

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICROCHIP TECHNOLOGY INC.,
Petitioner,

v.

APTIV TECHNOLOGIES AG,
Patent Owner.

IPR2024-00230
Patent 11,176,072 B2

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

HAMANN, *Administrative Patent Judge*.

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

I. INTRODUCTION

Microchip Technology Inc. (“Petitioner”) filed a petition for *inter partes* review of claim 1 (“the challenged claim”) of U.S. Patent No. 11,176,072 B2 (Ex. 1009, “the ’072 patent”). Paper 1 (“Pet.”). 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 to address unanticipated issues raised by Patent Owner. Paper 10. Patent Owner filed a Preliminary Sur-reply in response. Paper 11 (“Prelim. Sur-reply”).

Institution of an *inter partes* review is authorized by statute when “the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a) (2018); *see* 37 C.F.R. § 42.108 (2023). Upon consideration of the papers, we conclude that the information presented shows that there is a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of the challenged claim of the ’072 patent.

A. *Real Parties-in-Interest*

Petitioner states that it and “its subsidiaries are the real parties-in-interest.” Pet. 83. Patent Owner identifies itself and Aptiv Services US, LLC as real parties-in-interest. Paper 4, 2.

B. *Related Matters*

The parties identify *Aptiv Techs. AG v. Microchip Tech. Inc.*, Case No. 1:23-cv-00307-JDW (D. Del.), as a matter that may affect, or be affected by, a decision in this proceeding. Pet. 83; Paper 4, 2.

The parties also collectively identify the following review challenges to related patents: (i) US Patent No. 9,619,420 B2 (IPR2024-00228); (ii) US

Patent No. 9,645,962 B2 (IPR2024-00229); (iii) US Patent No. 11,681,643 B2 (PGR2024-00011); (iv) US Patent No. 9,460,037 B2 (IPR2024-00494); (v) US Patent No. 9,619,420 B2 (IPR2024-00495); and (vi) US Patent No. 10,545,899 B2 (IPR2024-00496). Pet. 83–84; Paper 7, 2–3.

C. The Challenged Patent

The '072 patent “generally relates to Universal Serial Bus (‘USB’) connectivity between . . . mobile consumer devices and vehicle electronic systems.” Ex. 1009, 1:21–23. “Historically, mobile consumer devices[,] such as . . . smart phones, . . . have relied on connections to other devices, such as laptop or desktop personal computers . . . to acquire content, exchange data, and charge the device’s internal battery,” according to the '072 patent. *Id.* at 1:29–33. “For many years . . . , that has been accomplished through USB ports on each device.” *Id.* at 1:33–35. “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,” so that “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 1:37–42.

“In vehicle systems that employ USB connections, . . . the vehicle is typically the USB Host,” and “[t]he USB Host function is often embedded into a component of the vehicle infotainment system, such as into the radio or other control module,” according to the '072 patent. *Id.* at 1:49–53. “Typically, multiple USB ports are strategically designed into the vehicle in locations convenient for the driver and passengers to connect their consumer devices.” *Id.* at 1:54–56. The '072 patent explains that because “there can be many USB ports in a vehicle, and each port requires a cable to connect the port to the USB Host, it is desirable to share cabling,” which “is

accomplished through the use of USB Hubs.” *Id.* at 1:66–2:4. In particular, “USB Hubs allow a single USB Host to connect to multiple USB Devices over a single cable between the USB Host and the USB Hub.” *Id.* at 2:4–6. “Once a consumer device is connected to one of the ports, the device begins charging and the vehicle infotainment system can access content on the consumer device.” *Id.* at 1:56–59.

In addition, the ’072 patent explains that “leading 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.” *Id.* at 2:59–62. “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.” *Id.* at 2:62–65. In fact, the ’072 patent predicts that increasingly “the smart phone will act primarily as the USB Host, and will rarely or never act as a USB device,” which “presents some problems for automotive systems” which “have a USB Host and require USB Devices to connect to it.” *Id.* at 3:2–8. In particular, “[i]f a phone acts as a USB Host, then the system will not function since by USB convention, two USB Hosts cannot directly connect with each other.” *Id.* at 3:9–12. “A redesign of the USB architecture in the vehicle is thus necessary such that the vehicle can act either as the USB Host (when necessary to connect to USB Devices such as memory sticks, thumb drives, etc.) or USB Device (when necessary to connect to USB Hosts, such as a smart phone which demands to be USB Host rather than USB Device[]),” according to the ’072 patent. *Id.* at 3:13–19.

The ’072 patent explains that “[t]he USB organization has added a standard that addresses the need for devices to act as either USB Host or USB Device and as such can be considered a ‘dual role’ USB controller.”

Id. at 3:21–25. “It is referred to . . . as ‘On the Go’ or ‘OTG’ for short,” and “[a]ny device that meets the OTG standard can act as either USB Host or USB Device and can change roles dynamically.” *Id.* at 3:25–27. The ’072 patent also acknowledges that custom USB hubs can be implemented “wherein the USB Hub is able to dynamically swap its upstream port with one it’s downstream ports when commanded to do so.” *Id.* at 3:49–52.

The ’072 patent, however, identifies disadvantages associated with these approaches. *Id.* at 3:39–48, 3:59–4:3. In response, the ’072 patent “provide[s] a system which is configured to enable a vehicle’s embedded USB Host system to connect to mobile devices through a USB Hub, regardless of whether the mobile devices are configured to act as USB Hosts or USB Devices, without the need to provide OTG or dual role controllers in the head unit [(i.e., a central vehicle microcontroller in the vehicle system architecture)] and without the need to provide additional cabling in the vehicle.” *Id.* at 4:7–15; *see also id.* at 2:22–24, Fig. 3 (illustrating head unit). Figure 4, shown below, illustrates an embodiment of the ’072 patent.

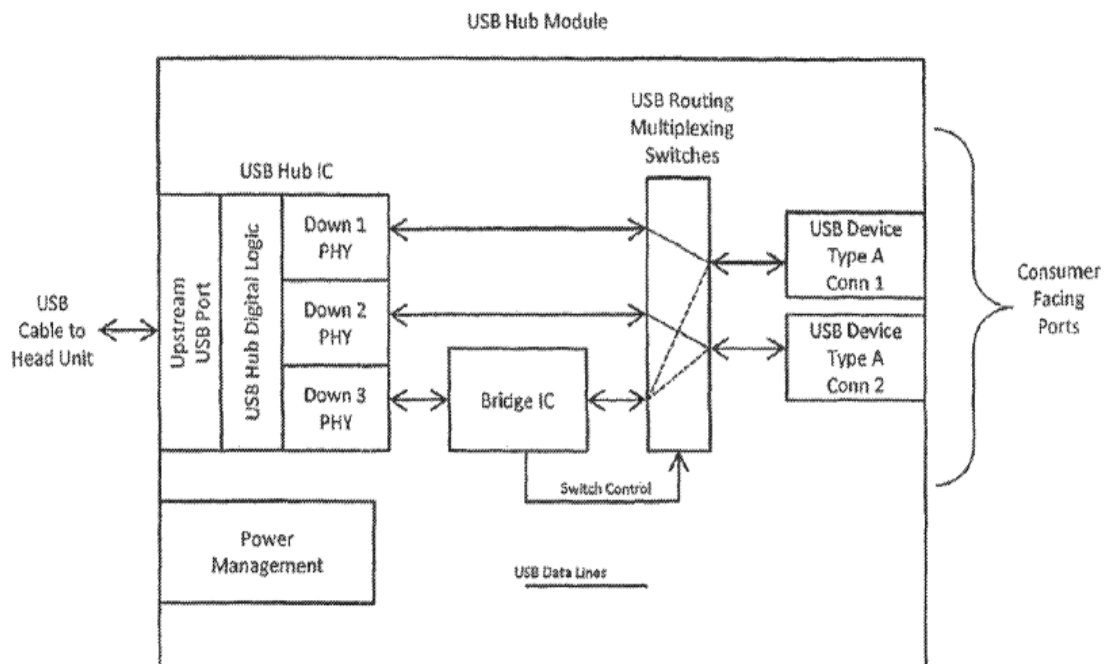


Figure 4 “illustrates a system which is in accordance with an embodiment of the [’072 patent], wherein a USB Hub, USB Bridge and a switching device are provided as discrete components.” *Id.* at 5:24–27. As illustrated, the system comprises a USB Hub Module having a USB Hub, a USB Bridge, and Multiplexing Switches, implemented as discrete devices. *Id.* at 5:53–56. The USB Hub comprises “an integrated circuit (IC), and is configured (via an upstream USB port) connected to a vehicle’s embedded USB Host (such as a USB Host in a Head Unit) via vehicle internal wiring.” *Id.* at 5:56–61. As illustrated, the USB Hub also includes three downstream USB ports, one of which is connected to the USB Bridge and two of which are connected to the Multiplexing Switches. *Id.* at 5:61–67. The switching device is shown as connected to two USB ports in the vehicle for connection to a consumer device. *Id.* at 5:67–6:2. The ’072 patent explains that “[t]he USB Bridge is configured to effectively control the switching device,” as indicated in the figure. *Id.* at 6:3–5, Fig. 4.

“The USB Hub Module is configured such that signals received from at least one [consuming facing] USB port are received by the switching device, and the switching device routes the signals to the USB Bridge or the USB Hub.” *Id.* at 6:5–8. In particular, “where the consumer device is acting as USB Host, the USB Bridge processes the USB packets from the consumer port and provides them to the USB Hub, thereby rendering the consumer device compatible with the vehicle’s embedded USB Host.” *Id.* at 6:8–13. On the other hand, “where the consumer device is acting as USB Device, the USB Bridge controls the switching device such that the switching device provides the USB signaling directly to the USB Hub, bypassing the Bridge.” *Id.* at 6:13–17.

In sum, the '072 patent's embodiments "effectively render a vehicle's embedded USB Host compatible with consumer devices which are configured to also act as USB Host or USB Device." *Id.* at 5:50–53.

D. The Challenged Claim

Petitioner challenges claim 1, which is reproduced below:

1. A method, comprising:

providing efficient communications among USB components of a data communication system that includes a first input port, a second input port, a USB hub, a USB bridge connected to the USB hub, an embedded USB host connected to the USB hub, a USB port connected to a USB device capable of operating in a USB Host mode and a USB device mode, and USB multiplexing switches connected to the USB port, the USB hub, and the USB bridge;

receiving a first USB signal from the USB device via the USB port while the USB device is operating in the USB host mode;

routing the first USB signal via the USB multiplexing switches from the USB device to the embedded USB host through the USB bridge and the USB hub;

receiving a second USB signal from the USB device via the USB port while the USB device is operating in the USB device mode; and

routing the second USB signal via the USB multiplexing switches from the USB device to the embedded USB host through the USB hub, wherein the second USB signal from the USB device to the embedded USB host bypasses the USB bridge.

Ex. 1009, 9:15–10:18.

E. Asserted Grounds of Unpatentability

Petitioner asserts that claim 1 is unpatentable based on the following grounds:

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)/Basis ²
1	103	Chang, ³ Chang II ⁴
1	103	Chang, Chang II, Chutorash ⁵

Pet. 5, 42–76. Petitioner submits in support of its arguments the Declaration of Eric Welch (Ex. 1013). Patent Owner submits in support of its arguments the Declaration of Henry Houh (Ex. 2001).

II. LEVEL OF ORDINARY SKILL IN THE ART

To determine whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). 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)). “[O]ne or more factors may predominate.” *Id.*

¹ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Because the ’072 patent issued from an application having an effective filing date after March 16, 2013, we apply the AIA version of the statutory basis for unpatentability.

² Petitioner also lists for each asserted ground the knowledge of one of ordinary skill in the art. Pet. 5. Such listing is unnecessary as we already consider such knowledge as part of our obviousness analysis. *See Randall Mfg. v. Rea*, 733 F.3d 1355, 1362–63 (Fed. Cir. 2013).

³ US 2006/0206650 A1, published Sept. 14, 2006 (Ex. 1014, “Chang”).

⁴ US 2009/0268743 A1, published Oct. 29, 2009 (Ex. 1015, “Chang II”).

⁵ US 8,447,598 B2, issued May 21, 2013 (Ex. 1029, “Chutorash”).

Petitioner argues that one of ordinary skill in the art for the '072 patent “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.” Pet. 26 (citing Ex. 1013 ¶47). Petitioner adds that “[a] relevant advanced degree may substitute for some work experience,” and “[s]imilarly, relevant work experience may substitute for formal education.” *Id.* at 26–27 (citing Ex. 1013 ¶47).

In addition, Petitioner argues that one of ordinary skill in the art “would have been well-versed in USB standards (including the USB 2.0 and 3.0 Specifications and the OTG Supplement) and the design/deployment of USB hosts, USB devices, and USB hubs, including suitable environments for USB systems.” *Id.* at 26 (citing Ex. 1013 ¶47). According to Petitioner, one of ordinary skill in the art “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.” *Id.*

Patent Owner argues that one of ordinary skill in the art for the '072 patent “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.” Prelim. Resp. 13 (citing Ex. 2001 ¶26). Patent Owner adds that “[l]ack of work experience can be remedied by additional education, and vice versa.” *Id.*

The parties’ dispute regarding the level of ordinary skill in the art does not substantively impact our analysis for purposes of institution. Rather, we

find in applying either parties' definition for what comprises the level of ordinary skill in the art that Petitioner shows that there is a reasonable likelihood that it would prevail in proving the unpatentability of the challenged claim. At this stage of the proceeding, however, we adopt Patent Owner's proposed definition for one of ordinary skill in the art. Prelim. Resp. 13. This proposed definition is consistent with the '072 patent and the asserted prior art, and we apply it in our analysis below.

During trial, and in accordance with our Rules, the parties should address what substantive effect, if any, different proposed definitions for the level of ordinary skill in the art have on analyzing what the prior art teaches or in otherwise evaluating unpatentability of the challenged claim.

III. CLAIM CONSTRUCTION

Because the Petition was filed after November 13, 2018, we apply the same claim construction standard that would be used in a civil action under 35 U.S.C. § 282(b), following the standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b); 83 Fed. Reg. 51,340, 51,340–41, 51,343 (Oct. 11, 2018). In applying such standard, claim terms generally are given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art, at the time of the invention and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13. “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

Here, Petitioner argues that “embedded USB host” means “USB host physically embedded in a vehicle.” *See* Pet. 27–28. Patent Owner does not disagree with this proposed construction, but argues that we do not need to construe this term, or any other, for purposes of institution. Prelim. Resp. 19. We agree with Patent Owner. Thus, for purposes of our Decision on Institution, we do provide an express construction of any term. *See, e.g., Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’”). And we afford the claim terms their plain and ordinary meaning. A final determination as to claim construction will be made at the close of the proceeding, based on all the arguments and evidence of record.

IV. PRINCIPLES OF LAW

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 of the invention to a person having ordinary skill in the art. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence

of non-obviousness, if present.⁶ *See Graham*, 383 U.S. at 17–18. When evaluating a claim for obviousness, we also must “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

V. ALLEGED OBVIOUSNESS OVER CHANG AND CHANG II

Petitioner argues that the combination of Chang and Chang II renders claim 1 obvious. Pet. 42–72. For the reasons that follow, we determine that Petitioner establishes a reasonable likelihood that it would prevail in showing that this combination renders claim 1 obvious.

A. *Summary of Chang*

Chang relates to “a hub with a host-to-host transmission function.” Ex. 1014 ¶ 1. More specifically, Chang teaches, “[f]or implementing a host-to-host transmission function, [having] a hub [which] comprises an uplink port and a host port for being linked [to] a host respectively, a hub control unit connected to the uplink port, and a bridge connected between the host port and hub control unit for the hosts [to] communicate with each other.” *Id.* at code (57).

⁶ Petitioner addresses arguments regarding secondary considerations that Patent Owner purportedly raised in related district court litigation. *See* Pet. 76–79. Here, Patent Owner makes arguments regarding failure by others and its commercial success. Prelim. Resp. 2–13; Prelim. Sur-reply 1–5. Patent Owner, however, does not map the challenged claim to any product, or otherwise show the required nexus. Thus, at this stage, the arguments and record evidence as to secondary considerations are not sufficiently articulated nor developed.

B. Summary of 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. In particular, upon detecting the connecting device type (host/slave), the data transmission bridge device automatically switches between different transmission paths, which not only support data transfer between a host device and a slave device (host-to-device communication), but they also can directly support data transfer between two host devices (host-to-host communication). *Id.* ¶¶ 11–12.

C. Challenged Claim 1

1. Method

Claim 1’s preamble recites “[a] method.” Ex. 1009, 9:15. We agree with Petitioner and find that the combination of Chang and Chang II teaches a method. *See* Pet. 52; *id.* at 52–72 (describing how the combination teaches the steps of claim 1).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that the combination of Chang and Chang II teaches claim 1’s preamble. In light of our finding, we need not, and thus do not, reach whether claim 1’s preamble is limiting.

2. Providing Efficient Communications Among USB Components

Claim 1 further recites “providing efficient communications among USB components of a data communication system that includes a first input port, a second input port, a USB hub, a USB bridge connected to the USB

hub.” Ex. 1009, 9:16–19. At this stage, we agree with Petitioner and find that Chang teaches this limitation. Pet. 52–58.

First, we agree with Petitioner and find that Chang teaches that a USB cable enables “a communication channel between two computers . . . [which is] simpler and more efficient” than linking the computers via a local area network. Pet. 52–53; Ex. 1014 ¶ 2. We also agree with Petitioner and find that in the context of claim 1, providing efficient communications follows from the claimed arrangement and functioning of the claimed USB components. Pet. 53. Thus, we understand that Petitioner does not argue that “providing efficient communications among USB components of a data communication system that includes” is indefinite for purposes of this proceeding, despite certain arguments to the contrary. *See, e.g., id.* (arguing that “the outer bounds of the claim being uncertain”); *see also Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 813 (Fed. Cir. 2021) (“The indefiniteness of a limitation . . . precludes a patentability determination only when the indefiniteness renders it logically impossible for the Board to reach such a decision.”).

Second, at this stage, we agree with Petitioner and find that Chang teaches “a first input port, a second input port, a USB hub, [and] a USB bridge connected to the USB hub.” Pet. 54–58. In particular, Chang’s Figure 3, shown below as annotated by Petitioner, illustrates these components.

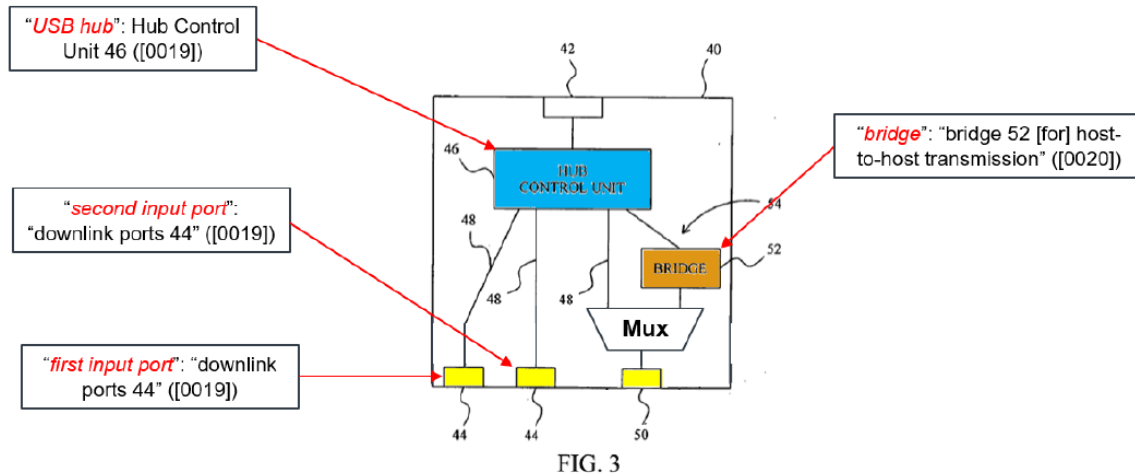


Figure 3 “is a schematic view of a hub according to” Chang’s teachings.

Ex. 1014 ¶ 14. Petitioner annotates in relevant part for this limitation the figure by coloring in (i) yellow downlink ports 44, (ii) orange bridge 52, and (iii) blue hub control unit 46. Pet. 56–57 (annotating Ex. 1014, Fig. 3).

Petitioner also maps⁷ components to the claim limitation by labeling (i) the left downlink port 44 as “first input port,” (ii) the right downlink port 44 as “second input port,” (iii) hub control unit 46 as “USB hub,” (iv) and bridge 52 as “bridge.” *Id.*

Chang teaches that the illustrated hub 40 comprises “several downlink ports 44 for being linked to devices, and a hub control unit 46 for establishing several transmission paths 48 between [an] uplink port 42 and downlink ports 44.” Ex. 1014 ¶ 19. In addition, Chang teaches that “bridge 52 [is] connected between the hub control unit 46 and host port 50” to allow for “a host-to-host transmission path 54 . . . such that the uplink port 42 may communicate with the host port 50.” *Id.* ¶ 20.

⁷ Petitioner provides an alternative mapping of Chang to this claim limitation where hub 40 is the claimed USB hub. At this stage, we need not, and thus do not, address this alternative mapping because we find Petitioner’s first mapping sufficient for purposes of institution.

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that Chang teaches this limitation.

3. *Embedded USB Host*

Claim 1 further recites “an embedded USB host connected to the USB hub.” Ex. 1009, 9:19–20. At this stage, we agree with Petitioner and find that Chang teaches this limitation. Pet. 58–60.

In particular, we find that Chang teaches having “uplink port 42 . . . being linked to a host.” Ex. 1014 ¶ 19. Moreover, Chang teaches that “[w]ith 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,” and “[a]s such, the host linked to the uplink port 42 can communicate with the host linked to the host port 50.” *Id.* ¶ 20; *see also id.* at Fig. 3 (showing that uplink port 42 is connected to hub control unit 46 (i.e., the claimed USB hub)).

In addition, we agree with Petitioner that “Chang broadly discloses its invention in the context of a USB hub that allows for a host-to-host connection, without restriction as to the type of host which will connect to uplink port 42.” Pet. 59 (citing Ex. 1014 ¶¶ 1, 3, 20). And at this stage, we agree with Petitioner and find that USB automotive applications were known in the art before the invention of the ’072 patent, including vehicles that employed USB-compatible embedded host computers in the form of infotainment systems. Ex. 1013 ¶ 102; Ex. 1029, 1:20–25 (“Vehicles typically include . . . an in-vehicle entertainment system.”), 27:4–55 (teaching a USB connector or interface may be embedded in vehicle control system, which “could be classified as an embedded host”), Figs. 1, 3, 27–30

(showing various embodiments for a vehicle control system connecting via a USB interface to various remote sources); Ex. 1049,⁸ 1 (“To utilise USB inside the automobile, either the portable consumer device or the infotainment system must contain a USB host to control the flow of data.”); Pet. 14–15, 58. We appropriately consider such evidence of the knowledge that one of ordinary skill in the art would have had as part of our obviousness analysis. *See Randall Mfg.*, 733 F.3d at 1362–63.

Accordingly, at this stage, we find persuasive the testimony of Mr. Welch that one of ordinary skill in the art “viewing Chang would have understood its application to the vehicle context and would have found it obvious to use Chang’s system in a vehicle,” and “[m]ore particularly, it would have been obvious to connect Chang’s system (and . . . [the] modified Chang/Chang II hub) to an embedded host in the vehicle context.” Ex. 1013 ¶ 240; *KSR*, 550 U.S. at 421 (“When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.”).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that Chang teaches “an embedded USB host connected to the USB hub” to one of ordinary skill in the art.

⁸ *USB in Automotive: No Longer Just for PCs*, Brian Ellis, Cypress Semiconductor Corp., Electronic Product News (Sept. 1, 2006).

4. USB Port Connected to a USB Device

Claim 1 further recites “a USB port connected to a USB device capable of operating in a USB Host mode and a USB device mode, and USB multiplexing switches connected to the USB port, the USB hub, and the USB bridge.” Ex. 1009, 9:20–10:4. At this stage, we agree with Petitioner and find that the combination of Chang and Chang II teaches this limitation. Pet. 8–12, 42–48, 60–65.

In particular, at this stage, we agree with Petitioner that this limitation is taught by the proposed combination of Chang and Chang II, which modifies Chang with Chang II’s teachings to include (i) a dual-role port connected to a dual-role device and (ii) a switch to route the port to the appropriate transmission path. Petitioner illustrates its combination by modifying Chang’s Figure 3, shown below truncated to the portions relevant to this limitation. Pet. 65 (modifying and annotating Ex. 1014, Fig. 3).

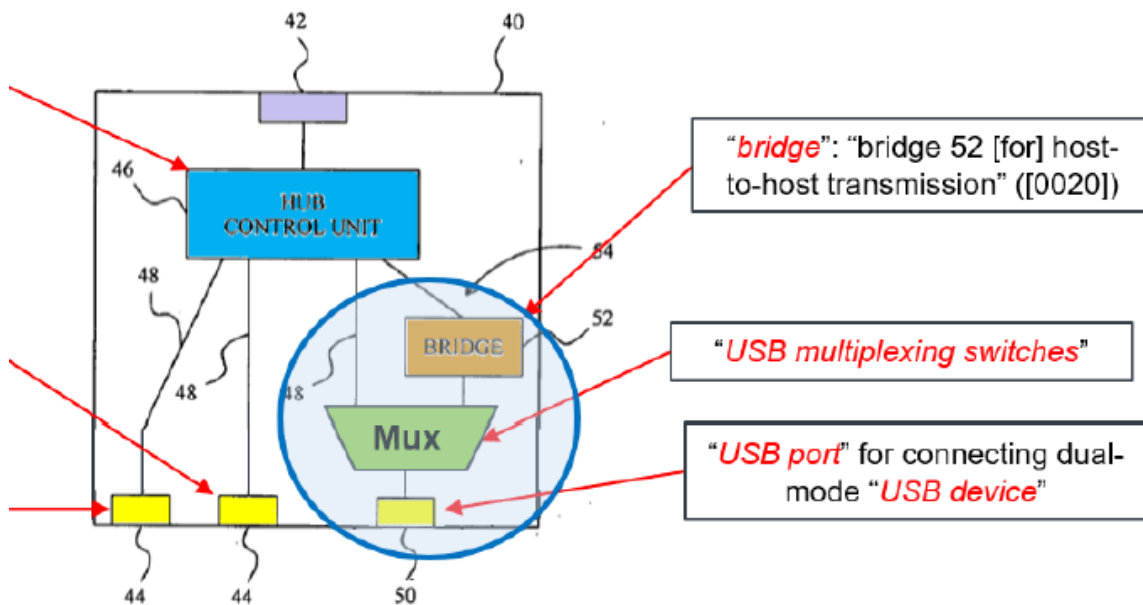


Figure 3 “is a schematic view of a hub according to” Chang’s teachings. Ex. 1014 ¶ 14. Petitioner modifies the figure by adding a Mux,⁹ which is connected to (i) port 50 at the input of the Mux and (ii) hub control unit 46 and bridge 52 at its output. Pet. 65. Petitioner draws a blue shaded circle around bridge 52, the Mux, and port 50. *Id.* Also, Petitioner labels (i) port 50 as “‘USB port’ for connecting dual-mode ‘USB device,’” (ii) Mux as “‘USB multiplexing switches,” and (iii) bridge 52 as “bridge.” *Id.* (emphasis omitted).

a) USB Port

At this stage, we agree with Petitioner that Chang II teaches providing “a USB port connected to a USB device capable of operating in a USB Host mode and a USB device mode.” Pet. 9–10, 60–65. In particular, we find that Chang II teaches providing a single port that allows a connected USB product to act either as a host device or a slave device. *See, e.g.*, Ex. 1015 ¶¶ 11 (“automatically detect the connecting device type”), 21 (“automatically detecting the type of device connected (host or slave)”), 22 (teaching that a “connection interface . . . is for connecting to a second host device . . . or a slave device”), 29–30 (teaching that a “dual connector type design” or an “adapter” can be used so that either a host device or a slave device can be connected to the interface).

Moreover, Chang II teaches that the first and second connection interfaces can each use an A-Type USB male connector to connect two host

⁹ Chang II teaches using a bypass circuit unit, a detection unit, and a central processing unit (CPU) for switching between the two paths. *E.g.*, Ex. 1015 ¶¶ 21, 34–40. Petitioner argues that it would have been obvious to accomplish the switching using a Mux as illustrated in the annotated figure. *See* Pet. 64. We address below arguments concerning this substitution. *See infra* Section V.C.4.b.

devices. Ex. 1015 ¶ 29. But Chang II also teaches that if a slave device (normally a B-Type USB female connector) needs to connect, then an adapter can be further attached to the second connection interface's A-Type USB male connector to provide a B-Type male connector. *Id.* Hence, Chang II teaches a single port for connecting a host device or a slave device.

In addition, Chang II teaches that “[o]f course, the connector type of the second connection interface 12 (A-Type male connector) is not limited to what is shown.” *Id.* ¶ 30. Instead, “other combinations and other connector types are too numerous to list, but those connector types covered under USB specification [are] all within the scope of” Chang II’s invention. *Id.* At this stage, we agree with Petitioner and find that such an “other connector type[]” would have included, for example, “the well-known ‘Micro-AB’ connector (and other known connectors) that accepted host, device, and/or dual-mode products.” Pet. 61–62; Ex. 1022,¹⁰ 13 (§ 1.3) (describing a dual-role device as “provid[ing] both host and peripheral capabilities over a single Micro-AB receptacle”); Ex. 1013 ¶ 250.

Moreover, at this stage, we agree with Petitioner that dual-role devices (i.e., devices that can function as a host and slave) were well-known to one of ordinary skill in the art before the effective filing date of the ’072 patent. Pet. 9; Ex. 1013 ¶¶ 69–73; Ex. 1016,¹¹ code 57 (discussing “dual-role devices (OTG devices)”); Ex. 1022, § 1.1 (“An OTG product is a portable device that uses a single Micro-AB receptacle (and no other USB receptacles) to operate at times as a USB Targeted Host and at times as a

¹⁰ *On-The-Go and Embedded Host Supplement to the USB Revision 2.0 Specification*, Rev. 2.0 ver. 1.1a (July 27, 2012).

¹¹ US 2004/0019732 A1, published Jan. 29, 2004.

USB peripheral.”); Ex. 1032¹² ¶¶ 7, 52, 102 (discussing dual-role peripheral devices); Ex. 1033¹³ ¶ 40 (discussing OTG devices). In fact, the ’072 patent acknowledges that “leading mobile device manufacturers and system designers ha[d] begun designing their mobile device products (i.e., smart phones, tablets, etc.) to support both USB Host and USB Device roles.” Ex. 1009, 2:59–62. We also note that because dual-role devices were well-known, it follows that connectors for such devices also would have been well-known.

Accordingly, in light of the above, we agree with Petitioner that one of ordinary skill in the art would have found it obvious to connect a dual-role product to Chang II’s second interface connection using a single dual-role connector. Pet. 62 (citing Ex. 1013 ¶¶ 250–253). In other words, it would have been obvious to substitute a well-known dual-role device (e.g., a mobile device) for a single-role device using one dual-role connector (e.g., a Micro-AB connector) when connecting to a dual-role port, such as Chang II’s port. *See KSR*, 550 U.S. at 417 (finding obvious “the simple substitution of one known element for another”); *see also id.* at 421 (“When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.”).

At this stage, we find unavailing Patent Owner’s argument that “Chang II does not mention dual-role devices.” Prelim. Resp. 21. For the reasons above, we find that one of ordinary skill in the art would have found it obvious to employ dual-role devices in the proposed combination. We

¹² US 2008/0005262 A1, published Jan. 3, 2008.

¹³ US 2007/0255885 A1, published Nov. 1, 2007.

also disagree with Patent Owner’s argument that “[n]othing about Chang II suggests that it is intended for use with dual-role devices.” *Id.* (citing Ex. 2001 ¶ 56). Rather, as we discuss above, Chang II’s dual-role ports coupled with what was well-known to one of ordinary skill in the art makes such a suggestion to one of ordinary skill.

We also find unavailing Patent Owner’s arguments that Chang II’s teaching of any USB connector being in the scope of its invention does not “suggest that Chang II would be useful for dual-role devices.” *Id.* at 22 (citing Ex. 2001 ¶ 58). Rather, as we discuss above, this teaching further supports that connecting dual-role devices would have been obvious in light of Chang II’s other teachings and the knowledge of an ordinary skilled artisan.

At this stage, we find inapposite Patent Owner’s argument that “it would have been apparent that Micro-AB connectors would limit the utility of a USB hub like Chang’s by using an uncommon port that would have required an adapter to interface with most USB devices.” *Id.* at 23 (citing Ex. 2001 ¶ 59). Rather, Petitioner points to Micro-AB connectors as an example of connectors for dual-mode products to show that dual-mode connectors were well-known to one of ordinary skill in the art. Pet. 61. To the extent that this argument relates to teaching away, Patent Owner does not identify sufficient criticism for such.

We also find inapposite Patent Owner’s argument that “[n]otably, Petitioner does not propose using Micro-AB connectors in its combination of Chang and Chang II.” Prelim. Resp. 23. Simply put, there is nothing in the claim language that requires a specific type of connector. Ex. 1009, 9:20–10:2. *See In re Hiniker Co.*, 150 F.3d 1362, 1369 (Fed. Cir. 1998) (stating “the name of the game is the claim”). To the extent that Patent

Owner believes that this limitation should be construed to require a specific connector (or that “connector” is synonymous with “port”), Patent Owner should provide detailed factual and legal support for such during trial, in accordance with our Rules.

We also find unavailing Patent Owner’s argument that “Chang II expressly discloses that the use of an adapter is necessary to swap between the USB connection used for USB hosts (A-type male) and the USB connection used for USB devices (B-type female).” Prelim. Resp. 24. Patent Owner continues that “Chang II’s disclosure that its second interface could use any of the connector types covered under the USB specification does not obviate the need for an adapter to switch between different USB specification connector types at a given port.” *Id.* (citing Ex. 1015 ¶ 30; Ex. 2001 ¶ 59). According to Patent Owner, “[i]t is the adapter that permits the second connection interface to ‘acquire’ a different USB specification connection type than the one it had ‘adopt[ed].’” *Id.*

At this stage, we find that these arguments concerning an adapter are inconsistent with Chang II’s teachings. In particular, Chang II teaches that “[i]n practical design, the second connection interface 12 can also directly adopt an A-Type male connector and a B-Type male connector of USB specification to achieve dual connector type design.” Ex. 1015 ¶ 30. Thus, Chang II teaches that an adapter is not necessary for at least some dual-role port embodiments. *Id.* Nor do we find a principled basis to limit Chang II’s teaching that “those connector types covered under USB specification [are] all within the scope of [its] invention” to those types that require an adapter. *Id.*

b) USB Multiplexing Switches

At this stage, we agree with Petitioner and find that the combination of Chang and Chang II renders obvious providing “USB multiplexing switches connected to the USB port, the USB hub, and the USB bridge.” Pet. 9–10, 61–65. In particular, we find that Chang II teaches “switch[ing] between two different transmission paths,” depending on the connected device. *E.g.*, Ex. 1015, code (57), ¶¶ 11, 21. More specifically, Chang II teaches providing “two different transmission paths, so that by automatically detecting the type of device connected (host or slave)[, its] invention can switch to the proper transmission path, [and] thus not only can host-slave operation between [a] host device and [a] slave device be supported, but direct bridging between two host device[s] for data transfer is also possible.” *Id.* ¶ 21. Figure 5, shown below, shows an embodiment in accordance with this teaching.

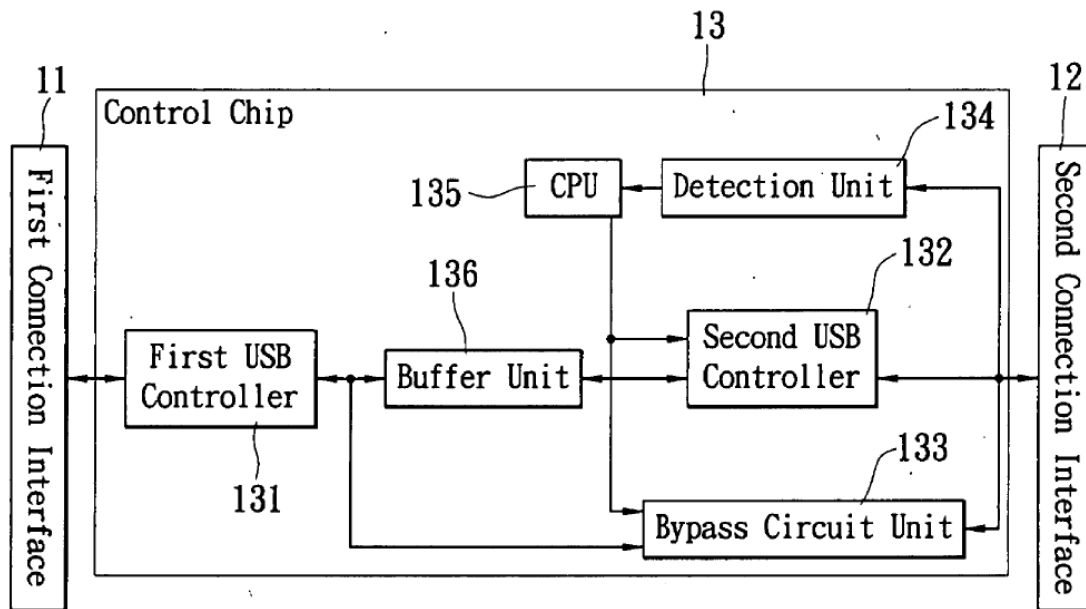
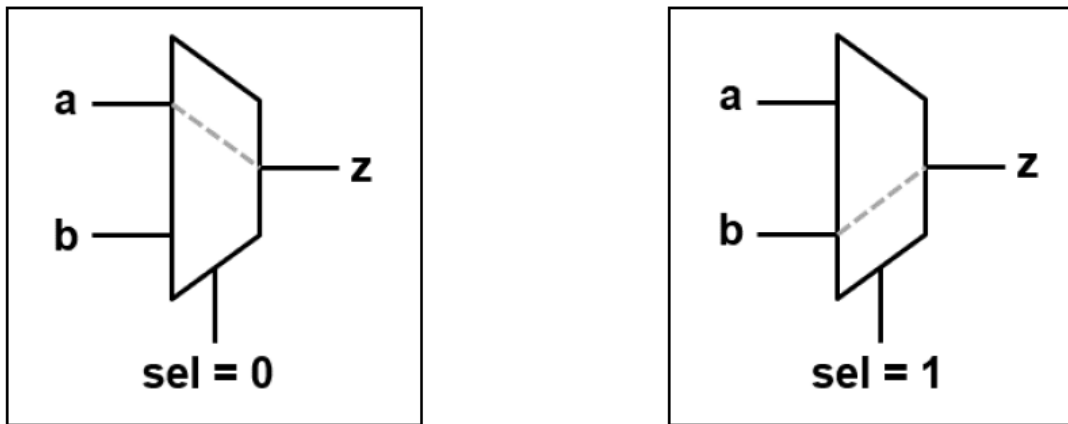


FIG. 5

Figure 5 “shows an embodiment of a schematic diagram for a control chip for a data transmission bridge device for transmitting data according to” Chang II’s teachings. *Id.* ¶ 19. As shown, control chip 13 “includes: a first USB controller 131, a second USB controller 132, a bypass circuit unit 133, a detection unit 134, a central processing unit (CPU) 135, and a buffer unit 136.” *Id.* ¶ 34. Also as illustrated, “[t]he first USB controller 131 connects to [a] first connection interface 11” and “[t]he second USB controller 132 couples to the first USB controller 132[, via the buffer unit 136,] and connects to the second connection interface 12.” *Id.* ¶¶ 35–36. Chang II teaches that “thus the second USB controller 132 coupled with the first USB controller 131 forms a transmission bridge” (i.e., a host path). *Id.* ¶ 36.

In addition, Chang II teaches that “[t]he bypass circuit unit 133 is connected between the first USB controller 131 and the second connection interface 12, such that when the second connection interface 12 is connected with a slave device 4, a direct connection between the first USB controller 131 and the second connection interface 12 can be made” (i.e., a slave path). *Id.* ¶ 37. “The [d]etection unit 134 is also connected to the second connection interface 12,” and “determine[s] 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. And “the CPU 135 is for receiving the detection signal, and then according to the detection signal controls the operation of either the second USB controller 132 or the bypass circuit unit 133.” *Id.* In other words, Chang II teaches switching between (i) the first USB controller 131 and the second USB controller 132 bridge path (two hosts) and (ii) the first USB controller 131 and the bypass circuit unit 133 path (host and slave). *Id.* ¶¶ 35–40.

In addition, we agree with Petitioner that “numerous USB multiplexing switching products were well-known and available by 2013.” Pet. 64; Ex. 1059,¹⁴ 1–2 (listing USB multiplexing switches, including 2:1 switch configurations); Ex. 1060,¹⁵ 1 (“The FSUSB63 is a bi-directional, low-power, High-Speed (HS) USB 2.0 3:1 Multiplexer (MUX).”). We also find persuasive Mr. Welch’s explanation of the operation of a 2:1 multiplexing switch, illustrated below. Ex. 1013 ¶ 89.



The figures collectively show the operation of a 2:1 Mux with (i) inputs “a” and “b,” (ii) output “z,” and (iii) “sel” control signal having a zero or one value. *Id.* Mr. Welch explains that this “multiplexing switch enables connecting either signal ‘a’ or ‘b’ to signal ‘z’ via the ‘sel’ (select) control signal.” *Id.*

Moreover, at this stage, we agree with Petitioner and find that it was well-known to use multiplexing switches “for the specific purpose of routing USB communications emanating from a product to the appropriate path upon detection of whether the product is operating in host or device

¹⁴ Fairchild Semiconductor USB Switch listing (Oct. 16, 2011), *Internet Archive Wayback Machine*, retrieved Aug. 25, 2023.

¹⁵ Fairchild Semiconductor FSUSB63 3:1 High-Speed USB 2.0 Switch / Multiplexer datasheet (Nov. 2010).

mode.” Pet. 11–12; Ex. 1013 ¶ 95; Ex. 1017¹⁶ ¶¶ 56–57, Fig. 6 (teaching a crossbar switch that routes connected USB devices depending on whether they are operating in host or device mode); Ex. 1052,¹⁷ Fig. 1, 3:7–20 (teaching a “switching structure” to route USB ports to the appropriate path depending on host or device detection); Ex. 1053,¹⁸ Fig. 1, ¶¶ 31–34 (teaching switching data line connections based on host/device mode detection).

In light of the above, we agree with Petitioner and find that it would have been obvious to employ multiplexing switches for switching between the bridge path (when a host connects) or bypass path (when a device connects). Pet. 62–64; Ex. 1013 ¶¶ 255–260. In particular, USB multiplexing switching products were well-known and routed connected devices like the routings produced by Chang II’s bypass circuit unit, detection unit, and CPU. *Compare* Ex. 1014 ¶¶ 34–40, Fig. 5 (teaching connecting a port (i.e., port 50) to either of two transmission paths based on a detection signal), *with* Ex. 1013 ¶ 89 (describing the operation of a 2:1 multiplexer switch). Moreover, as we discuss above, it was well-known to use multiplexing switches for routing USB communications based on whether a product is operating in host or device mode. Thus, using the multiplexing switches to perform the switching operations would have been obvious. *See KSR*, 550 U.S. at 417 (finding obvious “the simple substitution of one known element for another”).

In addition, we agree with Petitioner and find that the USB multiplexing switches (Mux) are connected to the USB port (port 50), the

¹⁶ US 2006/0195625 A1, published Aug. 31, 2006.

¹⁷ US 9,864,711 B2, issued Jan. 9, 2012 (Ex. 1052).

¹⁸ US 2004/0088449 A1, published May 6, 2004 (Ex. 1053).

USB hub (hub control unit 46), and the USB bridge (bridge 52). Pet. 44–46, 64–65. Petitioner’s placement of the Mux is consistent with Chang’s teachings of having a separate path for dedicated ports 44 (connecting to hub control unit 46 without traversing bridge 52) and a separate path for port 50 (connecting via bridge 52 to hub control unit 46). *See, e.g.*, Ex. 1014, Fig. 3. Chang II similarly teaches including, or not including, the bridge in the paths depending on the connected device (i.e., host or slave). *See, e.g.*, Ex. 1015, Fig. 5.

In addition, at this stage, we agree with Petitioner that the proposed multiplexing switches are “USB multiplexing switches” because they switch “USB” lines. Pet. 62 n.20; Ex. 1013 ¶ 255. We also agree, at this stage, and find that “a USB connection includes two data lines,” and thus, “typical USB switches will include at least two switches, *e.g.*, to switch (select) among D+ lines and to switch (select) among D- lines.” Pet. 64; Ex. 1060, 1; Ex. 1013 ¶ 259. The parties should consider addressing this issue further during trial, in accordance with our Rules, including whether “USB multiplexing switches” should be construed to have a particular meaning.

At this stage, we find unavailing Patent Owner’s argument that “Chang II contemplates switching between transmission paths, but does not actually disclose a discrete switch that performs this switching.” Prelim. Resp. 29 (citing Ex. 2001 ¶ 61). Patent Owner adds that one of ordinary skill in the art would have understood “that switching between transmission paths could be performed by an element other than multiplexing switches.” *Id.* (citing Ex. 2001 ¶¶ 60–61). As we discuss above, one of ordinary skill would have understood that using multiplexing switches—in lieu of Chang II’s bypass circuit unit and detection unit—for switching between the paths

was a suitable option, which is sufficient. *See Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1381 (Fed. Cir. 2023) (finding sufficient for obviousness showing that the combination was a suitable option).

Moreover, Chang II undisputedly teaches switching between the paths depending on the connected device, as we discuss above. *E.g.*, Ex. 1015 ¶¶ 11, 21. In light of this teaching, coupled with the knowledge of one of ordinary skill in the art we discuss above, it would have been obvious to employ multiplexing switches for switching between the paths. *See* Ex. 1013 ¶¶ 89, 95, 255–258; *Koninklijke Philips N.V. v. Google LLC*, 948 F.3d 1330, 1338 (Fed. Cir. 2020) (finding obviousness can rely on supported expert testimony to supply an element of a claim).

c) Combining Chang and Chang II

Petitioner modifies Chang with Chang II’s teachings to include a dual-role port and a Mux to route the port to the appropriate transmission path. At this stage, we agree with Petitioner and find that it would have been obvious to substitute Chang II’s dual-role port for Chang’s port 50, as well as to include Chang II’s switching. Pet. 42–44, 64–65; Ex. 1013 ¶¶ 184–185. In particular, we find persuasive Mr. Welch’s testimony that one of ordinary skill in the art would have been motivated to employ dual-role mode ports instead because employing dedicated ports requires having “‘multiple connectors, multiple [application-specific integrated circuit (ASIC)] pins and the like,’ which adds ‘overhead’ and ‘increase[s] the cost[s].’” Ex. 1013 ¶ 177 (quoting Ex. 1025,¹⁹ 1:36–43) (second and third alterations in original).

¹⁹ US 8,683,085 B1, issued Mar. 25, 2014 (Ex. 1025, “Castleberry”).

We also find persuasive Mr. Welch’s testimony that substituting Chang II’s dual-role port for Chang’s port 50 “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.* ¶ 179; Pet. 44. As Mr. Welch testifies, “[w]ith a dual-role port, the user would not have to know what mode the smartphone was operating in, and then switch the smartphone between the appropriate dedicated host or device port.” Ex. 1013 ¶ 179. At this stage, we find that this rationale also provides sufficient motivation for one of ordinary skill in the art to employ a dual-role port in lieu of host port 50.

In addition, at this stage, we agree with Petitioner that “in view of a dual-role mode USB port, it would have been obvious to include ‘USB multiplexing switches connected to the USB port, the USB hub, and the USB bridge’ to route the downstream USB product to the appropriate path.” Pet. 62 (emphases omitted). This is consistent with Chang II’s teachings, which require such switching. *E.g.*, 1015 ¶¶ 11, 21. In other words, to realize the benefits of the rationales for using dual-role ports in Chang, one of ordinary skill in the art would have included a switch to route the downstream port to the appropriate path. *See* Ex. 1013 ¶¶ 184–185.

In addition, we agree with Petitioner and find that one of ordinary skill in the art would have had an expectation of success in modifying Chang to include dual-role ports and switching. Pet. 44. As we discuss above, dual-role ports, host/device detection, and multiplexing switches were already well-known.

At this stage, we find unavailing Patent Owner’s argument that “Chang already accommodated both USB hosts and USB devices through dedicated ports for host-to-host and host-to-device transmission,” and thus,

one of ordinary skill in the art “would have no motivation to look to Chang II . . . when searching for a disclosure pertinent to incorporating dual-role ports into Chang’s invention (which already accommodated dual-role devices).” Prelim. Resp. 25 (citations omitted). First, Chang teaches having dedicated ports—rather than dual-role ports—and thus, one of ordinary skill in the art would have been motivated to look to Chang II’s dual-role ports to accommodate dual-role devices for the reasons we discuss above. Second, the proper focus is whether the combination provides a suitable option, rather than looking to whether a problem already is addressed. *See Intel Corp.*, 61 F.4th at 1380 (holding the Board erred by concluding there was no reason to combine in part because the base reference “already addresses” a problem); *id.* at 1381 (finding that a petitioner is not required to show that the combination would be an improvement, but only that it was a suitable option).

We also find unavailing Patent Owner’s argument that one of ordinary skill in the art “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. 25 (citing Ex. 2001 ¶ 67; Ex. 1014 ¶ 3). This is akin to arguing that the teachings cannot be physically combined, which is an improper focus for determining whether the claim would have been rendered obvious by the prior art as a whole. *See Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016) (quoting *In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983)); *see also id.* (quoting *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (en banc)) (“Etter’s assertions that Azure cannot be incorporated in Ambrosio are

basically irrelevant, the criterion being 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 addition, at this stage, we do not view Petitioner’s proposed combination as frustrating “easily establishing a connection between a computer and another computer.” Chang II’s teachings also provide for such a connection. *See infra* Section V.C.5–6. Moreover, “in many cases a person of ordinary skill w[ould] be able to fit the teachings of multiple patents together like pieces of a puzzle.” *KSR*, 550 U.S. at 420.

We also find unavailing Patent Owner’s argument that “Petitioner cherry-picks only a portion of Chang II’s bridge (the detection unit) as the sole component from Chang II that Petitioner proposes should be added to Chang.” Prelim. Resp. 26 (citing Pet. 46–47 & n.17); *see also id.* (making substantively same arguments). This argument is incorrect. For example, Petitioner states that “[i]t would have been routine and obvious for the detection unit and/or bridge *to control* the switching functionality.” Pet. 47 n.17 (citing Ex. 1013 ¶ 193) (emphasis added). Petitioner does not state here that the detection unit is the sole component to add to Chang. *See id.* at 46–47 & n.17. To the contrary, Petitioner identifies additional components of Chang II and explains why adding a Mux would have been obvious to one of ordinary skill in the art. *See supra* Section V.C.4.b.

We also find unavailing Patent Owner’s argument that Petitioner’s arguments for motivation to combine “fail to mention Chang II’s teachings at all and therefore fail as a matter of law.” Prelim. Resp. 27. First, Petitioner’s argument that products “with dual-role USB capabilities were gaining popularity” relates to one of ordinary skill in the art’s knowledge (i.e., that dual-role products were well-known), which is appropriately

considered. *Randall Mfg.*, 733 F.3d at 1362–63. Second, Petitioner’s arguments that one of ordinary skill in the art would have been motivated to modify Chang to include dual-role ports because (i) “it would be impractical, and inconvenient at best, to require consumers to understand when to switch connections between dedicated host- and device-ports when using a dual role product”; and (ii) including dual-role ports would save costs, are appropriate motivations. *See* Pet. 42–43; *Intel*, 61 F.4th at 1380 (quoting *Intel*, 21 F.4th at 797–99) (“[U]niversal” motivations known in a particular field to improve technology provide ‘a motivation to combine prior art references *even absent any hint of suggestion* in the references themselves.’”). And the dual-role ports Petitioner refers to are from Chang II.

At this stage, we also find unavailing Patent Owner’s argument that “Petitioner’s expert relies on the purportedly common-sense cost savings of dual-role ports, but provides no evidentiary support.” Prelim. Resp. 30. Rather, Mr. Welch cites Castleberry, which teaches that dedicated ports “add overhead and increase the cost associated with devices that are implemented with both Host and Device functionality.” Ex. 1013 ¶ 74 (citing Ex. 1025, 1:41–43); Ex. 1025, 1:41–43. We also find unavailing Patent Owner’s argument that “Petitioner’s expert [did not] compare the costs associated with Chang’s solution to the costs associated with Petitioner’s allegedly obvious modification of Chang.” Prelim. Resp. 30. In light of Castleberry’s teaching, at this stage, we find that one of ordinary skill in the art at least would have found it obvious to try making the proposed combination.

In addition, Patent Owner argues that Petitioner’s purported motivation based on Chang II’s mentions of a US hub are insufficient to support combining Chang and Chang II. Prelim. Resp. 31–32 (citing Pet. 46

(citing Ex. 1015 ¶¶ 27, 40)). At this stage, we question whether the cited discussion in Chang II regarding acting like a USB hub support making the proposed combination. The parties should consider further developing this issue during trial, in accordance with our Rules. We note, however, that Petitioner identifies other rationales, discussed above, that we find support combining Chang and Chang II in the manner Petitioner does.

Accordingly, in light of the above, we find that Petitioner has provided sufficiently articulated reasoning with rational underpinning to support combining Chang and Chang II in the manner Petitioner proposes. *See Kahn*, 441 F.3d at 988; *see also Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1374 (Fed. Cir. 2019) (“A motivation to combine may be found ‘explicitly or implicitly in market forces; design incentives; . . . and the background knowledge, creativity, and common sense of the person of ordinary skill.’”) (quoting *ZUP, LLC v. Nash Mfg., Inc.*, 896 F.3d 1365, 1371 (Fed. Cir. 2018)).

d) Summary

In sum, at this stage, we agree with Petitioner that the proposed combination of Chang and Chang II teaches “a USB port connected to a USB device capable of operating in a USB Host mode and a USB device mode, and USB multiplexing switches connected to the USB port, the USB hub, and the USB bridge.” We also find, at this stage, that Petitioner has provided sufficiently articulated reasoning with rational underpinning to support Petitioner’s combination.

5. Receiving a First USB Signal

Claim 1 further recites “receiving a first USB signal from the USB device via the USB port while the USB device is operating in the USB host

mode.” Ex. 1009, 10:5–7. At this stage, we agree with Petitioner and find that the combination of Chang and Chang II teaches this limitation. Pet. 66.

In particular, we agree with Petitioner that Chang teaches “allowing host-to-host communication through ‘a host-to-host transmission path 54 [that] may be established such that the uplink port 42 may communicate with the host port 50.’” Pet. 66 (quoting Ex. 1014 ¶ 20). In other words, the connected USB product sends USB signals to port 50. Ex. 1014 ¶ 20; Ex. 1013 ¶ 262.

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that the combination of Chang and Chang II teaches this limitation.

6. Routing the First USB Signal

Claim 1 further recites “routing the first USB signal via the USB multiplexing switches from the USB device to the embedded USB host through the USB bridge and the USB hub.” Ex. 1009, 10:8–10. At this stage, we agree with Petitioner and find that the combination of Chang and Chang II teaches this limitation. Pet. 66–67.

In particular, we agree with Petitioner that Chang II teaches generating “a detection signal (bridging detection signal or slave detection signal)” and “then according to the detection signal control[ling] the operation of either the second USB controller 132 or the bypass circuit unit 133.” Pet. 67 (quoting Ex. 1015 ¶ 38). We also agree with Petitioner and find that one of ordinary skill in the art, “[a]pplying this teaching . . . to Chang, upon detection of the consumer product in host mode, the switch would connect the port to the bridge.” *Id.*; Ex. 1013 ¶ 263; *see also* Pet. 11–12 (arguing that multiplexing switches were well-known). We also agree

with Petitioner and find that the proposed combination teaches routing the first USB signal via the USB multiplexing switches (Mux) from the USB device (connected to port 50) to the embedded USB host (connected to uplink port 42) through the USB bridge (bridge 52) and the USB hub (hub control unit 46). Pet. 67 (annotating and modifying Ex. 1014, Fig. 3) (showing the routing path).

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that the combination of Chang and Chang II teaches this limitation.

7. Receiving a Second USB Signal

Claim 1 further recites “receiving a second USB signal from the USB device via the USB port while the USB device is operating in the USB device mode.” Ex. 1009, 10:11–13. At this stage, we agree with Petitioner and find that the combination of Chang and Chang II teaches this limitation. Pet. 68–69.

In particular, we agree with Petitioner that Chang teaches “several transmission paths 48 between the uplink port 42 and downlink ports 44.” Pet. 68 (quoting Ex. 1014 ¶ 19). As we discuss above, we also agree with Petitioner and find that it would have been obvious to modify Chang to include dual-role ports for dual-mode USB products. *Id.*; *see also supra* Section V.C.4.a (addressing include dual-role ports for dual-mode products). Accordingly, we agree with Petitioner and find that the proposed combination teaches receiving a second USB signal from the USB device (dual-role product) via the USB port (port 50) while the USB device is operating in the USB device mode. Pet. 68; Ex. 1013 ¶ 266.

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that the combination of Chang and Chang II teaches this limitation.

8. Routing the Second USB Signal

Claim 1 further recites “routing the second USB signal via the USB multiplexing switches from the USB device to the embedded USB host through the USB hub, wherein the second USB signal from the USB device to the embedded USB host bypasses the USB bridge.” Ex. 1009, 10:11–13. At this stage, we agree with Petitioner and find that the combination of Chang and Chang II teaches this limitation. Pet. 69–71.

In particular, we agree with Petitioner that Chang II teaches generating “a detection signal (bridging detection signal or slave detection signal)” and “then according to the detection signal control[ling] the operation of either the second USB controller 132 or the bypass circuit unit 133.” *Id.* at 70 (quoting Ex. 1015 ¶ 38). We also agree with Petitioner and find that one of ordinary skill in the art, applying this teaching with the proposed combination of Chang and Chang II would have found it obvious to implement the switch to route USB signals to the embedded host by bypassing the bridge, upon detecting a product in device mode. *Id.*; Ex. 1013 ¶ 267. More specifically, we find that the proposed combination teaches routing the second USB signal via the USB multiplexing switches (Mux) from the USB device (connected to port 50) to the embedded USB host (connected to uplink port 42) through the USB hub (hub control unit 46), wherein the second USB signal from the USB device to the embedded USB host bypasses the USB bridge (bridge 52). Pet. 71 (annotating and modifying Ex. 1014, Fig. 3) (showing the routing path); Ex. 1013 ¶ 267.

After reviewing Petitioner’s arguments and evidence, which are not addressed by Patent Owner at this stage of the proceeding, we are persuaded that Petitioner demonstrates, for purposes of this institution decision, that the combination of Chang and Chang II teaches this limitation.

9. Summary

In sum, we determine that Petitioner shows a reasonable likelihood that it would prevail in showing that claim 1 would have been obvious in view of Chang and Chang II.

VI. ALLEGED OBVIOUSNESS OVER CHANG, CHANG II,
AND CHUTORASH

Petitioner argues that the combination of Chang, Chang II, and Chutorash renders claim 1 obvious. Pet. 72–76. Petitioner already has demonstrated a reasonable likelihood of success in proving that claim 1 would have been obvious. In order to provide guidance to the parties, however, we address disputed issues for this ground. *See* Consolidated Trial Practice Guide November 2019²⁰ (“CTPG”) 6 (“If a trial is instituted, the Board generally will provide analysis of the strengths and weaknesses of all challenges in the petition in order to provide guidance to the parties for the upcoming trial.”).

A. Summary of Chutorash

Chutorash “relates generally to the fields of communication, navigation, and/or user control in a motor vehicle.” Ex. 1029, 1:17–19. In relevant part, Chutorash teaches a vehicle control system with USB interfaces that facilitate operative connection of “portable device[s] that may be brought into [the] vehicle . . . and configured to communicate via USB

²⁰ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

connection” (e.g., mobile phones, GPS receivers, navigation devices, media players). *See* Ex. 1029, 27:1–30; *see also id.* Figs. 1, 3, 27–30 (showing the vehicle control system installed in a vehicle).

B. Combining Chang, Chang II, and Chutorash

The parties dispute whether one of skill in the art would have combined the teachings of Chutorash with Chang and Chang II to render claim 1 obvious. Pet. 72–76; Prelim. Resp. 33–35. We find that Petitioner’s rationale for combining these references is sufficient for institution.

Claim 1 recites “an USB embedded host.” Ex. 1009, 9:19–20. Petitioner relies on Chutorash’s USB “vehicle control system 106,” which includes a “media system” and “entertainment system,” and is within a vehicle to teach “an USB embedded host.” Pet. 75–76 (citing Ex. 1029, 5:27–33, Figs. 1–3, 27–30; Ex. 1013 ¶ 273).

At this stage, we agree with Petitioner that the combination of Chang and Chang II teaches “a USB hub with a host-to-host bridge and one (or more) dual-role ports,” and that “Chutorash expressly discloses using a USB hub in a vehicle control/infotainment system.” *Id.* at 72–73; *see supra* Section V.C (finding that Chang and Chang II teaches claim 1); Ex. 1029, 27:1–30, Figs. 1, 3, 27–30. And we find sufficient for institution Petitioner’s rationale that one of ordinary skill in the art “would have been motivated to use a USB hub with host-to-host capabilities[, such as taught by the combination of Chang and Chang II,] because ‘[v]ehicle control system 106 could be classified as an embedded host’ and various USB products (e.g., mobile phone 2734, media player 2752, etc.) are precisely the types of products that typically act as USB hosts.” Pet. 74 (citing Ex. 1029, 27:1–30; Ex. 1013 ¶ 206). We also credit Petitioner’s argument that “the desirability of being able to plug a smartphone (or other USB product) into any USB

port in the car (*e.g.*, including in passenger seat or backset) would also have motivated [one of ordinary skill in the art] to use a hub with dual-role ports.” *Id.* at 75 (citing Ex. 1013 ¶ 208).

We find unavailing Patent Owner’s arguments that Chutorash does not teach a USB topology having two hosts. Prelim. Resp. 33; *see also id.* at 34 (making similar argument). These arguments incorrectly focus on Chutorash’s teachings, rather than the combined teachings. *See Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986) (“Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references”). As we discuss above, we find that the proposed combination of Chang and Chang II teaches a USB hub with a host-to-host bridge and dual-role ports. *See supra* Section V.C (finding that Chang and Chang II teaches claim 1).

We also find unavailing Patent Owner’s argument that “Chutorash also fails to contemplate that the embedded host it describes is even capable of connecting to another host, much less how it would allow for communication between the two, as would be required for a system capable of coordinating commands to downstream devices.” Prelim. Resp. 34 (citing Ex. 2001 ¶¶ 75–76). “A reference may be read for all that it teaches, including uses beyond its primary purpose.” *In re Mouttet*, 686 F.3d 1322, 1331 (Fed. Cir. 2012). And again, Patent Owner incorrectly focuses on Chutorash’s teachings, rather than the combined teachings. *In re Merck*, 800 F.2d at 1097.

We also find unavailing Patent Owner’s argument that one of ordinary skill in the art “would have needed to significantly alter the infotainment system and its embedded host in order to make any dual-role system useful in the vehicle context.” Prelim. Resp. 34. Rather, “in many cases a person

of ordinary skill w[ould] be able to fit the teachings of multiple patents together like pieces of a puzzle.” *KSR*, 550 U.S. at 420.

VII. CONCLUSION

For the foregoing reasons, we determine that Petitioner has demonstrated that there is a reasonable likelihood that it would prevail in proving the unpatentability of the challenged claim of the ’072 patent. We thus institute an *inter partes* review of the challenged claim on all grounds asserted in the Petition. *See* 37 C.F.R. § 42.108(a).

Any findings or conclusions in this Decision are made only for the purposes of institution and are not dispositive of any issue. We have not made a final determination with respect to the patentability of any challenged claim. Our final determination will be based on the record as fully developed during trial, including any evidence or argument timely presented by the parties under our Rules.

VIII. ORDER

In consideration of the foregoing, it is hereby

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of the ’072 patent is instituted on all of the challenged claims and all grounds asserted in the Petition; and

FURTHER ORDERED that 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; the trial commences on the entry date of this Decision.

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