

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*.

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

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, “Reply”) and Patent Owner filed a Preliminary Sur-reply (Paper 11, “Sur-reply”).

We have authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2023). Under 35 U.S.C. § 314(a), we may not authorize an *inter partes* review unless the “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” For the reasons that follow, we institute an *inter partes* review as to claims 1–19 of the ’962 patent on all grounds of unpatentability presented.

I. BACKGROUND

A. *Real Parties-in-Interest*

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

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 proceeding 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 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 additional USB 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 2:60–67. In other words, a phone may configure itself such that it can function as a USB device when it needs to be, or as a USB host when it needs to be. *Id.*

If a phone acts as a USB host, then the system will not function because, by USB convention, two USB hosts cannot directly connect with each other. *Id.* at 3:8–20. The 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 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 4:17–45.

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.

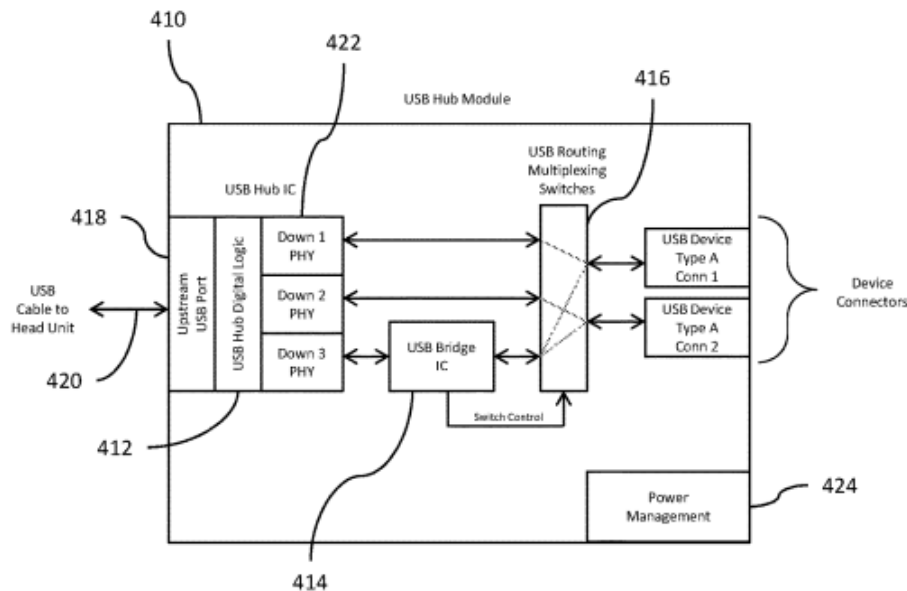


Figure 4 depicts a system configured to render a USB host compatible with consumer devices configured to act as a USB host or as a USB device. *Id.* at 6:62–7:37. The system is in the form of a USB hub module having a USB

hub IC (integrated circuit), a USB bridge IC, and a switching device having switches. *Id.*

The USB hub IC also includes three downstream USB ports, one of which is connected to the USB bridge IC. *Id.* Two downstream USB ports of the USB hub IC are connected to the switches, such as multiplexing switches. *Id.* The switches are connected to two USB ports 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 and provides them to the USB hub IC, thereby rendering the consumer device compatible with another USB host. *Id.* The bridge may be bidirectional and pass USB traffic between two USB hosts. *Id.* at 9:10–22. 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.¹

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 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.

¹ For clarity, we have modified the format of Petitioner's annotations. We have retained the paragraph formatting from the issued patent.

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”).²

F. Asserted Grounds

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

Ground	Claims Challenged	35 U.S.C. §	References
1	1–10, 14–17	103 ³	Chang, Chang II
2	11–13, 18–19	103	Chang, Chang II, AN96527

Petitioner filed the Declaration of Eric Welch (Ex. 1013) in support of its Petition. Patent Owner filed the Declaration of Henry Houh (Ex. 2001) in support of its Preliminary Response.

² 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).

³ 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.

II. ANALYSIS

We consider the arguments and evidence of the parties to determine whether Petitioner has met the reasonable likelihood standard for institution under 35 U.S.C. § 314(a).

A. *Legal Standards*

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 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.⁴ *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)).

⁴ Petitioner addresses arguments regarding secondary considerations that Patent Owner raised in related district court litigation. *See* Pet. 85–87. Patent Owner makes arguments regarding failure by others and commercial success. Prelim. Resp. 3–14. We have considered the parties’ arguments. We determine that, at this stage of this proceeding, the record and the evidence as to secondary considerations is not sufficiently articulated and developed. We will reconsider the secondary consideration arguments and evidence as part of the fully-developed and complete record, if necessary and appropriate, prior to making any final decision on obviousness.

B. Level of Ordinary Skill in the Art

Citing testimony from Mr. Welch, Petitioner contends:

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.

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. Similarly, relevant work experience may substitute for formal education.

Pet. 23–24 (citations and footnote omitted).

Patent Owner argues Petitioner’s definition should be rejected because Petitioner’s definition is heightened from its proposed definition of a POSITA (person of ordinary skill in the art) in co-pending district court litigation in that Petitioner’s POSITA definition in these proceedings “requires familiarity with a litany of specific documents and standards absent from Petitioner’s POSITA definition in parallel district court litigation.”⁵ Prelim. Resp. 14 & n.4. Patent Owner proposes “a POSITA

⁵ In support of this argument, Patent Owner cites a Declaration (Ex. 2016) that appears to be from litigation between the parties in the District of Delaware, *Aptiv Technologies AG v. Microchip Technology Inc.*, Case No.

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. Lack of work experience can be remedied by additional education, and vice versa.” *Id.* at 14 (citations omitted).

The parties agree that a POSITA would have a four year or bachelor's degree in electrical engineering or computer science and professional experience related to USB. *Compare* Pet. 23–24 *with* Prelim. Resp. 14. And, the parties 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.* Petitioner contends that a POSITA would have more familiarity with USB related documents and systems than contended by Patent Owner. We need not, and do not, resolve this dispute between the parties at this preliminary stage in this proceeding. We invite the parties to further address this issue, if they deem it necessary and appropriate.

For purposes of this Decision, we adopt Patent Owner's definition of the level of ordinary skill in the art. It appears consistent with what is reflected by the content of the applied prior art references. *Cf. Okajima v. Bourdeau*, 261 F.3d 1350, 1354–55 (Fed. Cir. 2001) (the applied prior art may reflect an appropriate level of skill). Accordingly, at this point, we consider the arguments and evidence from the standpoint of such a skilled artisan. If a POSITA was considered to have the additional work experience with USB systems and familiarity with USB standards as proposed by

1:23- cv-00307-JDW (D. Del.), (*see id.* at 1 (caption)). This Declaration relates to patents other than the '962 patent (*id.* at ¶¶ 1, 31).

Petitioner and the level of ordinary skill in the art was enhanced, our Decision to institute trial would be further supported. However, our Decision to go forward with trial is supported by either of the definitions offered by the parties.

C. Claim Construction

In an *inter partes* review, we construe claims using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

37 C.F.R. § 42.100(b). Accordingly, our claim construction standard is the same as that of a district court. *See id.* 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).

Petitioner states in the Petition that no terms need construction for this proceeding. Pet. 24–25. Patent Owner states that, at this time, Patent Owner sees no need to construe any claim language. Prelim. Resp. 20.

For purposes of this Decision, we 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))).

If either party contends that explicit claim construction is necessary in order to make a final determination whether or not any challenged claim is unpatentable based on the arguments and evidence presented, it should clearly explain why during trial and provide a clear and unambiguous construction with supporting evidence including specifically identifying the challenges, claims, and limitations for which the construction is necessary.

*D. Obviousness of Claims 1–10 and 14–17
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 opposes institution on this ground. *See* Prelim. Resp. 20–44.

We provide summaries of Chang and Chang II and then analyze the arguments and evidence of the parties relating to this ground.

1. Chang

Chang relates to “a hub and more particularly to a hub with a host-to-host transmission function.” Ex. 1014 ¶ 1. An object of the Chang invention is to provide a host-to-host transmission function. *Id.* ¶ 4.

Figure 2 illustrates a conventional USB hub and is reproduced below. *Id.* ¶ 13.

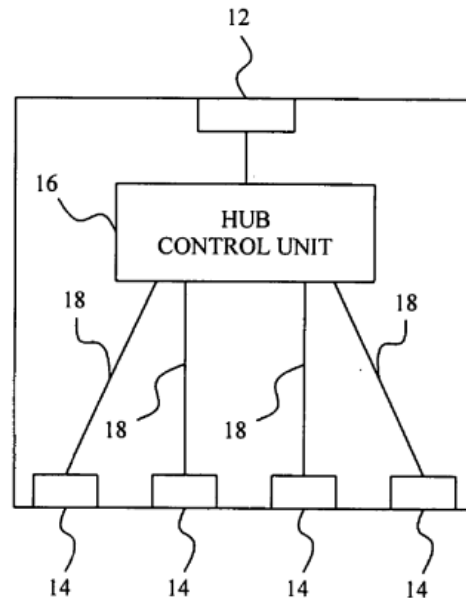


Figure 2 depicts a USB hub including uplink port 12 for being linked to a host, downlink ports 14 for being linked to other devices, and hub control unit 16. *Id.* ¶ 18. In the USB hub, several transmission paths 18 may be established such that uplink port 12 can communicate with each downlink port 14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

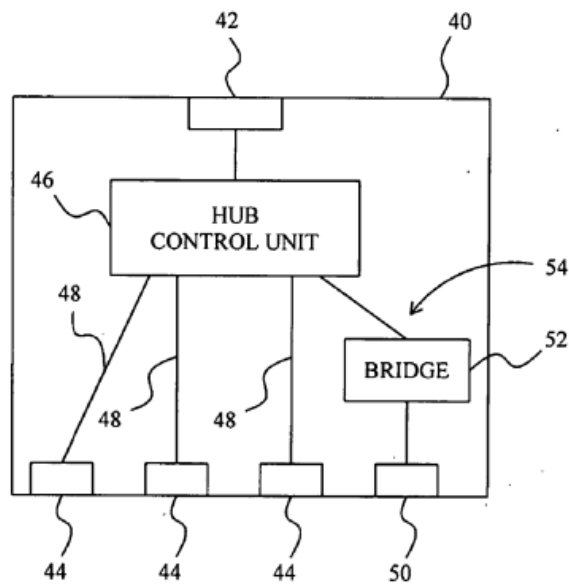


Figure 3 depicts hub 40, uplink port 42 for being linked to a host, several downlink ports 44 for being linked to devices, and hub control unit 46 for establishing several transmission paths 48 between uplink port 42 and downlink ports 44 such that the host linked to uplink port 42 can communicate with 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 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.

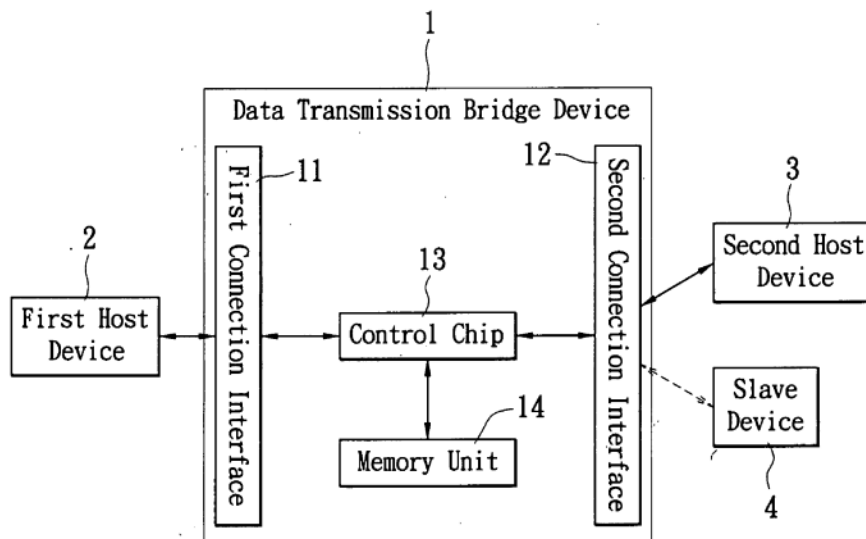


Figure 1 depicts data transmission bridge device 1 including first connection interface 11 for connecting to first host device 2, second connection interface 12 for connecting to second host device 3 or slave device 4, control chip 13 enabling connection to a detected host/slave device, and memory unit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

Figure 5 is a schematic diagram for 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.

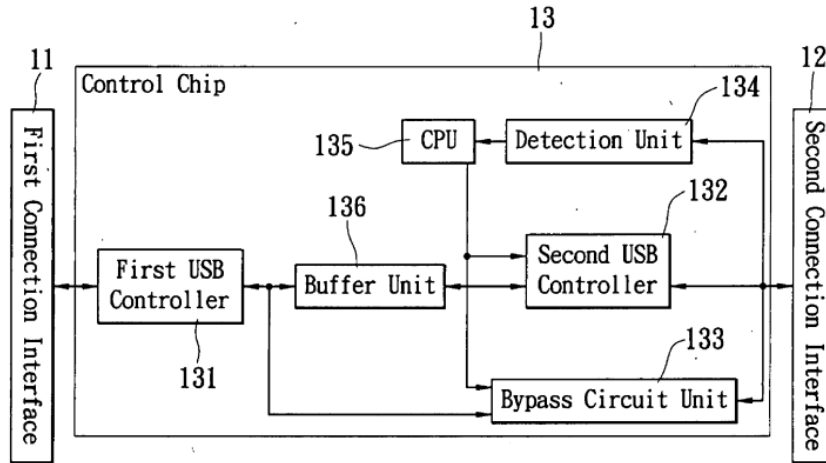


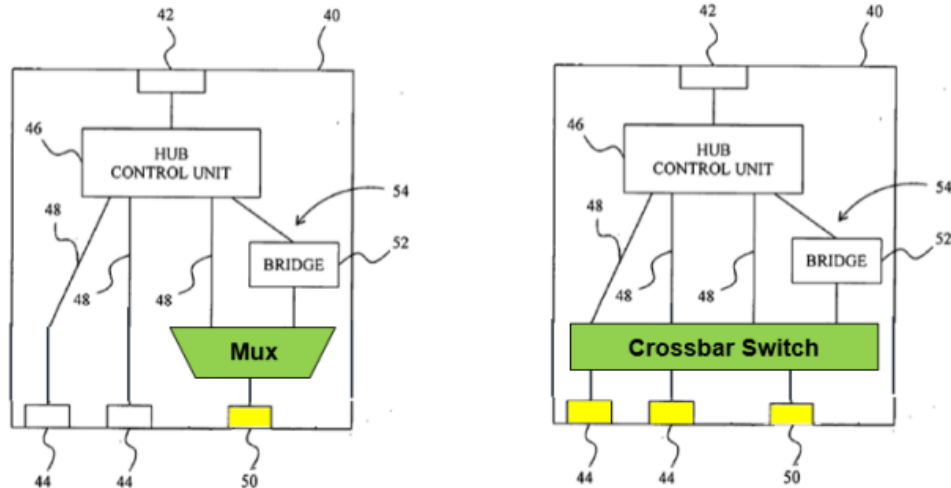
FIG. 5

Figure 5 depicts control chip 13 for a 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*

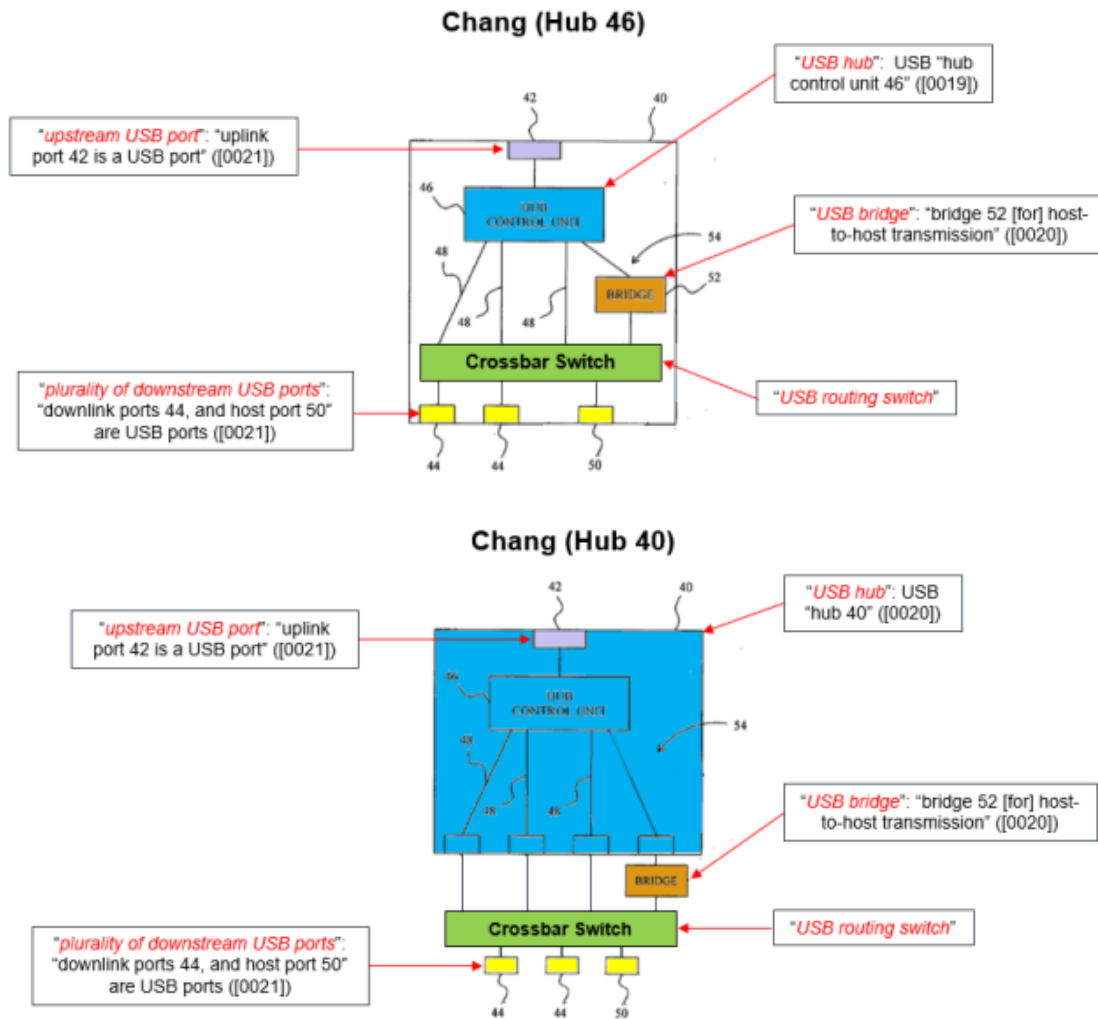
a. *Overview of Petitioner’s Showing*

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, 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. *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. *Id.* at 43–45. 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 along with Petitioner's mapping of claim 1 to each implementation. See Pet. 46–47.

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) module" as

recited in claim 1. *See* Pet. 47–48. Patent Owner does not dispute this showing. *See generally* Prelim. Resp. We also note that prior art Figure 1 of the '962 patent depicts a system with a USB hub module. *See* Ex. 1005, 2:8–9. Fig. 1.

[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 for being linked to a host” (Ex. 1014 ¶ 19) and “uplink port 42 is a USB port” (*id.* at ¶ 21). Patent Owner does not dispute that Chang teaches “an upstream USB port.” *See generally* Prelim. Resp. We also note that prior art Figures 1 and 2 of the '962 patent depict an upstream USB port.

[1b] a plurality of downstream USB ports

Petitioner identifies downlink ports 44 and host port 50 of Figure 3 of Chang as teaching “a plurality of downstream USB ports” as recited. *See* Pet. 49–51. The detailed description of Figure 3 states, “Fig. 3 shows . . . several downlink ports 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 does not dispute that Chang teaches “a plurality of downstream USB ports.” *See generally* Prelim. Resp. We also note that prior art Figures 1 and 2 of '962 patent depict a plurality of downstream USB ports.

[1c(i)] a USB hub interconnected to the upstream USB port and the plurality of downstream USB ports

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.

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.

Patent Owner does not dispute that Chang teaches “a USB hub interconnected to the upstream USB port and the plurality of downstream USB ports.” *See generally* Prelim. Resp. We also note that prior art Figures 1 and 2 of the ’962 patent depict a USB hub with an upstream USB port connected to a plurality of downstream USB ports. *See also* Ex. 1005, 2:8–11 (“FIG. 1 illustrates a system wherein a self-powered USB hub module 110 having a plurality of USB ports 112 connects to a plurality of USB devices via a plurality of consumer-facing USB ports 114.”).

[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

Petitioner relies on paragraphs 19, 20, 22, and 23 of Chang as teaching this limitation. Pet. 54–55. Paragraph 19 of Chang provides, “FIG. 3 shows a hub 40 . . . 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.” With regard to transmitting data between uplink port 42 and host port 50, paragraph 20 of Chang provides:

the hub 40 further comprises . . . a bridge 52 connected between the hub control unit 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.

Patent Owner does not dispute that Chang teaches a “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.” *See generally* Prelim. Resp.

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

Petitioner identifies bridge 52 of Figure 3 of Chang as teaching this limitation. *See* Pet. 56–57. As shown in the passage from paragraph 20 of Chang quoted above in analyzing the immediately preceding limitation, Chang supports Petitioner’s showing for this limitation. Patent Owner does not dispute that Chang teaches “a USB bridge interconnected to the USB hub and configured to connect the upstream USB port to a USB host.” *See generally* Prelim. Resp.

[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 Chang to include a USB routing switch 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 contends that “Chang II’s ‘main feature’ is providing ‘two different transmission paths.’” *Id.* at 58 (citing Ex. 1015 ¶ 21). Paragraph 21 of Chang II supports this contention and states (emphasis added):

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.

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 (emphasis added):

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.

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).

Patent Owner argues that Petitioner fails to specify where “a USB routing switch” is disclosed in Chang II. Prelim. Resp. 29–30. The Preliminary Response states:

Purely as a conceptual matter, Chang II contemplates switching between transmission paths, but does not actually disclose a discrete switch that performs this switching. (EX-2001, ¶ 61.) A POSITA would understand that switching between transmission paths could be performed by an element other than a routing switch. (EX-2001, ¶¶ 60-61.) Petitioner has thus failed to specify “where each element of the claim is found in the prior art.” *See* 37 C.F.R. 42.104(b)(4).

Id. at 30. We determine that Patent Owner’s argument lacks merit. Paragraph 24 in Chang II cited in the Petition states that the control chip switches between the two transmission paths. Ex. 1015 ¶ 24.⁶ Applying the plain and ordinary meaning to the term “a USB routing switch” (*see* Section II. C. (Claim Construction)), Patent Owner does not explain why the control chip as taught by Chang II is not “a USB routing switch.” Patent Owner acknowledges that “[t]he control chip detects whether a host or slave device is connected to the second connection interface and selects one of the two transmission paths to enable data transmission between the first and second connection interfaces.” Prelim. Resp. 18 (citing Ex. 1015 ¶ 23).

We determine that Petitioner adequately shows that this limitation is taught by the cited art.

⁶ 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).

[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

Here again, we note that Petitioner proposes to modify Chang to include a USB routing switch as taught by Chang II. Pet. 60–62. As discussed in relation to the immediately previous limitation, 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.”

Patent Owner does not specifically dispute the showing for this limitation. *See generally* Prelim. Resp.; *see also id.* at 17 (“Chang’s dedicated host port and bridge allow for host-to-host transmission between a first host device (such as a computer) connected to an uplink port and a second host device (such as another computer) connected to the dedicated host port” (citing Ex. 1014 ¶ 20)).

[If(ii)] is configured to initiate bidirectional communication with the upstream USB port, and

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. 3.⁷ However, Patent Owner argues that, “[r]ather than engaging with this limitation, Petitioner merely waves its hands at it and identifies no evidence that it would have been part of the Chang-Chang II combination” (Prelim Resp. 37) and that “Petitioner fails to produce evidence that Chang, modified as proposed, would include a bridge that enables ‘bidirectional communication’ as claimed” (*id.* at 43). This is inaccurate. 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.

⁷ And, as noted *supra*, Patent Owner does not dispute that Petitioner establishes that the cited art teaches “a USB hub interconnected to the upstream USB port and the plurality of downstream USB ports, 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**” or “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” as recited in claim 1. Ex. 1005, 11:40–41 (emphasis added).

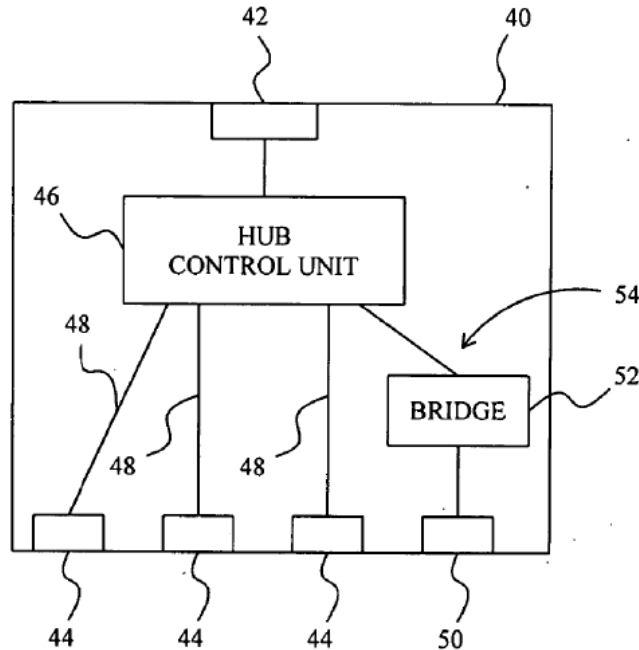


FIG. 3

Figure 3 of Chang depicts “an application of a USB hub.” Ex. 1014 ¶ 14.

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 its Preliminary Response, Patent Owner cites this same paragraph and acknowledges that “Chang’s dedicated host port and bridge allow for **host-to-host transmission** between a first host device (such as a computer) connected to an uplink port and a second host device (such as another computer) connected to the dedicated host port.” Prelim. Resp. 17 (citing Ex. 1014 ¶ 20) (emphasis added); *see also id.* at 27 (Chang’s bridge . . . provides simple host-to-host data transmission.”).

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.

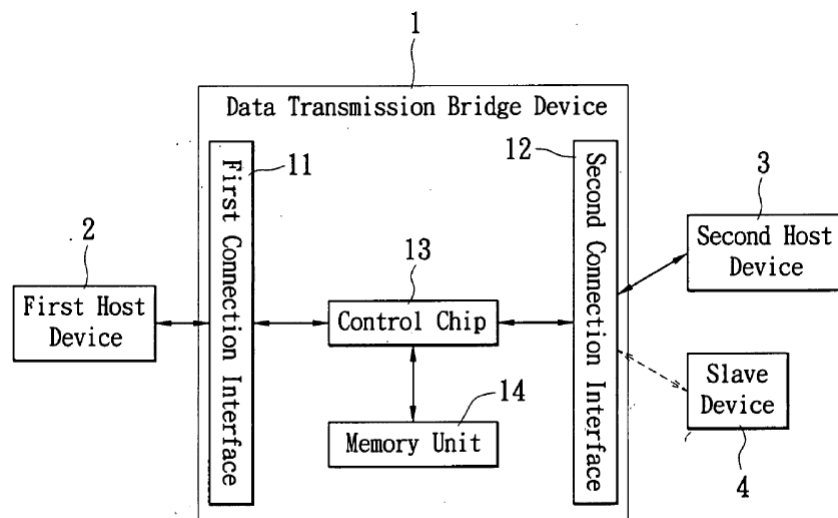


FIG. 1

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

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 responds, 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***.

In its Preliminary Response, Patent Owner acknowledges that, in Chang II, the “components are arranged in a particular logical configuration to form two transmission paths between the pair of connection interfaces.” Prelim. Resp. 18 (citing Ex. 1015 ¶ 23, Figs. 1, 5). And, when both connection interfaces are detected to be connected to hosts, a control chip enables the bridge transmission path for host-to-host data transmission. *Id.* at 17–18 (citing Ex. 1015 ¶ 26). We determine that Petitioner has shown that devices described in both Chang and Chang II are “configured to initiate bidirectional communication” as recited in claim 1.

Patent Owner further argues that the Petition is “facially insufficient” because “Petitioner equates a host’s well-known ability to ‘initiate communication requests’ with ‘bi-directional communication because each host may initiate communication’” and “initiating communication ***requests*** is only a part of the communication that the claims require be bidirectional.” Prelim. Resp. 40. Patent Owner’s argument ignores the specific language of the claims that only requires that the claimed module (claim 1) or circuit (claim 14) comprise a USB routing switch that “is configured to ***initiate*** bidirectional communication.” Ex. 1005, 11:40–41, 12:53–54 (emphasis added). Rather than being insufficient, the showing in the Petition appears to be specifically directed to the explicit claim language.

Patent Owner’s argument regarding the “configured to initiate bidirectional communication” limitation lacks merit. We determine that the showing in the Petition adequately establishes that the cited art teaches this limitation.

[1g(i)] wherein the USB routing switch is configured to connect the first downstream USB port directly to the USB hub

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.

Patent Owner does not dispute that this limitation is taught by the cited art. *See generally* Prelim. Resp.; *see also id.* at 17 (“The Chang hub also comprises a number of downlink ports for linking devices connected to the downlink ports to Chang’s uplink port.” (citing Ex. 1014 ¶ 19)). Patent Owner acknowledges that a standard USB hub is connected to multiple downstream USB ports. *Id.* at 3.

[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

Petitioner relies on Figure 1 of Chang II as depicting this limitation. Pet. 65–66. The detailed description of Figure 1 states that “[t]he second [transmission] path is the bypass path which spans first connection interface 11 [the upstream USB port], first USB controller 131, bypass circuit unit 133, and second connection interface 12 [a downstream USB

port].” Ex. 1015 ¶ 23. Patent Owner does not dispute that the cited art teaches this limitation. *See generally* Prelim. Resp.

[1g(iii)] thereby rendering the consumer device compatible with a device connected to the upstream USB port.

With regard to this limitation, the Petition states:

[T]he host-to-device connection in modified Chang Fig. 3 bypasses the bridge and thus ‘*render[s] the consumer device compatible with a device connected to the upstream USB port.*’ Specifically, 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).

Pet. 67–68 (citing Ex. 1013 ¶¶ 253–254; EX1014 ¶¶ 19, 23). Patent Owner does not dispute that the cited art teaches this limitation. *See generally* Prelim. Resp.

c. 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)^[8] and a switch to route the ports to the appropriate transmission path.

⁸ Petitioner describes a dual-role port as “a port supporting products that could operate in either a 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.

Id. at 34. Patent Owner challenges Petitioner’s showing on motivation to combine. *See* Prelim. Resp. 20–33.

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 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 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 seems reasonable 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 smartphones have become “standalone computing devices.” *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 of Chang to include dual-role ports as described 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).⁹ We determine that this reasoning also supports with evidence modifying 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:

[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.

⁹ 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.’”)).

Pet. 43 (citing Ex. 1013, ¶¶ 69–73, 194–199). Patent Owner does not dispute that Petitioner has shown a reasonable expectation of success in modifying Chang to include dual-role ports. *See generally* Prelim. Resp.

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* 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 Chang to include switching functionality as taught by Chang II and supported by other substantial evidence appears 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 ¶ 118; 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. 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. Prelim. Resp. 20–33. Generally, Patent Owner argues that “[i]nstead of establishing a motivation to combine Chang and Chang II, however, Petitioner relies on the general existence of dual-role devices and its expert’s say-so as the foundation for its hindsight-based combination.” *Id.* at 21. This criticism is not valid. As shown above, Petitioner relies on much more than the “general existence of dual-role devices and its expert’s say-so.” Petitioner (and its declarant, Mr. Welch) provide several well-articulated reasons that are well-supported by cited evidence to establish that a skilled artisan would have been motivated to make the combination of teachings alleged in the Petition.

Patent Owner argues that “Petitioner presents no evidence that a POSITA would be motivated to ‘modify Chang in view of Chang II and a POSITA’s knowledge to include dual-role port(s)’ for use with dual-role devices.” Prelim. Resp. 21–22 (emphasis added) (citing Ex. 2001 (Houh Decl.) ¶ 56). This criticism is also not valid. As shown above, Petitioner presents sufficient evidence to support modifying Chang in view of Chang II to include dual-role ports. Additionally, Patent Owner’s argument is based on the mistaken premise that the claims of the ’962 patent require a dual-role device. *See* Prelim. Resp. 24. Patent Owner relies on Dr. Houh’s testimony

to establish this mistaken premise. *See id.* (citing Ex. 2001 ¶ 46). However, in paragraph 46 of his declaration, Dr. Houh cites a different patent and never discusses or analyzes the claims of the '962 patent. *See* Ex. 2001 ¶ 46. There is no merit to this argument as it is directed to a combination not asserted in the Petition and is not commensurate in scope with the challenged claims of the '962 patent.

Patent Owner contends that “[a] POSITA would not have considered using Chang II to modify Chang because adding steps and components to Chang as Petitioner proposes would only have complicated Chang’s design and frustrated Chang’s ‘express goal’ of ‘easily establishing a connection between a computer and another computer.’” Prelim. Resp 26 (citing Ex. 2001 ¶ 67). 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 Pharmas., Inc.*, 773 F.3d 1186, 1197–1198 (Fed. Cir. 2014) (emphasis in original). And, Petitioner’s proposed modifications to Chang (dual-role ports and a USB routing switch) would not prevent the apparatus disclosed in Chang from “easily establishing a connection between a computer and another computer.” Patent Owner’s contention is contrary to Petitioner’s contention,

and its declarant's testimony, that its proposed modifications to Chang would further its express goal of "easily establishing a connection between a computer and another computer." Pet. 35–36 (citing Ex. 1013 ¶¶ 178–179). We have considered these arguments and, at least at this stage, we determine that Petitioner's modifications would not frustrate Chang's "express goal."

Patent Owner argues that "Petitioner's first three motivation-to-combine arguments fail to mention Chang II's teachings at all and therefore fail as a matter of law." Prelim. Resp. 28. This argument is contrary to the Supreme Court's decision in *KSR* that the motivation to combine the teachings of the references need not come from the references themselves. *KSR*, 550 U.S. at 418–419 (rejecting a rigidly applied TSM test). Thus, this argument lacks merit.

Patent Owner argues that "[t]he Petition overstates Chang II's passing mentions of a USB hub as a suggestion that Chang II's bridge would be considered for improving Chang's solution, which involved a hub and a bridge" and that Petitioner's argument for incorporating Chang II's teachings of a bridge with a dual-role port and a USB routing switch are "lacking in evidentiary support." Prelim. Resp. 32. As previously noted, we determine that Petitioner's showing on motivation to combine has good evidentiary support and this includes the argument that the teachings of Chang II would improve the usefulness of Chang's hub and bridge. *See* Pet. 38–39.

We have considered the arguments and the evidence presented by Petitioner relating to motivation to combine and the contrary arguments and evidence of the Patent Owner. Considering all these arguments and evidence, we determine that Petitioner has articulated sufficient reasoning

with good evidentiary support to combine the relevant teaching of Chang and Chang II as proposed in the Petition.

d. Summary as to Claim 1

Petitioner has sufficiently shown for purposes of institution that the combination of Chang and Chang II teaches all the limitations of claim 1 and has sufficiently articulated well-supported reasoning as to why a skilled artisan would have been motivated to combine the relied-upon teachings of Chang and Chang II as set forth in relation to claim 1. We determine that there is a reasonable likelihood that Petitioner will prevail in establishing the unpatentability of challenged claim 1 of the '962 patent.

4. Claims 2–10 and 14–17

Petitioner also challenges claims 2–10 and 14–17 of the '962 patent as unpatentable in view of a combination of the teachings of Chang and Chang II. Pet. 5, 68–80. Petitioner presents mappings of the limitations of these claims to the relevant teachings of Chang and Chang II. *Id.* Patent Owner does not present any separate arguments directed to these claims but instead treats independent claim 1 as representative. *See* Prelim. Resp. 15–17, 30, 37–44. After considering the Petitioner's showing, and for the reasons discussed above with regard to claim 1, we determine that Petitioner has sufficiently shown for purposes of institution a reasonable likelihood of prevailing in establishing the unpatentability of claims 2–10 and 14–17 of the '962 patent in view of a combination of the teachings of Chang and Chang II.

E. Obviousness of Dependent Claims 11–13 and 18–19 Based on Chang, Chang II, and AN96527

Petitioner contends that dependent claims 11–13 and 18–19 would have been obvious over Chang in view of Chang II, AN96527, and POSITA knowledge. Pet. 5, 80–85. Petitioner relies on AN96527 as teaching features recited in dependent claims 11–13 and 18–19. *See* Pet. 80–85. Patent Owner opposes institution on this ground. *See* Prelim. Resp. 1–2, 34–37.

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 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:

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

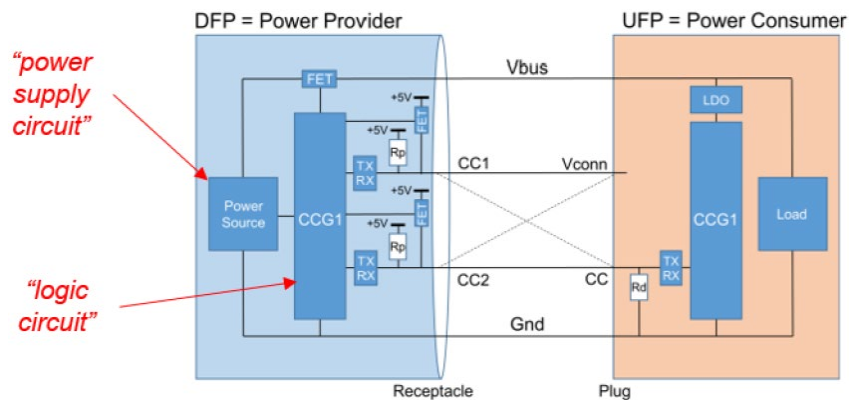
from the USB hub module to a first consumer device connected to the first downstream USB port.

Id. at 13:17–21.

For teachings of the additional limitations recited in claim 11, Petitioner relies on AN96527. *See* Pet. 82–83. 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).

Id. Petitioner relies on its showing for claim 11 for claim 18. *Id.* at 84–85 (“The additional limitations of claims 18-19 are present in claims 11-12,

respectively, and met for the same reasons.”). Patent Owner does not dispute that AN96527 discloses the additional limitations of claim 11. *See generally* Prelim. Resp. On the record at this stage of this proceeding, we determine that Petitioner shows that AN96527 teaches the additional limitations recited dependent claims 11 and 18.

3. *Claims 12 and 19*

Claim 12 recites, “[t]he USB hub module according to claim 11, wherein the logic circuit includes a communication control stack.” Ex. 1005, 12:31–32. Claim 19 recites: “[t]he integrated circuit according to claim 18, wherein the logic circuit includes a communication control stack.” *Id.* at 13:22–23.

For teaching or suggesting the additional limitation recited in claim 12, Petitioner relies on AN96527. *See* Pet. 83–84. 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. supplies.”

Id. Petitioner relies on its showing for claim 12 for claim 19. *Id.* at 84–85 (“The additional limitations of claims 18-19 are present in claims 11-12, respectively, and met for the same reasons.”). Patent Owner does not dispute that AN96527 teaches or suggests the additional limitations of claims 12 and 19. *See generally* Prelim. Resp. On the record at this stage of

this proceeding, we determine that Petitioner shows that AN96527 teaches or suggests the additional limitations recited dependent claims 12 and 19.

4. *Claim 13*

Claim 13 recites, “[t]he USB hub module according to claim 11, wherein the power supply circuit includes adjustable voltage power.” Ex. 1005, 12:33–35. For teaching the additional limitation recited in claim 13, Petitioner relies on AN96527. *See* Pet. 84. 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 (USBPD “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.

Id. Patent Owner does not dispute that AN96527 teaches the additional limitation of claims 13. *See generally* Prelim. Resp. On the record at this stage of this proceeding, we determine that Petitioner shows that AN96527 teaches the additional limitation recited dependent claim 13.

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

Petitioner articulates several reasons why a skilled artisan would be motivated to combine the relevant teachings of Chang, Chang II, and AN96527. Pet. 80–82. Patent Owner argues that Petition “provides no motivation to combine [Chang and Chang II] with AN96527.” Prelim. Resp. 34.

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.” Pet. 81 (citing Ex. 1013 ¶ 211). In support, the Petition provides:

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. This contention is reasonable and supported.

The Petitioner also contends that the combination would be motivated by the ability to “provid[e] flexible as-needed power capabilities.” Pet. 81 (citing Ex. 1013 ¶ 212). In support, Petitioner points to Figure 21 of AN96527, “a flow chart showing ‘power role swap’ where ‘5V@900mA, 12V@3A, 13V@3A and 20V@3A’ are all available options.” *Id.* (citing Ex. 1064, 18, Fig. 21).

And, Petitioner argues a skilled artisan would be motivated to use AN96527’s power delivery capabilities with a USB hub to obtain the benefit of being able to charge a laptop or other USB product. Pet. 81–82 (citing Ex. 1013 ¶ 213). The Petition states, “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. EX1064, 25.” *Id.* at 81.

Petitioner also contends that a skilled artisan would have had a high expectation of success in combining the teachings of the cited references. Pet. 82 (citing Ex. 1013 ¶ 214). In support, the Petition provides:

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).

Id. (alterations in original).

Patent Owner argues that, “nothing in AN96527 or the USB-PD specification make any mention of dual-role devices or dual-role ports.” Prelim. Resp. 35. This argument is unavailing because AN96527 is relied on for its power delivery teachings and not for teaching dual-role devices or dual-role ports.

Patent Owner next argues that Petitioner has failed to show how the power delivery systems of AN96527 could be incorporated into Chang or Chang II or a standard USB hub. Prelim. Resp. 35–36. But, Petitioner proposes a combination of the teachings and not a bodily incorporation of AN96527. Patent Owner’s argument does not address whether a skilled artisan would have been motivated to combine the relevant teachings of the cited references so that this argument has little or no merit.

In summary, we determine that Petitioner has sufficiently shown for purposes of institution that the combination of Chang, Chang II, and AN96527 teaches or suggests all the limitations of claims 11–13 and 18–19 and has sufficiently articulated well-supported reasoning as to why a skilled artisan would have been motivated to combine the relied-upon teachings of these references.

III. CONCLUSION

After considering the evidence and arguments presented in the current record, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail with respect to at least one of the claims challenged in the Petition.¹⁰ Accordingly, we institute *inter partes* review of all the challenged claims and on all grounds presented in the Petition. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348 (2018) (holding that the Board may not institute review on fewer than all claims challenged in the petition); 37 C.F.R. § 42.108(a) (2023) (“When instituting *inter partes* review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.”).

IV. ORDER

Accordingly, it is

ORDERED that pursuant to 35 U.S.C. § 314, *inter partes* review is instituted as to claims 1–19 of the ’962 patent with respect to all grounds of unpatentability presented in the Petition; and

FURTHER ORDERED that *inter partes* review is commenced on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

¹⁰ 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.

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