make a showing that there was any need that was long-felt but Patent Owner also fails to show that the alleged need was for the claimed invention. *See* PO Resp. 67–69.

Patent Owner argues “[f]ailure of others/skepticism of skilled artisans.” PO Resp. 69–73. Patent Owner presents evidence that, in 2014, Petitioner’s employees expressed doubt that a USB system could accommodate more than one USB host and were skeptical that Patent Owner had found a way to accommodate attaching a second host (such as an Apple phone) to a USB system. *See id.* Petitioner blames Apple for telling Petitioner that it “would not allow a bridge” and telling Patent Owner “that using a bridge was likely ‘fine.’” Pet. Reply 27. Although Patent Owner’s evidence is weak with regard to the relationship between the alleged failure and skepticism and the claimed invention, we give some weight to Patent Owner’s argument and these secondary consideration factors in our overall consideration of obviousness. It does appear that Patent Owner succeeded where Petitioner for at least some time failed and Petitioner’s employees were skeptical about Patent Owner’s solution.

Patent Owner alleges commercial success. PO Resp. 73–74. Patent Owner presents evidence that it won business from the Big 3 (GM, Chrysler, and Ford) US auto manufacturers. *Id.* Patent Owner presents evidence that the Big 3 switched their business from Petitioner to Patent Owner in 2014. *Id.* With regard to later years, Patent Owner provides:

GM contracted [Patent Owner] as their sole source supplier of media module hubs in every mid- and high-level infotainment system globally for model year 2015. (EX2037, 13.)

Altogether, [Patent Owner] captured 40% of the global Big 3 offerings for model year 2016, representing 10 million units. *Id.* Ultimately, [Patent Owner] sold approximately 45 million units between 2015 and November 2021. (EX2041, 281:12-22.)

Id. at 74. Patent Owner contends that “[t]his was an unquestionable commercial success for a new product launch in the automotive industry.”

Id.

Petitioner claims that Patent Owner has failed to show that any alleged commercial success was due to factors related to the claimed invention. Pet. Reply 26–27. Petitioner argues:

P[atent] O[wner] ignores other factors affecting sales such as Apple’s brand name, lower pricing (EX2040, 233:4-12), marketing, etc. The impact of Apple’s certification and brand name cannot be ignored.

Significantly, P[atent] O[wner] benefited from a head start due to early, insider access to Apple’s confidential CarPlay requirements through the Jaguar car company. *E.g.*, EX2003, 109:6-12, 157:6-15, 149:12-22 (CarPlay “not publicly known” and “Apple is pretty secret”), 108:13-109:10-12 (“Jaguar was talking to Apple...start[ed] feeding us some of these requirements.”).

Id. As discussed above, we determine that any alleged commercial success secondary consideration evidence has not been established to have a nexus to the claimed invention. Accordingly, we consider the evidence of commercial success but accord it little weight in our obviousness determination.

Patent Owner also argues that it “achieved significant acclaim within the automotive industry for its dual role hub.” PO Resp. 75. Patent Owner argues, “[m]ost notably, it was the winner of the 2016 PACE Award, an

industry honor awarded by Automotive News.” *Id.* (citing Ex. 2036 ¶ 4). For evidence as to this award, Patent Owner relies primarily on the Declaration of Michael Dreon (Ex. 2036). *See id.* at 75–76. Particularly, Patent Owner relies on the Dreon Declaration in an attempt to show that the award was linked to the invention claimed in the ’962 patent. *Id.* at 75 (citing Ex. 2036 ¶ 9). The cited paragraph in the Dreon Declaration states: “Based on my conversations with the judges, as well as from the judges’ citation and award video, it is my understanding that the feature driving their selection of the dual-role hub was its ability to allow persistent downstream USB connectivity to non-CarPlay devices while CarPlay was active without altering the head unit hardware to add a second upstream connection.” Ex. 2036 ¶ 9. As will be appreciated from this testimony, it is based on hearsay and the witness does not establish that he has any first-hand knowledge of the reason for the award. Petitioner argues:

P[atent] O[wner] cites a single “Automotive News” award (from a non-USB body) touting CarPlay compatibility. POR, 75-76. The dozen-plus “winners” included “Cover Carving Technology for seats” and “Electronic oil pump.” *See* www.autonews.com/awards/pace/2016/. P[atent] O[wner] self-nominated for the award (EX2036, ¶6) and hosted judges for “site tours” and “lunches” (EX2037, 2). P[atent] O[wner]’s declarant (Mr. Dreon) cites inadmissible hearsay based on purported “conversations with the judges” regarding why [Patent Owner] won. EX2036, ¶9. The PACE article mentions other reasons (*e.g.*, “lower cost”). www.autonews.com/awards/2016-winner-delphi-automotive-dual-role-hub. This is not “objective evidence” establishing nonobviousness.

Pet. Reply 27. Petitioner’s criticism of this purported evidence of industry praise has merit. We determine that Patent Owner’s argument is based on

hearsay and should not be considered. However, even if considered, this evidence of purported industry praise is entitled to little weight.

Patent Owner further alleges that Petitioner copied its product. PO Resp. 76–81. As evidence that Petitioner copied its product, Patent Owner argues that Petitioner “obtained one of [Patent Owner]’s chips from a competitor and analyzed it to understand its capabilities.” *Id.* at 79 (citing Ex. 2040, 186:22–188:12). Patent Owner claims that Petitioner introduced its product “[s]everal years later.” *Id.* at 80. Petitioner presents evidence that Patent Owner has this timing wrong. Pet. Reply 28. Petitioner argues:

Moreover, P[atent] O[wner]’s insinuation [Petitioner] copied [Patent Owner] because it “obtained...and analyzed [an [Patent Owner] product]” is baseless. POR, 79. The alleged activity was done in “July of 2016” as pre-suit investigation before suing [Patent Owner], *after* [Petitioner] “finished [its] device and [was] making it available [for customer testing].” EX2040, 125:9-126:16.

Id. Petitioner’s argument is supported by the cited evidence. Patent Owner’s purported evidence of alleged copying by Petitioner is entitled to little or no weight because it is not well-supported.

G. Summary of Findings and Basis for Conclusion

We have considered all the arguments and evidence presented by the parties. Based upon a strong preponderance of the evidence, we find that the cited art teaches or suggests all the limitations of the challenged claims and a skilled artisan would have been motivated to combine the relied-upon teachings as set forth in the challenged claims. With regard to the secondary considerations of non-obviousness, we find that Patent Owner has failed to show a nexus between the proffered secondary consideration evidence and the subject matter of the claims. And, weighing the evidence of obviousness

against the evidence of non-obviousness, we find that the evidence of obviousness is strong and the evidence of non-obviousness is weak.

III. PENDING MOTIONS

A. *Patent Owner's Motion to Strike*

Patent Owner moves to strike a section of Petitioner's Reply (Section IV.A.3.b. (Pet. Reply 12–15)); paragraphs 6–17 and 44–57 of Exhibit 1102 (Reply Declaration of Eric Welch); and Exhibit 1103 (Excerpts from *The ART of Electronics*, P Horowitz and W. Hill, Cambridge University Press, 2nd Edition (1989)) in its entirety. Paper 34, 1. Petitioner opposes Patent Owner's Motion to Strike. Paper 35. Patent Owner filed a Reply. Paper 36.

Patent Owner argues that “[t]he Board should grant the Motion because the Reply improperly presents new theories of unpatentability with belated supporting evidence that could have been presented in the Petition itself.” Paper 34, 1. Patent Owner contends that, in response to an argument Patent Owner made in the Response that “Petitioner's proposed prior art combination features a structural flaw” (*id.* at 2), Petitioner's Reply improperly presents a new argument not found in the Petition (*id.* at 3–6). As discussed *supra* (section II.E.3.a.), we determine that, because Patent Owner's structural flaw argument fails, we need not reach the alleged new argument and evidence that Patent Owner seeks to strike. Accordingly, this motion is moot.

For this reason, we deny Patent Owner's Motion to Strike (Paper 34).

B. *Petitioner's Motion to Exclude Evidence*

Petitioner filed a motion to exclude a number of Patent Owner's exhibits (Exhibits 2001–2003, 2005–2010, 2017, 2019, 2024–2028, 2030–2043) on various grounds. Paper 42, 1. Patent Owner filed an Opposition to

the motion (Paper 44) and Petitioner filed a Reply in support of the motion (Paper 45).

1. Exhibits 2001 and 2019 (Houh Declarations)

Exhibit 2001 is the Declaration of Henry Houh filed with Patent Owner's Preliminary Response. Exhibit 2019 is the Supplemental Declaration of Henry Houh filed with Patent Owner's Response. Petitioner argues, "[t]he Board should exclude Dr. Houh's testimony in its entirety as impermissible expert testimony by a lay person (FRE 701^[23]/702^[24]) (*viz.*, expert testimony by a non-expert who does not satisfy the qualifications of a POSITA [person of ordinary skill in the art]) and as being based on an incorrect POSITA standard/definition, making it irrelevant, unreliable, and unfairly prejudicial." Paper 42, 1. Petitioner's request to exclude the Houh Declarations is based upon the Board accepting Petitioner's contention that a POSITA would have knowledge and experience with USB standards and the

²³ Federal Rule of Evidence 701 states: "If a witness is not testifying as an expert, testimony in the form of an opinion is limited to one that is: (a) rationally based on the witness's perception; (b) helpful to clearly understanding the witness's testimony or to determining a fact in issue; and (c) not based on scientific, technical, or other specialized knowledge within the scope of Rule 702."

²⁴ Federal Rule of Evidence 702 states: "A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if the proponent demonstrates to the court that it is more likely than not that: (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; (b) the testimony is based on sufficient facts or data; (c) the testimony is the product of reliable principles and methods; and (d) the expert's opinion reflects a reliable application of the principles and methods to the facts of the case."

design and deployment of USB hosts, USB devices, and USB Hubs. *Id.* at 2 (“If the Board agrees [with Petitioner’s definition of a POSITA], it should exclude Dr. Houh’s testimony because: (1) he rendered no opinions under the correct POSITA definition; and (2) he lacks the qualifications of a POSITA.”), 3 (“Thus, if the Board agrees USB experience/knowledge is required, it should exclude Dr. Houh’s testimony as irrelevant and far more prejudicial than probative.”). As discussed *supra* (section II.B.), we do not adopt Petitioner’s definition of a POSITA because of the lack of evidentiary support.

Petitioner argues that “[t]he Board should also exclude Dr. Houh’s secondary considerations testimony (re long-felt need, failure/skepticism of others, and copying) at ¶¶137-151 of EX2019 under *Daubert*^[25] and FRE 403^[26].” Paper 42, 1. However, this argument is not well-developed and is largely skeletal and conclusory. Nonetheless, to the extent Petitioner’s argument is explained, we consider it.

With regard to long-felt need, Petitioner argues that Dr. Houh’s testimony does not establish that any alleged need was long-felt. Paper 42, 6. Petitioner argues:

[B]y Dr. Houh’s own admission ([Ex. 2019] ¶41), Apple informed “automakers of its plans to release a new technology known as CarPlay” “around 2013,” the same year the patent was filed. That cannot constitute long-felt need and Dr. Houh’s

²⁵ *Daubert v. Merrell Dow Pharms, Inc.*, 509 U.S. 579 (1993).

²⁶ Federal Rule of Evidence 403 states that, “[t]he court may exclude relevant evidence if its probative value is substantially outweighed by a danger of one or more of the following: unfair prejudice, confusing the issues, misleading the jury, undue delay, wasting time, or needlessly presenting cumulative evidence.”

self-contradictory “long-felt need” testimony is a waste of time, unfairly prejudicial, unreliable, lacks foundation / personal knowledge, and should be excluded.

Id. Thus, Petitioner challenges Dr. Houh’s testimony on long-felt need on the merits. As discussed *supra* (section II.G.), even considering Dr. Houh’s testimony, we find that Patent Owner fails to establish that there existed a long-felt but unsatisfied need for the invention claimed in the ’962 patent. Although we consider Petitioner’s challenge to these paragraphs to have some merit especially as Dr. Houh “lacks automotive industry expertise and has no independent knowledge or qualifications to opine on car makers’ wishes” (*id.*), it is unnecessary to exclude this testimony as requested by Petitioner as we find in Petitioner’s favor on long-felt need even considering this testimony and giving it appropriate weight.

Petitioner requests that we exclude paragraphs 142–144 of Dr. Houh’s testimony related to failure/skepticism of others. Paper 42, 6. However, in arguing “[f]ailure of others/skepticism of skilled artisans,” Patent Owner does not discuss, cite, or otherwise rely on Dr. Houh’s testimony. *See* PO Resp. 69–73. Petitioner does not direct our attention to any use of this testimony by Patent Owner. *See* Paper 43, 6. Accordingly, we did not consider this testimony in determining whether Patent Owner had shown “[f]ailure of others/skepticism of skilled artisans.” *See* Section II.G.

Petitioner requests that we exclude paragraphs 145–151 of Dr. Houh’s testimony related to copying. Paper 42, 6–7. In its argument regarding copying, Patent Owner does not discuss, cite, or otherwise rely on paragraphs 145–151. *See* PO Resp. 76–81. And, we did not rely on this testimony or the testimony in paragraph 152 in deciding whether Patent Owner had shown copying. *See* Section II.F. In analyzing copying *infra*

(*see id.*), we determine that Patent Owner's allegations of copying by Petitioner are not well-supported without considering Dr. Houh's testimony on copying.

In summary, Petitioner fails to show that Dr. Houh's Declarations (Exhibits 2001 and 2019) should, in whole or in part, be excluded.

2. *Remaining Challenged Exhibits*

The additional exhibits that Petitioner requests that we exclude were not used by Patent Owner to support its arguments relating to secondary considerations or were not cited by Patent Owner. *See* Paper 42, 7–15; PO Resp. 66–82.

Petitioner acknowledges that Exhibits 2017, 2024, 2043 were not cited by Patent Owner. Paper 42, 8, 14. Petitioner requests that we exclude Exhibit 2035 (*id.* at 10), but does not allege that it is cited by Patent Owner (*see id.* at 11). We could find no discussion or citation of, or reliance by Patent Owner, on Exhibit 2035. *See generally* PO Resp. We did not rely on these exhibits.

With regard to the remaining challenged exhibits, as acknowledged by Petitioner (*id.*), these exhibits are used by Patent Owner to make arguments to establish secondary considerations of non-obviousness or nexus. *See also* PO Resp. 66–82. As discussed *supra* (section II.F.), we find in Petitioner's favor in that we determine that the secondary considerations evidence offered by Patent Owner lacks sufficient weight in view of the Petitioner's evidence of obviousness and that Patent Owner fails to show a nexus between its secondary considerations evidence and the claimed invention. In weighing the evidence of secondary considerations and nexus, we were also

cognizant of Petitioner's objections to these exhibits and accordingly gave them appropriate weight.

For these reasons, we deny Petitioner's Motion to Exclude Evidence (Paper 42).

IV. CONCLUSION

In light of these findings and for the reasons provided, we conclude that claims 1–19 of the '962 patent are unpatentable as obvious. A summary of our conclusions is set forth in the table below.

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–10, 14–17	103	Chang, Chang II	1–10, 14–17	
11–13, 18, 19	103	Chang, Chang II, AN96527	11–13, 18, 19	
Overall Outcome			1–19	

V. ORDER

Accordingly, it is

ORDERED that claims 1–19 of U.S. Patent No. 9,645,962 B2 are determined to be unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Strike (Paper 34) and Petitioner's Motion to Exclude Evidence (Paper 42) are denied; 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.

IPR2024-00229
Patent 9,645,962 B2

PETITIONER:

Travis Jensen
Jeremy Jason Lang
ORRICK, HERRINGTON & SUTCLIFFE LLP
tjensen@orrick.com
jlang@orrick.com

PATENT OWNER:

Adam Brausa
Alex Yap
Mehran Arjomand
Andrew Jones
Bryan Blumenkopf
MORRISON & FOERSTER LLP
abrausa@mofo.com
ayap@mofo.com
marjomand@mofo.co
andrewjones@mofo.com
bblumen@mofo.com

Clinton Ewell
Clint.ewell@outlook.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE OFFICE OF THE UNDER SECRETARY OF COMMERCE
FOR INTELLECTUAL PROPERTY AND DIRECTOR OF THE
UNITED STATES PATENT AND TRADEMARK OFFICE

MICROCHIP TECHNOLOGY INC.,
Petitioner,

v.

APTIV TECHNOLOGIES AG,
Patent Owner.

IPR2024-00228 (Patent 9,619,420 B2)
IPR2024-00229 (Patent 9,645,962 B2)
IPR2024-00230 (Patent 11,176,072 B2)
PGR2024-00011 (Patent 11,681,643 B2)¹

Before COKE MORGAN STEWART, *Acting Under Secretary of
Commerce for Intellectual Property and Acting Director of the United States
Patent and Trademark Office.*

ORDER

¹ This order applies to each of the above-listed proceedings.

IPR2024-00228 (Patent 9,619,420 B2)
IPR2024-00229 (Patent 9,645,962 B2)
IPR2024-00230 (Patent 11,176,072 B2)
PGR2024-00011 (Patent 11,681,643 B2)

The Office received a request for Director Review of the Final Written Decision in each of the above-captioned cases and an authorized response to each request. *See* Papers 62, 63.²

Having considered the requests and responses, it is:

ORDERED that the requests for Director Review are denied.

² Citations are to the record in IPR2024-00228. The parties filed similar papers in IPR2024-00229, IPR2024-00230, and PGR2024-00011.

IPR2024-00228 (Patent 9,619,420 B2)
IPR2024-00229 (Patent 9,645,962 B2)
IPR2024-00230 (Patent 11,176,072 B2)
PGR2024-00011 (Patent 11,681,643 B2)

FOR PETITIONER:

Travis Jensen
Jeremy Jason Lang
ORRICK, HERRINGTON & SUTCLIFFE LLP
t61ptabdocket@orrick.com
ptabdocketjl2@orrick.com

FOR PATENT OWNER:

Adam R. Brausa
Andrew T. Jones
Alex S. Yap
Mehran Arjomand
Bryan Blumenkopf
MORRISON & FOERSTER LLP
ABrausa@mofo.com
AndrewJones@mofo.com
AYap@mofo.com
MArjomand@mofo.com
BBlumen@mofo.com