

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICROCHIP TECHNOLOGY INC.,
Petitioner,

v.

APTIV TECHNOLOGIES AG,
Patent Owner.

Case No. PGR2024-00011
Patent No. 11,681,643

PATENT OWNER'S RESPONSE

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	THE '643 PATENT	3
III.	LEVEL OF ORDINARY SKILL IN THE ART	3
IV.	CLAIM CONSTRUCTION	5
V.	PRIORITY DATE	5
VI.	PETITIONER'S REFERENCES	5
A.	Chang.....	5
B.	Chang II.....	7
C.	Chutorash.....	11
VII.	GROUND I: CLAIMS 1-15 ARE NOT RENDERED OBVIOUS BY CHANG IN VIEW OF CHANG II AND POSITA KNOWLEDGE.....	12
A.	The Petition's Proposed Combination	12
1.	The Hub 46 Mux Implementation	13
2.	The Hub 40 Mux Implementation	16
B.	The Proposed Combination Is Incomplete and Technically Unsound.....	18
1.	The Petition Fails to Show the Claimed Method or Routing Logic Circuit With Particularity For Any Challenged Claim.....	19
2.	The Proposed Combination Is Technically Unsound Because the Routing Logic Circuit Would Disconnect Its Control Signals.....	22
C.	The Proposed Combination Does Not Meet the Claim Limitations.....	31
1.	Claims 1, 5, and 10	31
2.	Claims 2, 7, 13	33
3.	Claims 3, 4, 8, 9, 14, 15	36

D.	The Proposed Combination Is Improper For Relying On Conclusory Statements And Unspecific Expert Testimony To Establish A Missing Claim Limitation.....	37
E.	The POSITA Would Not Have Been Motivated to Modify Chang in View of Chang II and the POSITA’s Knowledge To Meet The Claim Limitations	39
1.	The Proposed Combination Would Change the Principles Under Which The Prior Art Was Designed to Operate And Would Render The Prior Art Inoperable For Its Intended Purposes	40
2.	The Proposed Combination Would Impair Usability And Functionality And Undermine USB Goals	42
3.	The Proposed Combination Would Introduce Unnecessary Complexity, Redundancy, and Additional costs.....	44
4.	The POSITA Would Not Have Any Reasonable Expectation Of Success In Combining The References	48
VIII.	GROUND II: CLAIMS 2, 7, and 13 ARE NOT RENDERED OBVIOUS BY CHANG IN VIEW OF CHANG II, Chutorash, AND POSITA KNOWLEDGE.....	48
IX.	SECONDARY CONSIDERATIONS FURTHER SUPPORT THAT THE CHALLENGED CLAIM IS NON-OBVIOUS	49
A.	There Are Numerous Objective Indicia Of Non-Obviousness As To The Patented Approach To Providing Persistent Downstream Connectivity.....	50
1.	Long-felt but unsolved needs.....	50
2.	Failure of others/skepticism of skilled artisans	55
3.	Commercial success.....	60
4.	Industry praise.....	62

5.	Copying	64
B.	There Is A Clear Nexus Between The Persistent Downstream Connectivity Claims And Objective Indicia	68
X.	THE CHALLENGED CLAIMS ARE NOT INDEFINITE UNDER 35 U.S.C. § 112.....	70
A.	“The USB Hub and USB Bridge Have Different Components and Functionality” (Ground 3)	71
B.	“Routing Logic Circuit” (Ground 4)	74
C.	“Signal Detection Circuit” (Ground 5)	77
1.	35 U.S.C. § 112 ¶ 6 does not apply because “signal detection circuit” does not recite “means” or a similar nonce word.....	77
2.	Petitioner cannot overcome the presumption that “signal detection circuit” is not a means-plus- function term	79
D.	“Wherein the USB Routing Switch Includes the Signal Detection Circuit” (Ground 6).....	82
1.	Petitioner’s contention that its argument also extends to dependent Claim 15 is baseless	82
2.	“Includes” has a straightforward meaning.....	83
3.	Petitioner’s contention relates to implementation- level details, not definiteness	85
XI.	THE CHALLENGED CLAIMS HAVE SUFFICIENT WRITTEN DESCRIPTION UNDER 35 U.S.C. § 112.....	86
1.	Petitioner’s contention that its argument extends to dependent Claim 15 is baseless.....	86
2.	Claims 4 and 9 have adequate written description	87
XII.	CONCLUSION.....	90

TABLE OF AUTHORITIES**Page(s)****Cases**

<i>Aptiv Techs. Ltd. v. Microchip Tech., Inc.</i> , No. 1:23-cv-00307-JDW, 2024 WL 3400109 (D. Del. July 12, 2024)	71, 75, 77, 80
<i>Arendi S.A.R.L. v. Apple Inc.</i> 832 F.3d 1355 (Fed. Cir. 2016)	2, 37
<i>Ariad Pharm., Inc. v. Eli Lilly & Co.</i> , 598 F.3d 1336 (Fed. Cir. 2010)	87
<i>BASF Corp. v. Johnson Matthey Inc.</i> , 875 F.3d 1360 (Fed. Cir. 2017)	72
<i>Boston Sci. Corp. v. Johnson & Johnson</i> , 647 F.3d 1353 (Fed. Cir. 2011)	88
<i>Entropic Commc'ns, LLC v. Charter Commc'ns, Inc.</i> , No. 22-cv-00125-JRG, 2023 WL 4181266 (E.D. Tex. June 26, 2023)	83
<i>Fox Factory, Inc. v. SRAM, LLC</i> , 944 F.3d 1366 (Fed. Cir. 2019)	69
<i>Graham v. John Deere Co.</i> , 383 U.S. 1 (1966)	39
<i>In re Kaslow</i> , 707 F.2d 1366 (Fed. Cir. 1983)	87
<i>In re Kotzab</i> , 217 F.3d 1365 (Fed. Cir. 2000)	39
<i>Koninklijke Philips N.V. v. Google LLC</i> 948 F.3d 1330 (Fed. Cir. 2020)	2, 37, 39
<i>Linear Tech. Corp. v. Impala Linear corp.</i> , 379 F.3d 1311 (Fed. Cir. 2004)	78, 81

<i>McGinley v. Franklin Sports, Inc.</i> , 262 F.3d 1339 (Fed. Cir. 2001)	41
<i>In re Merck & Co., Inc.</i> , 800 F.2d 1091 (Fed. Cir. 1986)	48
<i>Microchip Tech. Inc. v. Aptiv Techs. AG</i> , PGR2024-00011, Paper 9, 42-43 (P.T.A.B. Apr. 18, 2024)	72, 85
<i>MIT v. Abacus Software</i> , 462 F.3d 1344 (Fed. Cir. 2006)	75, 78, 79, 80
<i>MTD Prods. Inc. v. Iancu</i> , 933 F.3d 1336 (Fed. Cir. 2019)	77
<i>Nalpropion Pharms., Inc. v. Actavis Lab'ys., FL, Inc.</i> , 934 F.3d 1344 (Fed Cir. 2019)	89
<i>Nautilus, Inc. v. Biosig Instruments, Inc.</i> , 572 U.S. 898 (2014).....	71, 85
<i>In re Packard</i> , 751 F.3d 1307 (Fed. Cir. 2014)	71
<i>Phenix Longhorn, LLC v. Wistron Corp.</i> , No. 2:17-cv-00711-RWS, 2019 WL 2568476 (E.D. Tex. June 21, 2019)	80
<i>Plas-Pak Indus., Inc. v. Sulzer Mixpac AG</i> , 600 F. App'x 755 (Fed. Cir. 2015).....	41
<i>Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.</i> , 711 F.3d 1348 (Fed. Cir. 2013)	78
<i>PowerOasis, Inc. v. T-Mobile USA, Inc.</i> , 522 F.3d 1299 (Fed. Cir. 2008)	73
<i>In re Rouffet</i> , 149 F.3d 1350 (Fed. Cir. 1998)	50
<i>Sonix Tech. Co v. Publ'ns Int'l, Ltd.</i> , 844 F.3d 1370 (Fed. Cir. 2017)	73

<i>Sorensen v. Int’l Trade Comm’n</i> , 427 F.3d 1375 (Fed. Cir. 2005)	74, 85
<i>Tandon Corp. v. U.S. Int’l Trade Comm’n</i> , 831 F.2d 1017 (Fed. Cir. 1987)	83
<i>Tinnus Enters., LLC v. Telebrands Corp.</i> , 733 F. App’x 1011 (Fed. Cir. 2018)	73, 76
<i>Univ. of Rochester v. G.D. Searle & Co., Inc.</i> , 358 F.3d 916 (Fed. Cir. 2004)	87
<i>Williamson v. Citrix Online, LLC</i> , 792 F.3d 1339 (Fed. Cir. 2015)	77

Statutes

35 U.S.C. § 112	3, 70, 86, 87
35 U.S.C. § 112 ¶ 6	77, 82
35 U.S.C. § 312(a)(3)	22

Exhibit List for Post-Grant Review of U.S. Patent No. 11,681,643

Exhibit #	Exhibit Description
2001	Declaration of Henry Houh (“Houh Decl.”)
2002	Trial Transcript Excerpts, <i>Microchip Tech. Inc. v. Aptiv Servs. US, LLC</i> , No. 17-cv-1194 (D. Del. Apr. 6-13, 2022) – Testimony of Mitch Obolsky
2003	Trial Transcript Excerpts, <i>Microchip Tech. Inc. v. Aptiv Servs. US, LLC</i> , No. 17-cv-1194 (D. Del. Apr. 6-13, 2022) – Testimony of Robert Voto
2004	Complaint, <i>Aptiv Technologies Ltd. v. Microchip Technology, Inc.</i> , No. 23-cv-307-JDW (DED)
2005	Trial Exhibit No. 58 - Jun. 18, 2014, Mark Orlosky and Brigham Steele Email Chain re: CarPlay and forced DCP to external ports
2006	Trial Exhibit No. 62 - Oct. 1, 2014, Stefan Saenger, Chris Behal, and Ray Kamps Email Chain re: CarPlay - Fiat
2007	Trial Exhibit No. 66 - Nov. 26-Dec. 1, 2014, David Sroka, Eric Kawamoto, and Sal Canu Email Chain re: Media Hub Interim Update
2008	Trial Exhibit No. 246 - Jul. 20, 2014, Don Perkins Email re: UNG Detroit Sales Meeting and Training July 15 – 18
2009	Trial Exhibit No. 252 Aug. 11, 2014, David Sroka, Don Perkins, and Sal Canu Email Chain re: CarPlay compliance Strategy
2010	Trial Exhibit No. 262 - Sal Canu Dec. 2, 2014, Email re: Microchip Position for the Thursday Chrysler Meeting
2011	Merriam Webster – https://www.merriam-webster.com/dictionary/includes
2012	U.S. Patent No. 7,282,965 (“Hatooka”)
2013	U.S. Patent No. 5,838,875 (“Cho”)
2014	U.S. Patent No. 6,441,627 (“Larson”)
2015	Wiley Electrical and Electronics Engineering Dictionary (2004)

Exhibit #	Exhibit Description
2016	Declaration of Robert Dezmelyk in Support of Microchip’s Responsive Claim Construction Brief, <i>Aptiv Technologies Ltd. v. Microchip Technology, Inc.</i> , No. 23-cv-307-JDW (DED)
2017	Trial Transcript Excerpts, <i>Microchip Tech. Inc. v. Aptiv Servs. US, LLC</i> , No. 17-cv-1194 (D. Del. Apr. 6-13, 2022) – Testimony of Michael Dreon
2018	Redacted Version of Jury Verdict Form, <i>Microchip Tech. Inc. v. Aptiv Servs. US, LLC</i> , No. 17-cv-1194 (D. Del.), D.I. 357
2019	Supplemental Declaration of Henry Houh (“Suppl. Houh Decl.”)
2020	Corrected Joint Claim Construction Brief, <i>Aptiv Techs. AG. v. Microchip Tech. Inc.</i> , No. 1:23-cv-00307 (D. Del)
2021	Deposition Transcript of Eric Welch (Oct. 10, 2024)
2022	Trial Exhibit No. 5 – Oct. 23, 2013 Presentation Entitled “Digital iPod Out OTG Solution Dual Role USB HUB”
2023	Trial Exhibit No. 6 – Boston USB Hub with SD Card Port ASIC, Product Specification
2024	Trial Exhibit No. 7 – Functional Diagram of Boston 2 Chip
2025	Trial Exhibit No. 12 – Nov. 10, 2014 Presentation Entitled “Delphi/Unwired USB Hub Apple CarPlay Overview
2026	Trial Exhibit No. 25 – Product Business Plan for Sandia
2027	Trial Exhibit No. 124 – Jun. 9, 2017 Presentation Entitled “Delphi Data Connectivity”
2028	Trial Exhibit No. 143 – Oct. 7, 2015 Presentation Entitled “Delphi Data Connectivity”
2029	Trial Exhibit No. 192 – Jan. 2013 Presentation re: Apple Digital iPod Out Support
2030	Trial Exhibit No. 236 – USB4916 Product Specification

Exhibit #	Exhibit Description
2031	Trial Exhibit No. 248 – Jul. 23, 2014 David Sroka, Brigham Steele, Andrew Rogers, Don Perkins Email Chain re: Debunking Unwired
2032	Trial Exhibit No. 268 – Jan. 5, 2015 David Sroka, Santosh Shetty, Mark Bohm Email Chain re: USB Multi Host Bridge Questions
2033	Trial Exhibit No. 273 – Jan. 12, 2015 Davis Sroka, Mike Pennell, Mark Bohm, Eric Kawamoto Email Chain re: Sparta and Tecvox
2034	Trial Exhibit No. 275 – Jan 26, 2016 Mitchel Obolsky, Steve Sanghi, Ganesh Moorthy Email Chain re: Initial Proposal for Tecvox (Chrysler and Fiat, too) with Attachment
2035	Trial Exhibit No. 287 – Jan. 21, 2016 Mark Bohm, Mitchel Obolsky Email Chain re: Analysis of Unwired Media Connectivity Module
2036	Declaration of Michael Dreon
2037	Dreon Decl. Ex. A – Trial Exhibit No. 18 – Jan. 27, 2016 Presentation Entitled “PACE Award Finalist Dual Role Hub”
2038	Dreon Decl. Ex. B – PACE Award Judge’s Citation
2039	Dreon Decl. Ex. C – PACE Award Video Transcript
2040	Trial Transcript (Vol. 2)
2041	Trial Transcript (Vol. 3)
2042	Trial Transcript (Vol. 4)
2043	Declaration of Eric Welch in IPR2024-00228 (U.S. Patent No. 9,619,420)
2044	Declaration of Eric Welch in IPR2024-00229 (U.S. Patent No. 9,645,962)
2045	Declaration of Eric Welch in IPR2024-00230 (U.S. Patent No. 11,176,072)

I. INTRODUCTION

Patent Owner Aptiv Technologies AG (“Aptiv”) provides this Patent Owner Response to Petitioner Microchip Technology Inc.’s (“Microchip”) Petition (Paper 1). All claims of the ’643 patent are not unpatentable, as the grounds in the Petition are meritless, as set forth herein and supported by the Declaration and Supplemental Declaration of Dr. Henry Houh (EX2001; EX2019).

First, the Petition’s aspirational combination of the references is structurally incapable of operating as described in the Petition or required by the claims. As Petitioner’s expert, Mr. Welch, cautions: “the detection unit *must connect* to the downstream port to detect the mode, as shown in Chang II.” (EX1013, ¶193¹.) But as described further herein, the Petition’s proposed combination ignores Mr. Welch’s own warning: once the proposed combination detects a USB device mode, and routes the downstream port accordingly, the routing switch electrically *bypasses* the detection unit—cutting it off from all downstream ports. Unable to detect any further downstream port modes, the proposed combination is incapable of providing the control signals necessary to reconnect the detection unit or control the switch. The Petition fails to meet the claim limitations, and thus fails to establish a *prima facie* case of obviousness for either asserted ground.

¹ All emphases added by Patent Owner unless otherwise specified.

Second, the Petition’s combination of Chang and Chang II with POSITA knowledge improperly relies on a POSITA’s unexplained common knowledge, rather than reasoned analysis and evidentiary support, to supply claim limitations that are missing from the references. The alleged POSITA knowledge is based on testimony from Mr. Welch that is conclusory, contradictory, and rebutted by Patent Owner’s expert, Dr. Houh. The Federal Circuit held in *Arendi S.A.R.L. v. Apple Inc.*, and confirmed in *Koninklijke Philips N.V. v. Google LLC*, that such reliance on such “conclusory statements and unspecific expert testimony” cannot support a finding of unpatentability as a matter of law. *Arendi*, 832 F.3d 1355, 1366-67 (Fed. Cir. 2016); *Koninklijke Philips*, 948 F.3d 1330, 1337-38 (Fed. Cir. 2020).

Third, the Petition is the product of admitted hindsight reconstruction, and fails to demonstrate that the POSITA would have been motivated to combine Chang and Chang II with the POSITA’s knowledge to meet the claim limitations with any reasonable expectation of success. The proposed combinations would not perform as described by Petitioner; to the contrary, the proposed combinations are technically unsound, would render the references inoperable for their intended purposes, and would undermine core USB design goals. The combinations further would have introduced complexity, inefficiency, and additional costs—drawbacks that the POSITA would have sought to avoid.

Fourth, numerous secondary considerations of non-obviousness further support that the claims are patentable. Aptiv patented its innovative solution to a long-standing but unsolved problem in the automotive industry: how to meet automakers’ unique USB requirements for integrating smartphones supporting Apple’s “CarPlay” feature. As described herein, Aptiv succeeded where others, including Petitioner, offered only skepticism and failure. Aptiv’s commercial success, along with industry acclaim and the emergence of copycat efforts, further undermine Petitioner’s challenge to Aptiv’s patent.

Finally, the Petition fails to show that any challenged claim is indefinite under § 112. As explained herein, the POSITA would be able to ascertain the scope of the claim terms with reasonable certainty.

II. THE ’643 PATENT

The ’643 Patent is generally directed to methods for facilitating host-to-host and host-to-device communications through a USB hub. (EX1011, Abstract.) Claims 1, 5, and 10 are each directed to methods, as are their dependent claims, 2-4, 6-9, and 11-15. (EX1011.)

III. LEVEL OF ORDINARY SKILL IN THE ART

At the time of the invention, a POSITA would have had a bachelor’s degree in computer science, electrical engineering, or an equivalent, and two years of professional experience working with computer network protocols such as USB.

(EX2019, ¶26.) Lack of work experience can be remedied by additional education, and vice versa. (EX2019, ¶26.)

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

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

The Board should adopt Patent Owner’s definition of the level of ordinary skill, as it did in the Decision on Institution. Patent Owner’s definition is

supported by Dr. Houh’s testimony and, as the Board recognized, is “consistent with what is reflected by the content of the applied prior art references.” (DI (Paper 12), 11 (citing *Okajima v. Bourdeau*, 261 F.3d 1350, 1354-55 (Fed. Cir. 2001)).)

IV. CLAIM CONSTRUCTION

For the purposes of this proceeding, Patent Owner does not contend that any claim construction is required. The claims are not obvious under any reasonable interpretation of the claims.

V. PRIORITY DATE

The Challenged Claims of the ’643 patent are entitled to a priority date of September 26, 2013.

VI. PETITIONER’S REFERENCES

A. Chang

Chang is an abandoned U.S. patent application that discloses a USB hub for implementing host-to-host USB transmission through a dedicated host port connected to a bridge. (EX1014, Abstract, [0020]; EX2019, ¶52.) Chang’s hub addresses the express goal of “easily establishing a connection between a computer and another computer.” (EX1014, [0003]; EX2019, ¶52.) In Chang’s hub, a USB host device (such as a computer) can connect to a dedicated host port (50), and communicate via a bridge (52) and hub control unit (46) to another USB host

device—such as a second computer—connected to an uplink port (42). (EX1014, [0020]; EX2019, ¶52.) FIG. 3 illustrates:

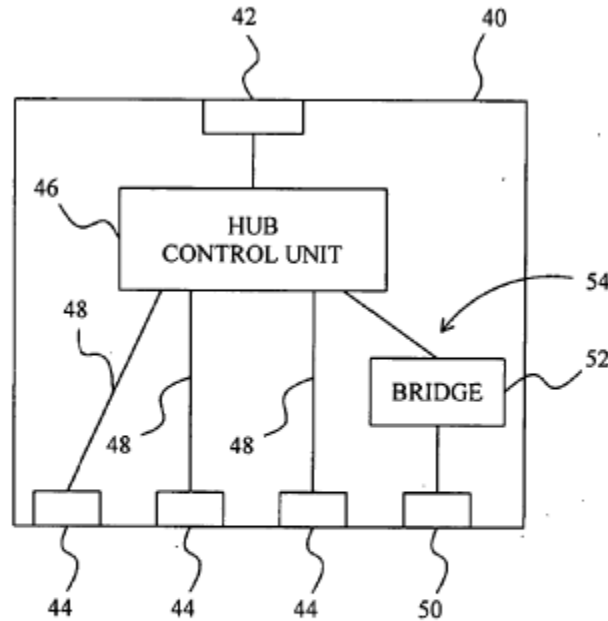


FIG. 3

(EX1014, FIG. 3; EX2019, ¶52.)

The Chang hub also comprises a number of downlink ports (44) for linking devices connected to the downlink ports to the uplink port. (EX1014, [0019]; EX2019, ¶53.) The downlink ports allow for host-to-device transmission between USB devices (in a device mode) connected to the downlink ports and a host device connected to the uplink port. (EX1014, [0019]; EX2019, ¶53.)

B. Chang II

Chang II is an abandoned U.S. patent application that discloses a data transmission bridge device. (EX1015, Abstract.) The Chang II bridge device (1) has a first connection interface (11) and a second connection interface (12) connected by a control chip (13) in communication with a memory unit (14). (EX1015, [0023]; EX2019, ¶54.) The bridge device permits data transmission between a first USB host device (2) connected to the first connection interface, and a second USB device connected to the second connection interface; the second USB device may be a device in a host mode (3) or a slave mode (4) (elsewhere referred to as a device mode). (EX1015, [0021]-[0022]; EX2019, ¶54.) FIG. 1 illustrates:

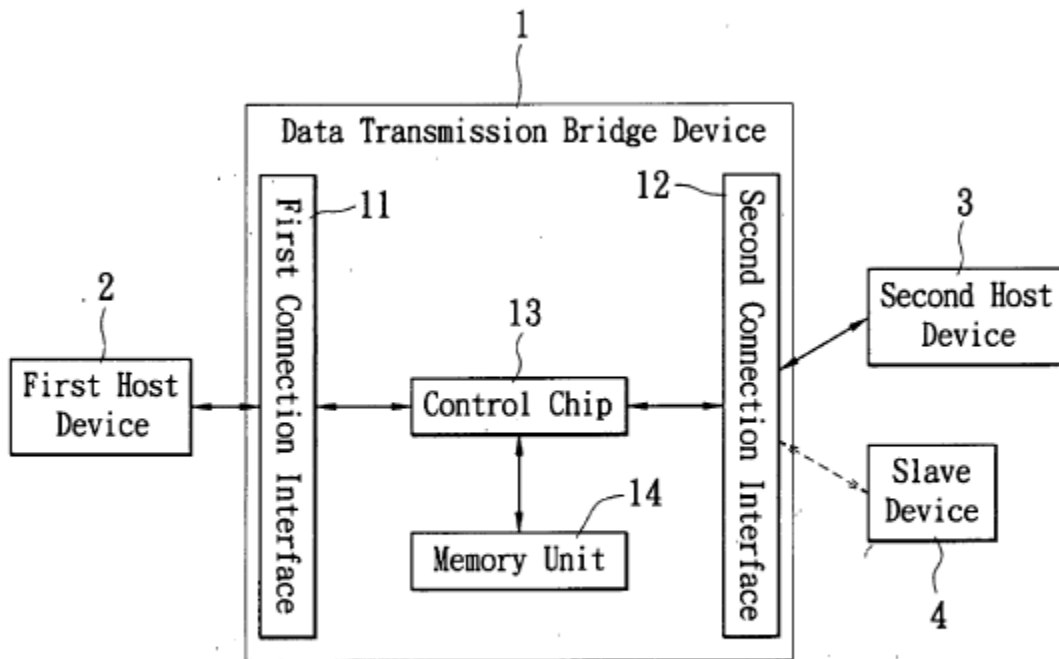


FIG. 1

(EX1015, FIG. 1.)

Chang II's "main feature" is providing two different transmission paths, automatically detecting whether a host or "slave" USB device is connected to the second connection interface, and selecting one of two different transmission paths between the first and second connection interfaces accordingly. (EX1015, [0021]; EX2019, ¶55.) Chang II's control chip implements this feature via a process shown in FIG. 6:

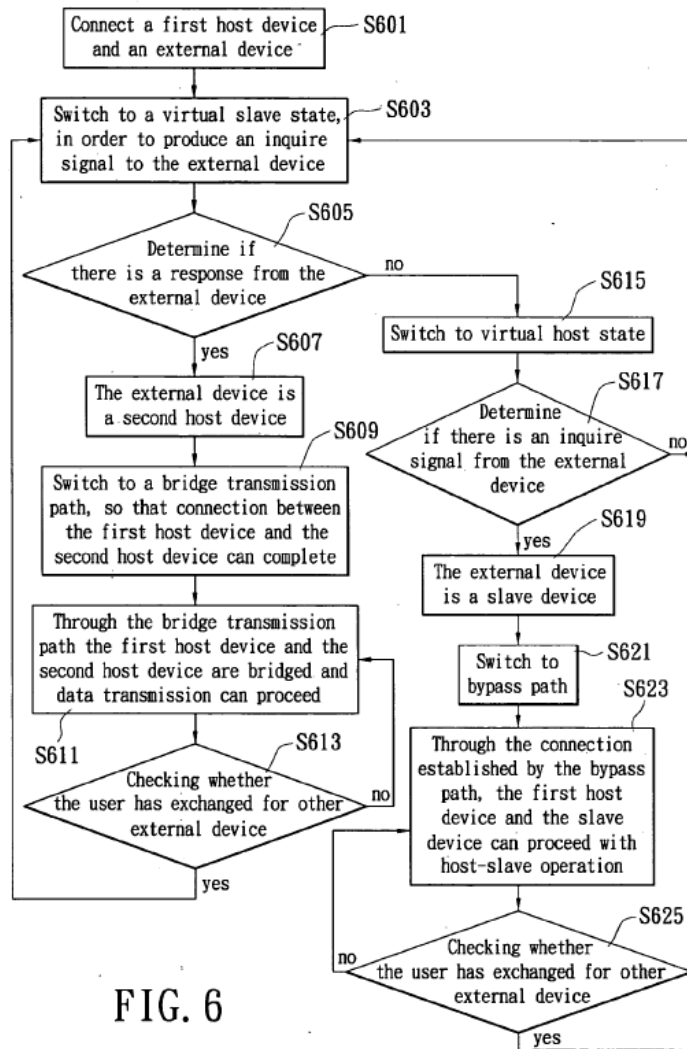


FIG. 6

(EX1015, [0023], [0042], FIG. 6; EX2019, ¶55.)

As shown in the figure, upon connection of an external device to the second connection interface (S601, S613, S625), a detection unit 134 of the control chip switches to a virtual slave state (S603) and/or a virtual host state (S615), and detects a signal from the external device (S605, S617) on the second connection interface to determine whether the external device is a host device (S607) or a slave device (S619). (EX1015, [0042]-[0046], FIG. 6.) If the external device is a

host device, a CPU 135 of the control chip switches the device to the first connection interface via a bridge transmission path, which includes a first USB controller 131, a buffer unit 136, and a second USB controller 132. (EX1015, [0023].) FIG. 5 illustrates:

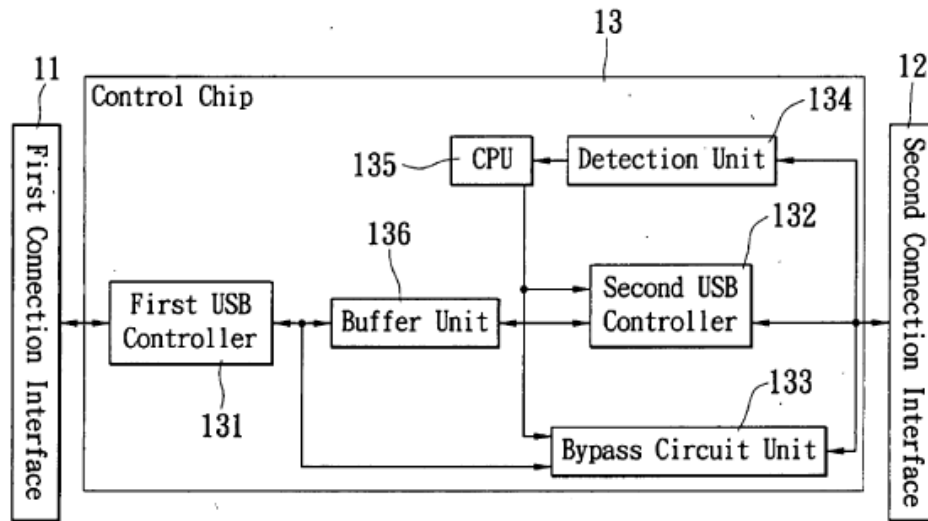


FIG. 5

(EX1015, FIG. 5.)

Conversely, if the external device is a host device, CPU 135 switches the device to the first connection interface via a bypass path, which includes the first USB controller 131 and a bypass circuit unit 133, bypassing the buffer unit 136 and the second USB controller 132. (EX1015, [0023].)

Upon connecting either the bridge transmission path or the bypass path, the control chip waits for the user to insert a different external device (S613, S625) before performing any additional detection or switching. (EX1015, FIG. 6.)

C. Chutorash

Chutorash is directed to a system for connecting a vehicle control system to a device, such as a mobile phone, via USB. (EX2019, ¶56.) Chutorash identifies two problems with vehicle user interface systems. First, it notes that the human-machine interfaces of vehicles and portable devices are “typically separate, look very different, and are difficult to use together.” (EX1029, 1:31-1:32; EX2019, ¶56.) Because “[a]pplications provided on portable devices are typically not configured to interact with a vehicle,” Chutorash explains that there is a need for “improved user interface features and/or connectivity features.” (EX1029, 1:32-1:33, 1:34-35; EX2019, ¶56.) Second, Chutorash states that “[t]here is a need for effective display reproduction and/or user interface reproduction from a remote source to an in-vehicle display or other in-vehicle interface.” (EX1029, 1:36-1:39; EX2019, ¶56.) The portions of Chutorash quoted in Petitioner’s summary stand for the unremarkable proposition that USB was a known method for connecting a mobile phone to a vehicle’s infotainment system. (Petition, 39-41; EX2019, ¶56.)

VII. GROUND I: CLAIMS 1-15 ARE NOT RENDERED OBVIOUS BY CHANG IN VIEW OF CHANG II AND POSITA KNOWLEDGE

The Petition proposes in Ground I that claims 1-15 are met by combining the electronic circuit of Chang with the electronic circuit of Chang II; and by further modifying that combination by inserting circuit elements not found in or suggested by either reference, but which Petitioner claims were within the knowledge of the POSITA. (*See, e.g.*, Petition, 42-69; EX2019, ¶58.)

The challenged claims are not rendered obvious by the Petition's proposed combination at least because, as explained below, the proposed combination fails to meet all limitations of the challenged claims. (EX2019, ¶59.) The proposed combination is additionally improper for relying on conclusory statements and unspecific expert testimony to supply missing claim elements, defying Federal Circuit precedent. (EX2019, ¶59.) Furthermore, as explained below, the hindsight-driven combination is technically unsound and would render the references more costly and inoperable for their intended purposes, thus failing to motivate the POSITA to make the proposed combination with any reasonable expectation of success. (EX2019, ¶59.)

A. The Petition's Proposed Combination

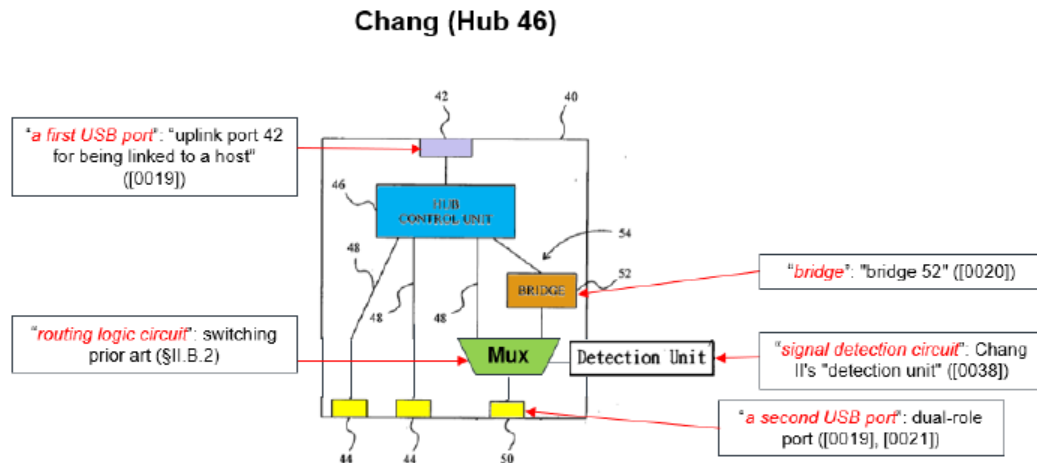
The Petition proposes two separate implementations of combining Chang, Chang II, and the POSITA's knowledge. (Petition, 49-51; EX2019, ¶60.) Each proposed implementation offers a modification of Chang by Chang II, plus a

switching element—*i.e.*, a multiplexer (mux)—inserted downstream of the purported bridge. (Petition, 42-52; EX2019, ¶60.)

Asked to explain why multiple implementations are proposed, Mr. Welch testified: “It was about if a specific claim had language which could be interpreted in order to have one of these rather than the other.” (EX2021, 220:11-221:11; EX2019, ¶61.) This admitted claims-first approach to combining the prior art is precisely the type of hindsight reconstruction that is prohibited. Even so, the proposed combination is fundamentally defective and fails to meet the claim limitations as described herein. (EX2019, ¶61.)

1. The Hub 46 Mux Implementation

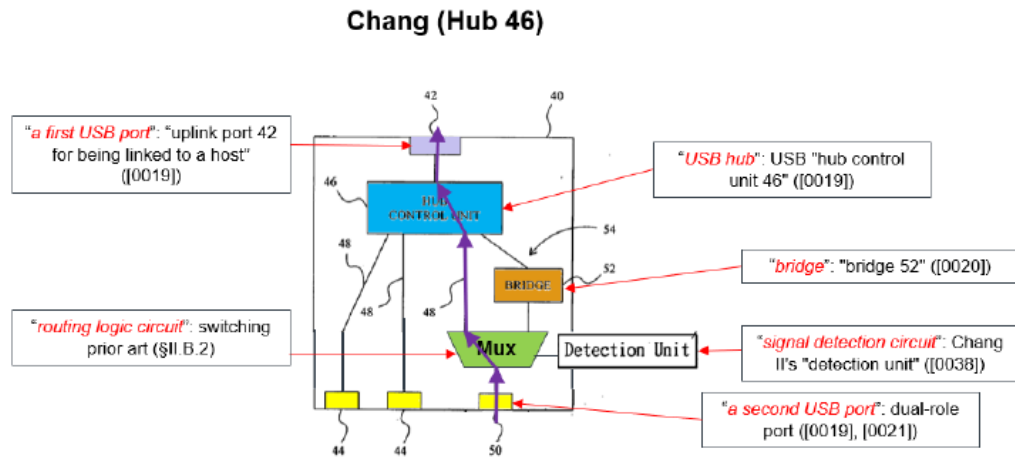
The Petition discloses a proposed implementation (the “Hub 46 mux implementation”), that inserts a multiplexer within Chang’s USB hub 40. (Petition, 47-52.) In this implementation, Chang is modified by replacing its ports with dual-role ports; and inserting a 2:1 multiplexer between Chang’s port 50 and bridge 52. (Petition, 42-52; EX2019, ¶62.) Chang’s transmission paths 48 are rewired such that host port 50 is connected to the input of the multiplexer; and the multiplexer can connect host port 50 to either Chang’s bridge 52 (Chang II’s bridge device 1) or Chang’s hub control unit 48, depending on its select lines:



(Petition, 47-52; EX2019, ¶¶62.)

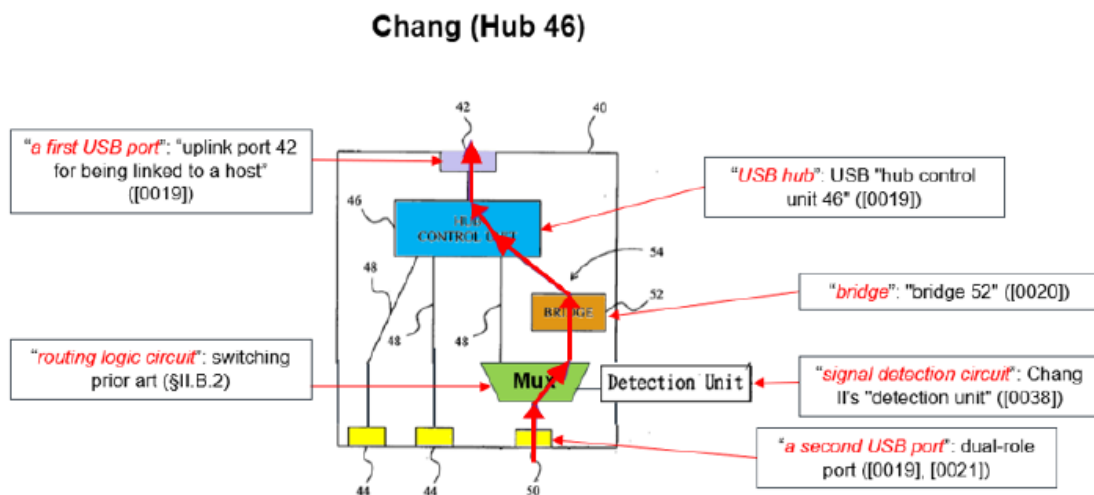
The Petition then modifies the combination further to incorporate Chang II's detection unit 134, which belongs to control chip 13 of Chang II's bridge device 1. (Petition, 48; EX2019, ¶¶63.) The Petition supposes that Chang II's detection unit and/or bridge would generate signals that control the multiplexer's switching, surmising that doing so "would have been routine and obvious." (Petition, 48; EX2019, ¶¶63.)

According to the Petition, the mux can switch a downstream USB port (44, 50) to the hub control unit 46 directly, bypassing bridge 52 (if a connected device is in device mode):



(Petition, 67-68; EX2019, ¶64.)

Alternatively, the mux can switch the downstream USB port to the hub control unit 46 through bridge 52 (if the connected device is in host mode):



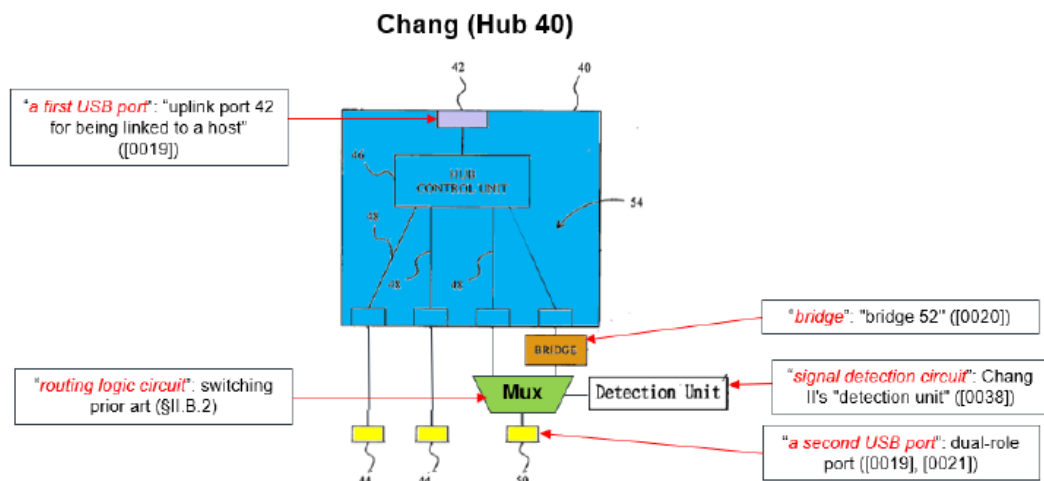
(Petition, 61-62; EX2019, ¶65.)

The Petition does not rely on Chang II's internal switching between the bridge path or the bypass path; instead, the multiplexer apparently performs the

switching based on signals generated by Chang II's detection unit 134 of control chip 13. (Petition, 48-49; EX2019, ¶66.) The Petition speculates that this proposed modification "would have been routine and obvious." (Petition, 48-49.)

2. The Hub 40 Mux Implementation

In the "Hub 40 mux implementation," the multiplexer is inserted external to Chang's USB hub 40. (Petition, 47; EX2019, ¶67.) Chang and Chang II are further modified by relocating Chang's bridge 52 outside the USB hub 40; adding new dual-role USB ports (44, 50) outside the USB hub 40; inserting the multiplexer between the dual-role USB ports and the bridge 52; and connecting the outputs of the multiplexer to the hub control unit 46:

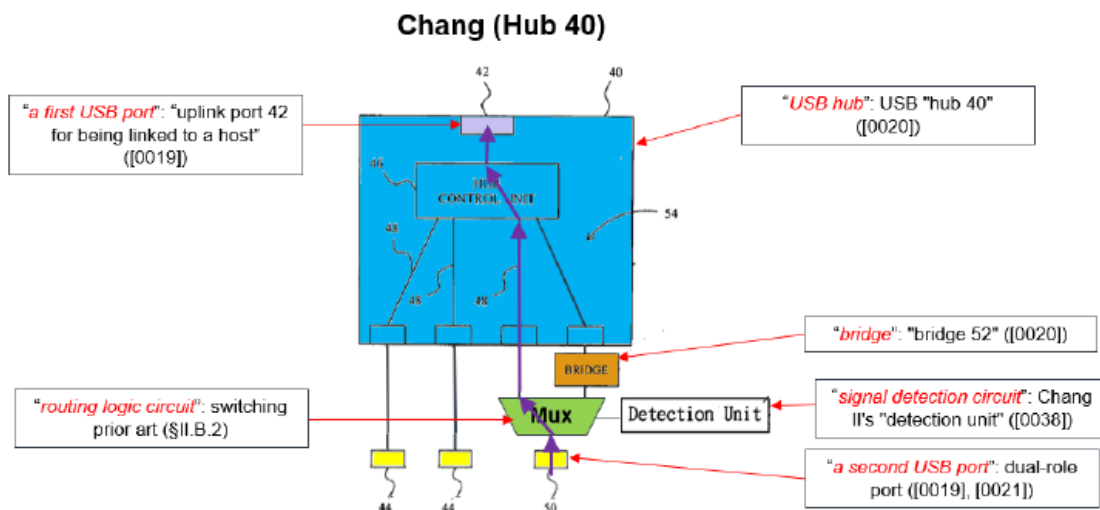


(Petition, 48-50, 52; EX2019, ¶67.)

As above, the Petition modifies the combination further to incorporate Chang II's detection unit 134, which belongs to control chip 13 of Chang II's

bridge device 1. (Petition, 48; EX2019, ¶¶68.) The Petition supposes that Chang II's detection unit and/or bridge would generate signals that control the multiplexer's switching, surmising that doing so "would have been routine and obvious." (Petition, 48; EX2019, ¶¶68.)

According to the Petition, as above, the multiplexer can switch a downstream USB port (44, 50) to the hub control unit 46 directly, bypassing bridge 52 (if a connected device is in device mode):



(Petition, 68; EX2019, ¶¶69.)

And as above, the mux can switch the downstream USB port to the hub control unit 46 through bridge 52 (if the connected device is in host mode):



Petitioner’s proposed combination—including both implementations—is incompletely described in the Petition; and is technically unsound and would not be operable in the manner set forth in the Petition. (EX2019, ¶72.) The proposed combination further is unsupported by the references, and relies solely on expert testimony that is contradictory and unreliable. (EX2019, ¶72.)

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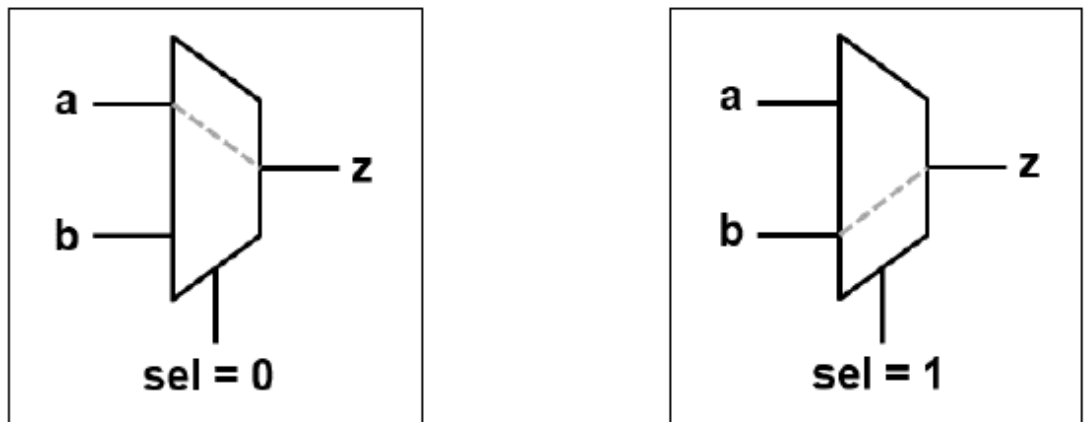
Petitioner’s proposed combination—including both implementations—is incompletely described in the Petition; and is technically unsound and would not be operable in the manner set forth in the Petition. (EX2019, ¶72.) The proposed combination further is unsupported by the references, and relies solely on expert testimony that is contradictory and unreliable. (EX2019, ¶72.)

1. The Petition Fails to Show the Claimed Method or Routing Logic Circuit With Particularity For Any Challenged Claim

All challenged claims recite a method with particular steps of routing USB signals, requiring a specific routing logic circuit. As described above, the proposed combination relies on outside switching elements—multiplexers—to implement the claimed method steps and meet the claimed routing logic circuit. (*See* Petition, 58; EX2019, ¶73.) These switching elements are absent from Chang and Chang II, and are instead supplied from the POSITA’s alleged knowledge. (*See* Petition, 42-52; EX2019, ¶73.)

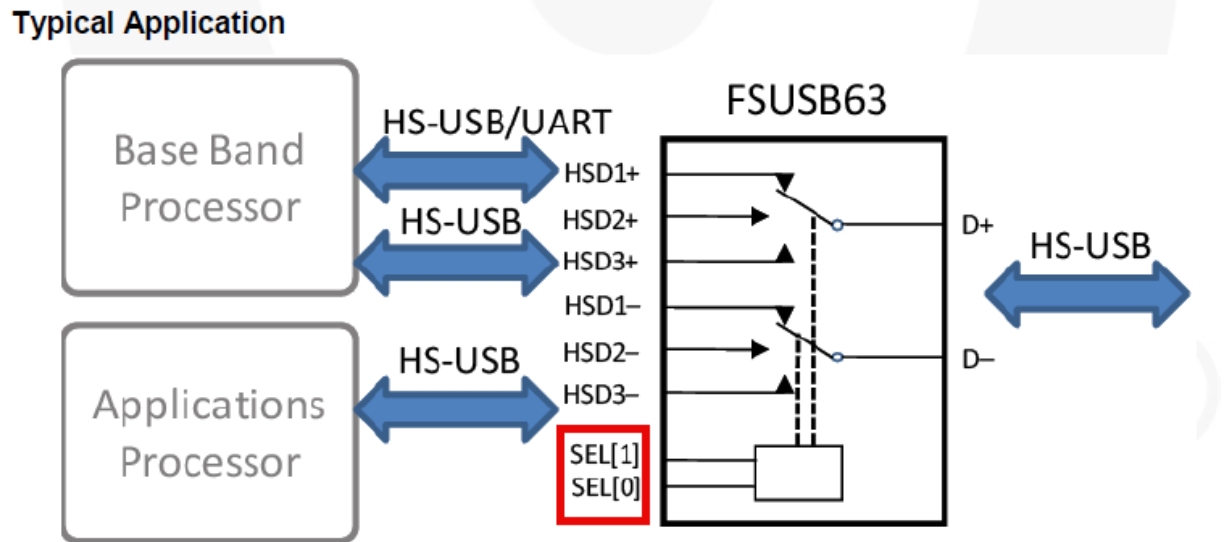
The claimed method cannot be met by off-the-shelf switching components alone. (EX2019, ¶74.) The method instead requires the USB signals to be routed in a particular manner. *First*, the USB signals emanating from the consumer USB device must be routed to the first USB port via a routing logic circuit connected directly to a USB bridge and a USB hub connected to the USB bridge, in accordance with a determination by the signal detection circuit that the consumer device is operating in a USB host mode. (EX1011, claim 1.) *Second*, the USB signals must be routed to the first USB port via the routing logic connected directly to the USB hub and thereby bypassing the USB bridge, in accordance with a determination by the signal detection circuit that the consumer device is operating in a USB device mode. (EX1011, claim 1.)

The Petition fails to show how generic switching elements—multiplexers—would be combined with Chang and Chang II to meet these specialized configuration requirements. (EX2019, ¶75.) As the Petition recognizes, multiplexers rely on control signals (“select lines”) to configure which input(s) are routed to which output(s) within the switching element:



(Petition, 12; EX2019, ¶75.)

A datasheet relied on by Petitioner’s expert further illustrates the required select lines (*i.e.*, SEL[0], SEL[1]):



(EX1060 (annotated); EX1013, ¶93 (citing EX1060); EX2019, ¶76).

But the Petition is incomplete, inconsistent, and erroneous about how those control signals would be supplied or implemented in the proposed combination. Instead of explaining with particularity how the control signals of the multiplexer would implement the claimed switching configurations, the Petition merely speculates that “It would have been routine and obvious for the detection unit and/or bridge [of Chang II] to control the switching functionality.” (Petition, 48; EX2019, ¶77.)

The Petition’s evidentiary support is limited and nonspecific. (EX2019, ¶78.) The Petition identifies that “Chang II’s bridge controls routing”; and observes generically that the Chang II bridge includes a control chip and detection unit. (Petition, 48; EX2019, ¶78.) From this, the Petition concludes that “it would have been obvious for Chang’s bridge and/or detection unit to control, *e.g.*, the

switch's select lines.” (Petition, 48; EX2019, ¶78.) But the Petition fails to set forth how the detection unit of Chang II would be utilized by the multiplexer in the proposed combination to route the USB ports in the specific manner recited by claim 1; or how any such modification to Chang and Chang II would be within the scope of the POSITA's general knowledge. (EX2019, ¶78.) To the contrary, as Dr. Houh explains, while the POSITA's knowledge may include multiplexer components, it does not include the specific knowledge of how to use such generic switching components to modify Chang and Chang II to meet the specific routing requirements of the claims. (EX2019, ¶78.)

The Petition's generic and evidence-starved description of switching cannot meet the Petitioner's duty to identify, “in writing and with particularity ... the grounds on which the challenge to each claim is based, and the evidence that supports the grounds for the challenge”. (35 U.S.C. § 312(a)(3); EX2019, ¶79.) The Petition is deficient with respect to all challenged claims for at least this reason. (EX2019, ¶79.)

2. The Proposed Combination Is Technically Unsound Because the Routing Logic Circuit Would Disconnect Its Control Signals

The Petition's proposed combination simply would not operate as described, and the Petition is further deficient with respect to all challenged claims for at least this additional reason. (EX2019, ¶80.)

In the proposed combination, as described above in Section VII.A, a multiplexer (whether in the Hub 46 or Hub 40 implementation) is used to switch between (1) connecting a downstream USB port directly to the hub control module 46, if a device on the downstream port is in device mode; and connecting the USB port to the hub control module 46 via Chang's bridge 52, if the device on the downstream port is in host mode. (EX2019, ¶81.) The Petition proposes modifying Chang with Chang II's bridge device 1, which includes a control chip 13 for detecting (via detection unit 134) the mode of a connected downstream device, and switching between two transmission paths accordingly. (See Petition, 34-35 (citing EX1015, [0024], [0046]); EX2019, ¶81.)

Even though Chang II provides its own mechanism for switching transmission paths based on the mode of a connected device, the proposed combination does not rely on Chang II's switching elements to meet the claimed routing logic circuit. (See EX2021, 147:10-24, 148:11-25; EX2019, ¶82.) Instead, the Petition relies on the *multiplexer* as the routing logic circuit, with Chang II's bridge and/or detection unit to control the select lines. (Petition, 48; EX1013, ¶¶185, 190; EX2019, ¶82.) This switching process is described in Section VII.A.

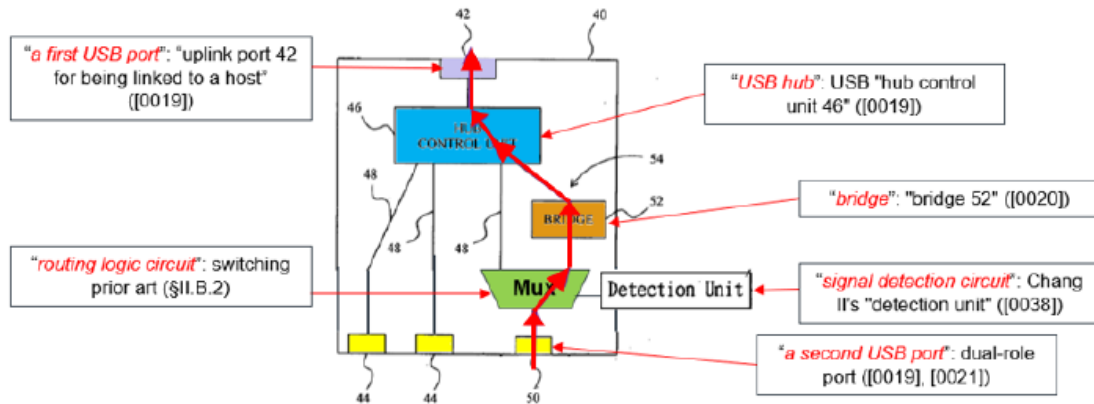
Notwithstanding the Petition's deficient description of the multiplexer control signals, discussed above, the proposed combination relies on Chang II's bridge device 1 and detection unit 134 to provide the control signals that cause the

multiplexer to route the downstream ports through the appropriate transmission path. (Petition, 48-49; EX2019, ¶83.) As Chang II indicates, and as the Petition acknowledges, the detection unit is part of the control chip 13 of bridge device 1. (Petition, 47; EX1015, FIGs. 1, 5, [0034], [0037]-[0038], [0040]; EX2019, ¶83.) For example, the Petition indicates that Chang II’s “bridging detection signal,” which is provided by detection unit 134, is applied to the multiplexer to direct it to connect the downstream port to the bridge upon detecting a downstream host. (Petition, 56-57; EX2019, ¶83; *see also* EX1060, 1; EX1055, 284-288.)

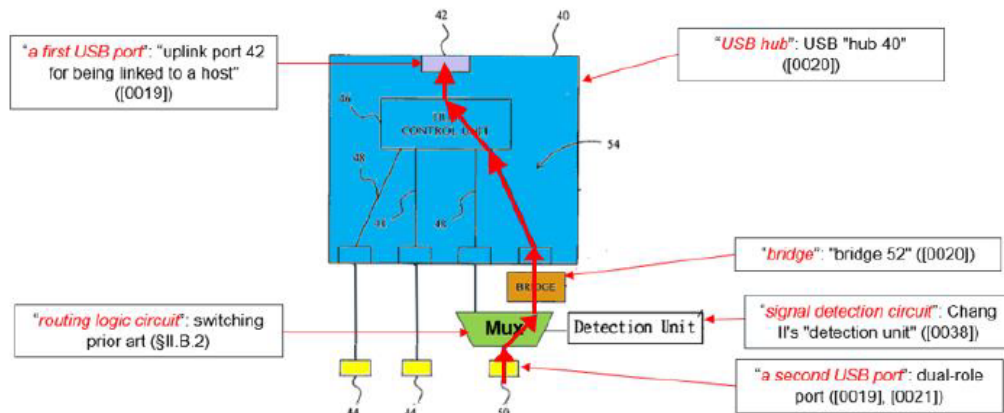
In order to generate the detection signal, the detection unit 134 executes the process shown in FIG. 6 of Chang II, described above. (Petition, 35, 45, 59; EX1015, FIG. 6, [0024]; EX2019, ¶84; EX1013, ¶¶159, 271 (citing EX1015).) Generating the detection signal requires that the detection unit 134 (and thus the bridge) communicate with the downstream port. (EX2019, ¶84.) For example, as described by Mr. Welch, the detection unit determines the connection of either a host or device on the port by “sending an ‘inquire signal’ and receiving a response” when a host connects (as shown in S603 and S605 of FIG. 6), or “receiving an ‘inquire signal’” when a device connects (S617); and producing a detection signal (*e.g.*, a bridging detection signal or slave detection signal) accordingly. (EX1013, ¶¶80, 159, 249, 261; EX2019, ¶84.)

But the proposed combination includes a structural flaw. As Mr. Welch cautions: “the detection unit *must connect* to the downstream port to detect the mode, as shown in Chang II.” (EX1013, ¶193.) And as discussed above, the detection unit is a component of the bridge. (EX2019, ¶85.) But the claims require routing the USB signals from the consumer USB device to the first USB port via the routing logic connected directly to the USB hub, and *thereby bypassing* the USB bridge, in accordance with a determination that the consumer device is in a USB device mode. (EX1011, claims 1, 10.) Thus, in order to satisfy the “bypassing the USB bridge” limitation of the claims, the detection circuit in the proposed combination must be *bypassed* when the USB signals are routed to the USB hub, when the consumer device is in the USB device mode. (EX2019, ¶85.)

The behavior of the multiplexer thus demonstrates the need for Mr. Welch’s admonition. In either the Hub 46 or Hub 40 implementations, when the multiplexer connects the downstream port 50 to the hub via the bridge 52, the bridge 52 is connected to the downstream port 50 through the multiplexer:

Chang (Hub 46)

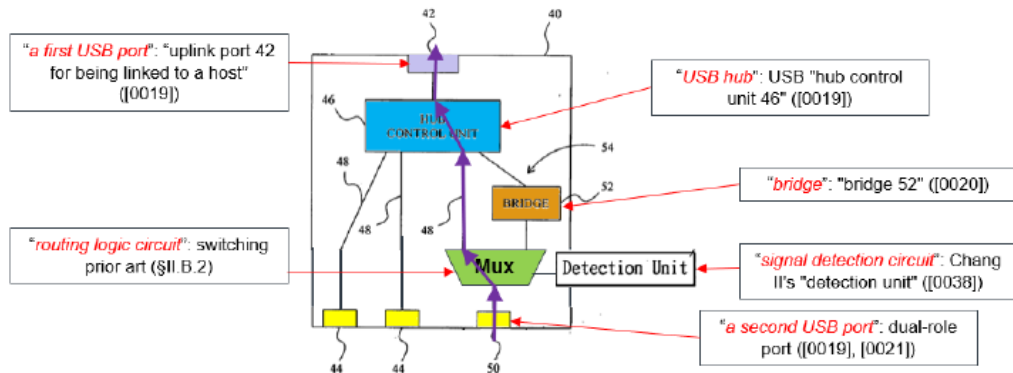
(Petition, 61-62; EX2019, ¶86.)

Chang (Hub 40)

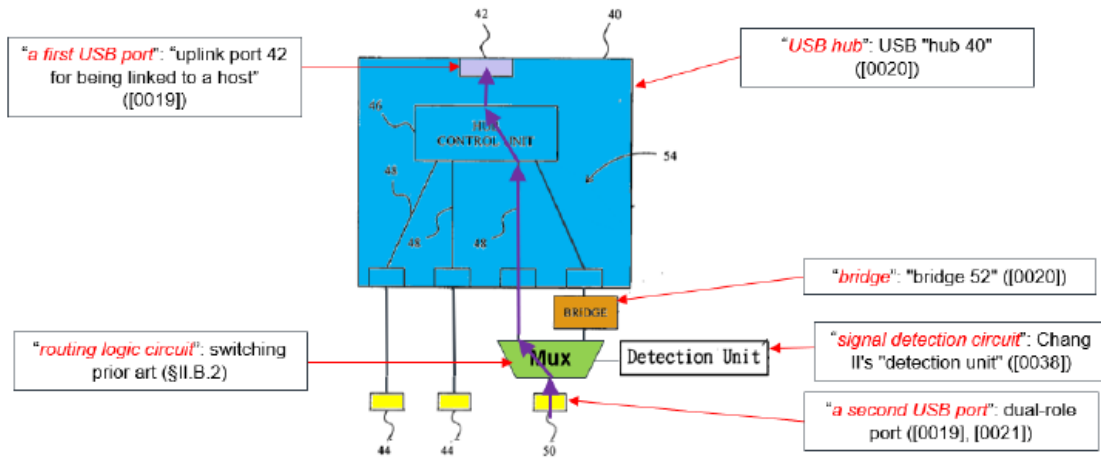
(Petition, 63; EX2019, ¶86.)

But when the multiplexer connects the downstream port 50 via the direct-to-hub path—*i.e.*, when the device on the port is in device mode—it bypasses the bridge entirely:

Chang (Hub 46)



Chang (Hub 40)

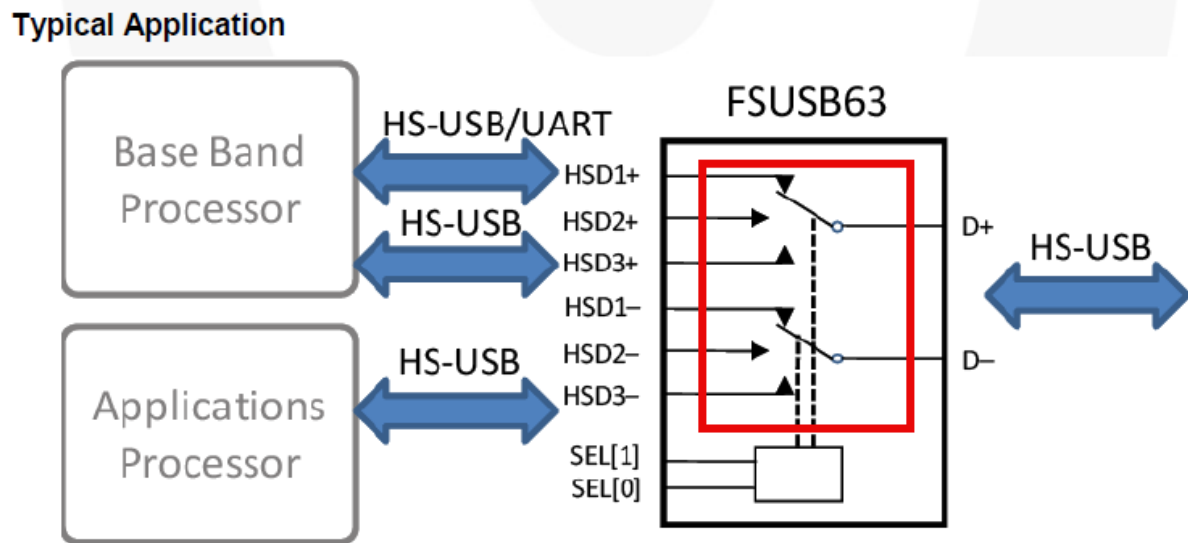


(Petition, 67-69; EX2019, ¶¶87.)

As Dr. Houh explains, consistent with Mr. Welch's description of switching elements and supporting evidence, the multiplexer selecting the direct-to-hub path electrically disconnects the bridge device from all downstream USB ports.

(EX2019, ¶¶88; *see, e.g.*, EX1013, ¶¶93.) For example, Mr. Welch explains that in a switch, a disconnected path "will be left floating (*e.g.*, tri-stated)." (EX1013, ¶¶188; EX2019, ¶¶88.) Similarly, a reference cited by Mr. Welch explains that

transmission gates, such as those that connect a multiplexer's inputs to its outputs, comprise transistors that switch between a closed circuit and an open circuit of “essentially infinite resistance.” (EX1069, 23; EX2019, ¶93.) And the FSUSB63 component, on which Mr. Welch relies to illustrate a multiplexer, indicates that the control logic operates to electrically connect and disconnect (via open circuits) its inputs and outputs:



(EX1060, 1; EX2019, ¶88; *see also* EX1013, ¶93.)

When the bridge device is bypassed by the multiplexer, it is thus electrically disconnected from the downstream USB ports coupled to the multiplexer.

(EX2019, ¶89.) Because the bridge device cannot send or receive signals (*e.g.*, “inquire signals”) from a downstream USB port in this state, the bridge device is rendered incapable of detecting whether a device is in host or device mode, such as described above for FIG. 6 of Chang II; and, accordingly, prevents the bridge

device from generating or providing control signals to the multiplexer. (*See* Petition, 29-30; EX1013, ¶¶80, 159, 254; EX2019, ¶89.) Consequently, once the proposed combination switches to the device mode, the bridge (and thus the detection unit) is *incapable* of directing the multiplexer to perform any further switching operations—including connecting or reconnecting any downstream ports to the bridge 52 or to the hub control unit 46 (*e.g.*, in response to a connected device switching to a host or device mode). (*See* Petition, 29-30; EX1013, ¶¶80, 159, 254; EX2019, ¶89.)

FIG. 6 of Chang II further demonstrates the flaw in the proposed combination. As described above, FIG. 6 illustrates a process performed by Chang II's bridge device (*i.e.*, control chip 13 of the bridge device) to detect whether a connected external device is in host mode or device ("slave") mode (EX2019, ¶90.)

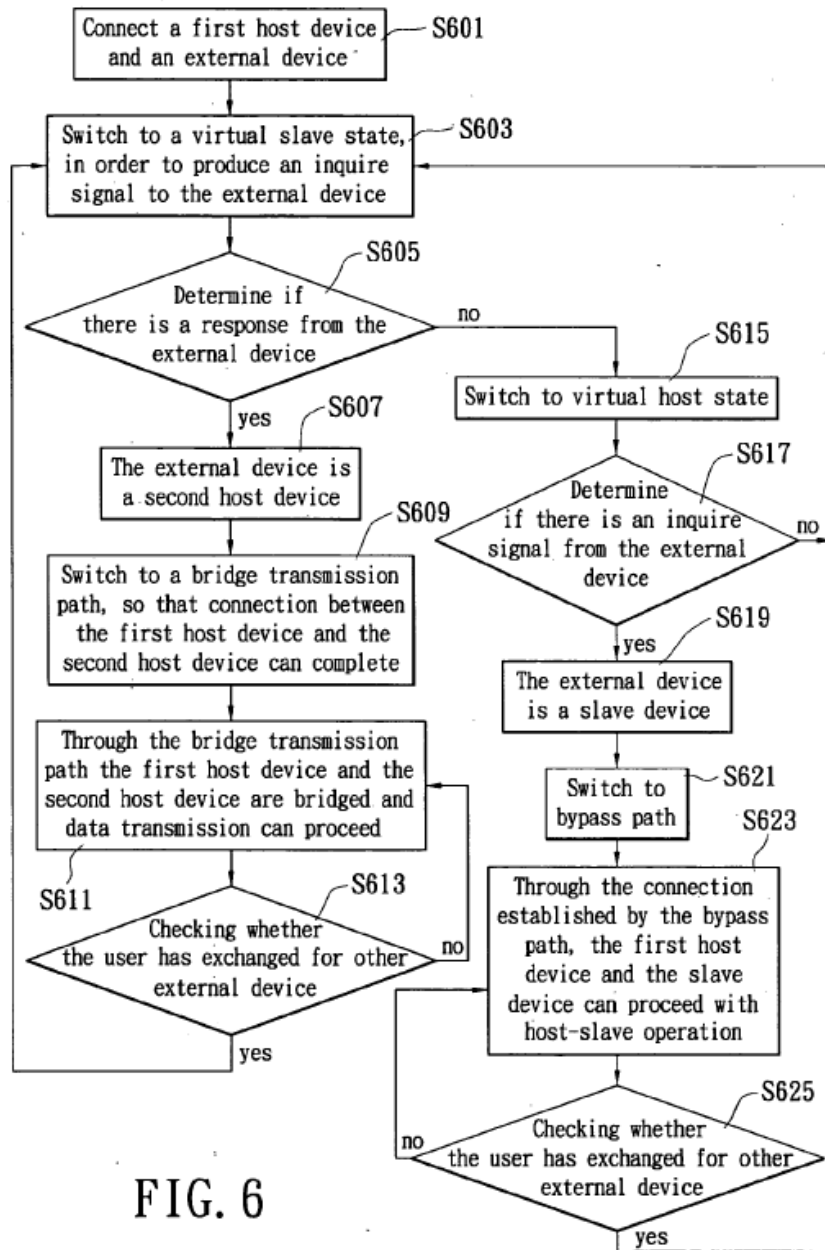


FIG. 6

(EX1015, FIG. 6; EX2019, ¶90.)

In the illustrated process, the control chip exchanges signals with the external device at least at stages S603, S605, S617; and checks for a newly inserted external device at stages S601, S613, and S625. (EX1015, FIG. 6; EX2019, ¶91.)

In the proposed combination, once a connected device is detected to be in device mode, the multiplexer switches to a direct-to-hub path that bypasses the bridge device and disconnects it from downstream ports, as described above. (EX2019, ¶91.) In this disconnected state, the bridge device is unable to exchange signals with an external device; thus, the bridge device will never reach stages S607 or S619 in the FIG. 6 process and cannot direct the multiplexer to switch paths accordingly. Moreover, because the bridge device is unable to detect a newly inserted external device; the Petition's USB hub module will remain in the device mode even if a new device is connected. (EX2019, ¶91.) This dead-end state—which the Petition wholly fails to address—renders the proposed combination incapable of meeting the claimed dynamic switching as described above. (EX2019, ¶91.)

C. The Proposed Combination Does Not Meet the Claim Limitations

1. Claims 1, 5, and 10

The Petition's proposed combination fails to meet the limitations of claim 1 or analogous claims 5 and 10. (EX2019, ¶92.) Because all challenged claims depend from claims 1, 5, or 10, this defect is fatal to the Petition.

Claim 1 requires routing USB signals according to specific requirements. For example, the USB signals emanating from the consumer USB device must be routed to the first USB port via a routing logic circuit connected directly to a USB

bridge and a USB hub connected to the USB bridge, in accordance with a determination by the signal detection circuit that the consumer device is operating in a USB host mode. Further, the USB signals must be routed to the first USB port via the routing logic connected directly to the USB hub and thereby bypassing the USB bridge, in accordance with a determination by the signal detection circuit that the consumer device is operating in a USB device mode. (EX1011, claim 1.)

To meet this claim limitation, the Petition relies on its proposed Mux Implementations “includ[ing] a switching structure, such as a mux, to select the appropriate transmission path.” (Petition, 59.) The Petition explains the limitation is met based on the Hub 46 or Hub 40 mux implementations, which allegedly perform the claimed routing based on control signals (*e.g.*, a bridging detection signal) provided by Chang II’s detection unit 134 to the multiplexer of the proposed combination. (Petition, 62-64; EX2019, ¶94.)

But as explained above in Section VII.B, the Petition’s characterization is inaccurate. (EX2019, ¶95.) The proposed combination does not provide, or act in accordance with, the claimed “determination by the signal detection circuit that the consumer device is operating in a USB host mode.” (EX2019, ¶95.) Instead, as described above, it reaches a state in which the multiplexer routes the downstream consumer device directly to the USB hub, disconnecting the detection unit that

generates the control signals; and rendering it unable to make or respond to such determination as required by the claims. (EX2019, ¶95.)

Further, to the extent the Petition proposes that Chang II’s detection unit 134 could be relocated to access the downstream USB ports—*e.g.*, proximate to or integrated with the multiplexer, *see* Petition at 49 n.14—this would fail to meet claim 1 because it would fail to meet the claim requirement of “bypassing the USB bridge.” (EX1011, claim 1; EX2019, ¶96.) As the Petition acknowledges, Chang II’s detection unit is part of the bridge (*e.g.*, via control chip 13), such that providing USB signals to the detection unit would not “bypass[]” the bridge. (Petition, 48; EX2019, ¶96.) There is no way for the proposed combination to satisfy the “bypassing” limitation while allowing the detection unit access to the downstream USB ports. (EX2019, ¶96.)

The Petition thus fails to show that claim 1, or analogous claims 5 and 10 (and their respective dependent claims) are met. (EX2019, ¶97.)

2. Claims 2, 7, 13

Claims 2, 7, and 13 depend from claims 1, 5, and 10, respectively. In addition to the reasons described above for the parent claims 1, 5, and 10, claims 2, 7, and 13 are not rendered obvious because the Petition’s proposed combination fails to meet that the USB host is embedded in an infotainment system. (EX2019, ¶98.)

Neither Chang nor Chang II disclose or relate to infotainment systems, or to vehicles; the Petition’s citations to generic descriptions of infotainment systems for vehicles thus fail to support that a POSITA would have modified the Petition’s proposed combinations to incorporate such systems in a manner that meets the claim limitations. (Petition, 69-71; EX2019, ¶¶99.) Moreover, even if the proposed combinations could be modified to include an infotainment system, the Petition makes no attempt to show that the modification would meet the particular data connection requirements of such systems. (Petition, 69-71; EX2019, ¶¶99.)

The POSITA would have recognized that infotainment systems present unique difficulties for hubs with host-to-host functionality. (EX2019, ¶¶100.) At the time the ’643 patent was filed in 2013, the POSITA would understand automotive infotainment systems with USB support to require more functionality than a radio, CD or cassette player; they were also expected to support mapping, video, and screen mirroring functionality. (*See, e.g.*, EX1011, 1:57-62 (describing vehicle infotainment systems as accessing “streaming music, video and other services” provided by consumer devices, such as smartphones); EX2019, ¶¶100.) If the data for these functions is being provided by a USB device—as described in the specification—it must be transferred in real-time, i.e. streamed, to the head unit for display. (EX2019, ¶¶100.)

As the POSITA would recognize, a USB data connection pipe between such infotainment systems and consumer devices would have specific and heightened requirements for latency and bandwidth; however, the Petition makes no attempt to establish that such requirements are met by the proposed combination. (EX2019, ¶101.) The USB specification itself recognizes the unique challenges presented by streaming data and has defined a specific type of data transfer pipe—*isochronous* or “ISO”—which is capable of transferring constant-rate, time-critical data that, unlike the other types of USB data transfers, is not retried if there is an error. (EX1018, 4.7.4; EX2019, ¶ 101.) But none of the prior art USB bridges identified by Petitioner support such isochronous data transfer pipes. (EX1035, 1 (“Supports USB Full/High Speed Control/Interrupt/Bulk Endpoints Transfer”); EX1036, 14 (listing only control, bulk, and interrupt endpoints); EX1037, 1 (same); EX2019, ¶101.) Instead, because those bridges were not designed to handle the time-sensitive transfers required in the streaming context, those bridges include only control, interrupt, and bulk data transfers. (*Id.*)

The Petition offers no attempt to explain how the proposed combination could be modified to support the isochronous transfers required by infotainment systems, or how a POSITA would have been motivated to make such a modification with any reasonable expectation of success. (EX2019, ¶102.) The

proposed combination accordingly fails to meet claim 2, or analogous claims 7 and 13. (EX2019, ¶102.)

3. Claims 3, 4, 8, 9, 14, 15

Claim 3 depends from claim 1 and recites that bypassing the USB bridge is performed by a USB routing switch. Claims 8 and 14 depend from claims 5 and 10, respectively, and recite analogous limitations. Claims 4, 9, and 15 depend from claims 3, 9, and 14, respectively, and recite that the USB routing switch includes the signal detection circuit.

As discussed above for claim 1, the Petition does not meet these claims at least because it relies on proposed combination's multiplexer—directed by control signals provided by Chang II's detection unit—to meet the claimed routing logic circuit or the claimed USB routing switch. (Petition, 71-72; EX2019, ¶104.) As discussed above, by bypassing the USB bridge as recited in the claim, the multiplexer disconnects the detection unit (part of the bridge), preventing it from providing the control signals that would perform the routing recited in claim 1. (EX2019, ¶104.) Similarly, because the Petition maps the claimed signal detection circuit to detection unit 134, the multiplexer cannot include the signal detection circuit because it would fail to meet the limitation of the parent claims that routing the USB signals bypasses the bridge (which includes detection unit 134). (Petition,

72-75; EX2019, ¶104.) Accordingly, the Petition fails to meet any of claims 3, 4, 8, 9, 14, and 15. (EX2019, ¶104.)

D. The Proposed Combination Is Improper For Relying On Conclusory Statements And Unspecific Expert Testimony To Establish A Missing Claim Limitation

Even if the Petition’s proposed combination of Chang and Chang II with POSITA knowledge (including the addition of otherwise undisclosed circuit elements) were viewed to meet the claim limitations, the proposed combination is improper because it relies on generically alleged common knowledge, rather than reasoned analysis and evidentiary support, to supply a claim limitation that is missing from the prior art references. In *Arendi*, the Federal Circuit reversed the Board’s finding of obviousness in an IPR proceeding for relying on the POSITA’s knowledge to provide such a missing claim limitation, where the POSITA’s knowledge was alleged based on “conclusory statements” and “unspecific expert testimony” rather than “reasoned analysis and evidentiary support.” 832 F.3d at 1362, 1366-67.

The Federal Circuit revisited the issue in *Koninklijke Philips*, to clarify that it may sometimes be permissible to rely on the POSITA’s general knowledge to meet an otherwise missing claim limitation. 948 F.3d at 1337-38. However, the Federal Circuit distinguished the reliance on “conclusory statements and unspecific expert testimony” in *Arendi* from the facts in *Koninklijke Philips*, where unrebutted

expert evidence, corroborated by the prior art itself, substantiated the POSITA's alleged general knowledge. *Id.* at 1338.

Here, as described above in Section VII.A, the Petition does not dispute that the claimed method steps or routing logic circuit are not met by Chang or Chang II, and instead relies on the POSITA's general knowledge to supply the claimed method steps and routing logic circuit. But as in *Arendi*, the Petition relies on conclusory statements and unspecific expert testimony to establish that the specific method steps or routing logic circuit required by the claims was part of the POSITA's general knowledge. For example, as described above, the Petition relies on conventional multiplexer components, and generic descriptions of switching in Chang II, to conclude that “it would have been routine and obvious for the detection unit and/or bridge to control the switching functionality.” (Petition, 39 n.14.)

The Petition cites to the testimony of Mr. Welch. But Mr. Welch—like Appellees' experts in *Arendi*—fails to support extrapolating the missing claim element from the POSITA's general background knowledge of switching. (Petition, 39 n.14, 60-61 n.18 (citing EX1013, ¶¶242-243, 88-96).) Further, at his deposition, Mr. Welch admitted he was “not certain” about how the references would produce the control signals on which the Petition relies for the claimed routing logic circuit; and that his interpretation was “just plausible.” (EX2021,

283:4-23.) Additionally, Mr. Welch’s testimony is contradictory: for example, Mr. Welch cautions that “the detection unit *must connect* to the downstream port to detect the mode,” EX1013, ¶193; but then proposes a prior art combination that cannot satisfy the claimed “bypassing” limitation unless configured to disconnect the detection unit from the downstream port, as described in Section VII.B.2. Mr. Welch’s testimony is thus unreliable. Moreover, unlike in *Koninklijke Philips*, Mr. Welch’s conclusory and speculative testimony is rebutted by Patent Owner’s own expert, who explains that even if generic switching elements were part of the POSITA’s knowledge, the specific steps and structures required by the claims were not.

The Board accordingly should give no weight to the Petition’s conclusory and improper assertions that the claimed method steps and routing logic circuit can be met by the POSITA’s knowledge.

E. The POSITA Would Not Have Been Motivated to Modify Chang in View of Chang II and the POSITA’s Knowledge To Meet The Claim Limitations

The Petition’s proposed combination additionally fails to render the challenged claims obvious because it relies on hindsight reconstruction—a process employed by Petitioner’s expert, *see* EX2021 at 64:24-65:17, EX2021 at 9:15-10:10, but long rejected as impermissible. *Graham v. John Deere Co.*, 383 U.S. 1, 36 (1966); *In re Kotzab*, 217 F.3d 1365, 1369 (Fed. Cir. 2000). The Petition

proposes a multiple-stage reconstruction: first modifying a prior art USB hub (Chang) with a control circuit from an unrelated reference (Chang II); and then modifying the combination again—transforming components and rewiring internal connections in the process—to insert new electronic switching components (multiplexers) cherry-picked from the “POSITA’s knowledge.” (EX2019, ¶105.) At best, the Petition’s results-driven proposal describes how the POSITA *might have* combined the prior art, disregarding how the POSITA as of the priority date *would have been motivated* to combine the prior art with a reasonable expectation of success. (EX2019, ¶105.)

As Petitioner’s expert admitted, the proposed combination is a product of a claims-first analysis, in which Mr. Welch was provided with various patent claims, and with the Chang and Chang II references; and tasked with determining whether they taught the claims. (EX2021, 64:24-65:17.) Asked to explain why multiple implementations were proposed but not relied on for claims, Mr. Welch testified: “It was about if a specific claim had language which could be interpreted in order to have one of these rather than the other.” (EX2021, 220:11-221:11.) This hindsight analysis improperly fails to consider evidence of how the POSITA would not have been motivated to make the proposed combination; the Petition fails to make a *prima facie* case of obviousness for at least these reasons. (EX2019, ¶106.)

1. The Proposed Combination Would Change the Principles Under Which The Prior Art Was Designed to Operate And

Would Render The Prior Art Inoperable For Its Intended Purposes

If a proposed prior art combination would “change the ‘basic principles under which the [prior art] was designed to operate,’” or would “render the prior art ‘inoperable for its intended purpose,’” then the proposed combination is insufficient to render the claims *prima facie* obvious. *Plas-Pak Indus., Inc. v. Sulzer Mixpac AG*, 600 F. App’x 755, 758 (Fed. Cir. 2015) (internal citations omitted); *see also McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1354 (Fed. Cir. 2001) (inoperative combinations of references “teach away from the combination and thus cannot serve as predicates for a *prima facie* case of obviousness”).

The proposed combination improperly transforms the references, removing key functionality, and cannot support a *prima facie* case. (EX2019, ¶108.) As the Petition repeatedly emphasizes, Chang II repeats two “fundamental concepts”: “(1) host/device detection and (2) selecting between two different transmission paths.” (Petition, 34-35 (citing EX1015, [0024], [0046]); EX2019, ¶108). These concepts enable Chang II’s express “main feature”: a control chip that can automatically detect the type of device connected and internally switch to the appropriate transmission path (*i.e.*, the bridge transmission path or the bypass path). (Petition, 34-38, 46; EX1015, [0021]; EX2019, ¶108.) But as described above, the Petition’s proposed combination would be unable to “automatically detect” the type of device

once the hub module has been placed into device mode, and to switch to the appropriate transmission path accordingly (*e.g.*, from a device mode back to a host mode). (EX2019, ¶108.)

Thus, the proposed combination would render Chang II inoperable for its admitted main feature and intended purpose. (EX2019, ¶109.) And with respect to Chang, limiting the user’s ability to connect a consumer device to a USB hub would defeat Chang’s intended purpose of providing “a device capable of easily establishing a connection between a computer and another computer.” (*See* EX1014, [0002]; EX1013, ¶178; EX2019, ¶109.) Moreover, by replacing the existing internal switching functionality of Chang II with an external switching element (a multiplexer), the proposed combination physically bypasses Chang II’s bridge circuit, thus changing Chang II’s principle of operation: utilizing its switching circuitry to switch to the appropriate transmission path. (Petition, 35-38; EX1013, ¶¶160-165; EX2019, ¶109.)

2. The Proposed Combination Would Impair Usability And Functionality And Undermine USB Goals

The proposed combination suffers from additional defects that no POSITA would be motivated to incur. (EX2019, ¶110.) As described above, the proposed combination enters a state from which it cannot return: Chang II’s control chip 13 is physically disconnected from the downstream USB ports (and any devices connected to those ports), and can no longer perform the process of Chang II’s

FIG. 6 to determine whether the connected device is in a host mode. (EX2019, ¶110.) Further, Chang II’s control chip 13 cannot re-execute this process unless and until the control chip is somehow reconnected to the downstream USB port—an operation wholly unaddressed by the Petition. (EX2019, ¶110.) Additionally, as described above, the proposed combination would be unable to properly detect new external devices connected to the bridge device. (EX2019, ¶110.) This would impair usability and result in confusion, because the proposed combination would respond to user input in a manner inconsistent according to users’ expectations—such as by retaining an out-of-date, and perhaps inapplicable, USB mode when a new device is connected (*e.g.*, a direct-to-hub connection for a newly inserted device in host mode). (EX2019, ¶110.) Moreover, the proposed combination would remove existing USB hub functionality, including the ability to connect and reconnect USB devices in host mode or device mode, present in Chang and Chang II. (EX2019, ¶110.) No POSITA would thus be motivated to modify Chang and Chang II in the manner proposed. (EX2019, ¶110.)

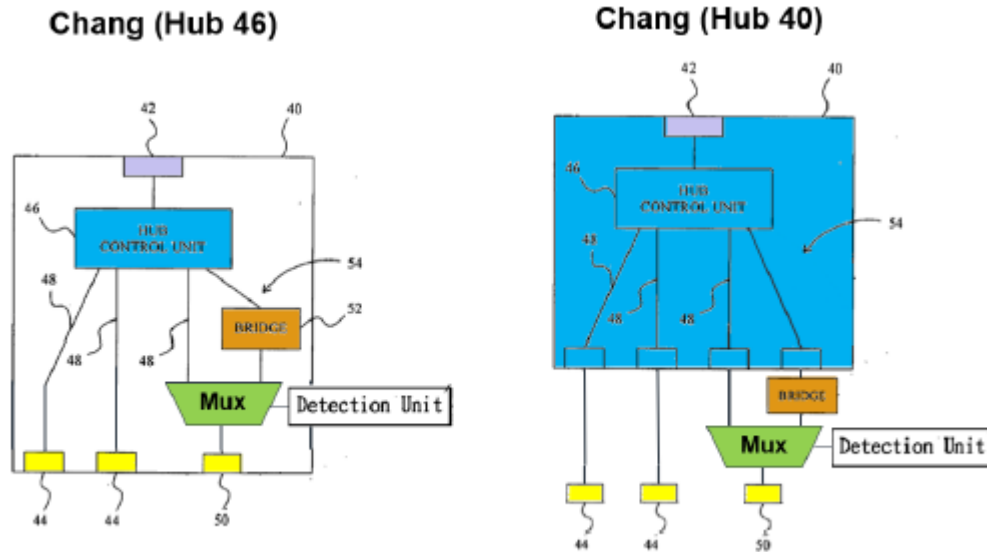
Furthermore, as described above, the proposed combination limits or disables “hot-swapping” functionality, by removing Chang II’s ability to detect newly inserted downstream devices. (EX2019, ¶111.) But as the USB 2.0 specification demonstrates, support for “dynamically attachable and reconfigurable peripherals” was a key design feature of USB. (EX1018, 41; EX2019, ¶111.)

Similarly, Mr. Welch identified “Support [for] hot plug and unplug” as motivation for the development of USB. (EX1013, ¶151.) The proposed combination’s loss of functionality would thus undermine the goals of USB generally, and would defeat the ’643 patent’s ability to maintain USB compatibility. (EX1011, 4:7-15; EX2019, ¶111.) No POSITA would be motivated to implement this combination. (EX2019, ¶111.)

3. The Proposed Combination Would Introduce Unnecessary Complexity, Redundancy, and Additional costs

The proposed combination is wasteful and inefficient. As described above, the Petition takes existing USB solutions in Chang and Chang II; adds duplicative switching components and new electronic hardware; and disregards existing components, for no reason other than to conjure a hindsight version for the challenged claims. (EX2019, ¶112.) For example, as described above, the Petition proposes modifying Chang’s USB hub by replacing its ports with new dual-role ports, and applying the bridge device of Chang II to the existing bridge device of Chang. (EX2019, ¶112.)

Even though Chang II already includes, as its “main feature,” circuitry for switching between two transmission paths, EX1015 at [0021], the Petition proposes *further* modifying the Chang/Chang II combination to insert additional switching hardware, inside and outside of Chang’s hub, *e.g.*:



(Petition, 49; EX2019, ¶113.)

As described above, the proposed combination uses the new switching hardware as a replacement for Chang II's existing switching circuitry. (EX2019, ¶114.) For example, the Petition explains that when the multiplexer switches a USB port to a direct-to-hub path, it bypasses the bridge of Chang 2 (Petition, 67-68; EX2019, ¶114.) In this combination, the Chang II control chip circuit is left intact, but neither the bypass circuit unit 133, nor the existing switching circuitry connecting to the bypass circuit unit, are utilized:

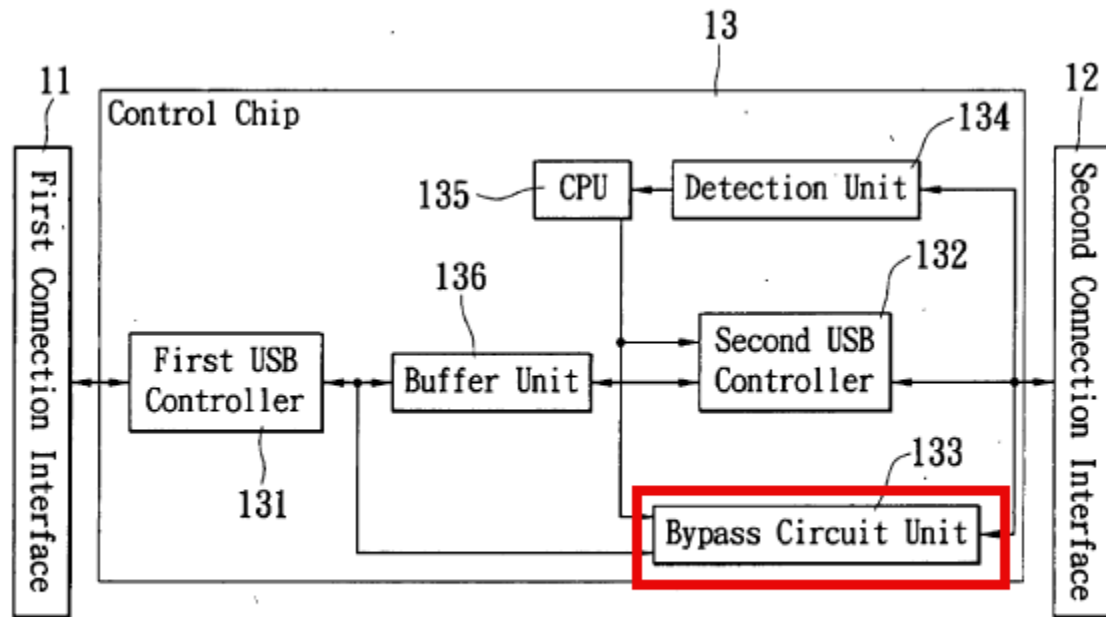
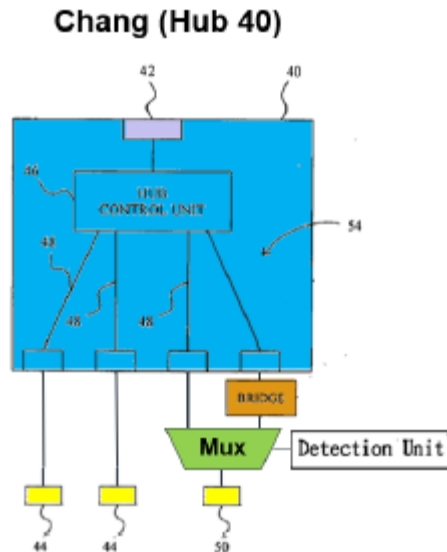


FIG. 5

(EX1015, FIG. 5 (annotated); EX2019, ¶114.)

Similarly, the proposed combination, at least in some implementations, introduces additional ports (44, 50) to Chang's USB hub, which already includes ports; and extends the circuitry outside Chang's existing hub enclosure 40:



(Petition, 49; EX2019, ¶115.)

In at least these instances, the proposed combination introduces redundant components with no clear benefit; adds unnecessary complexity; and wastefully leaves existing components unused or underutilized. (EX2019, ¶116.) This inefficiency brings with it real costs, as Petitioner's expert does not dispute (and did not consider in his analysis)—potentially including, for example, expenses associated with manufacturing, purchasing, integrating, and maintaining components; additional bulk and power consumption; unnecessary heat dissipation; and overall complexity. (See EX2021, 235:19-24, 236:5-22, 237:7-16, 240:24-241:18; EX2019, ¶116.) No POSITA would be motivated to combine the prior art in a manner that introduces such costs and complexity unnecessarily. (EX2019, ¶116.) Moreover, the proposed combination would undercut key goals of Chang and Chang II: simplicity, efficiency, and convenience. (EX1014, [0002],

[0003], [0024]; EX1015, [0010], [0021]; EX2019, ¶116.) Chang II thus discourages the Petition's proposed combination. (EX2019, ¶116.)

4. The POSITA Would Not Have Any Reasonable Expectation Of Success In Combining The References

The Petition additionally fails to establish a *prima facie* case of obviousness because the POSITA would have no reasonable expectation of success in combining the references as proposed by the Petition to achieve the claimed invention. *In re Merck & Co.*, 800 F.2d 1091 (Fed. Cir. 1986); EX2019, ¶117. For the reasons described above, the proposed combination would be incapable of meeting the claim limitations, and would suffer from critical defects in usability, including as the loss of detection functionality once a device mode has been entered. (EX2019, ¶117.) The Petition fails to acknowledge these defects, let alone to offer any evidence of how a POSITA would be able to combine the prior art with any reasonable expectation of success. (EX2019, ¶117.)

VIII. GROUND II: CLAIMS 2, 7, AND 13 ARE NOT RENDERED OBVIOUS BY CHANG IN VIEW OF CHANG II, CHUTORASH, AND POSITA KNOWLEDGE

Ground II challenges dependent 2, 7, and 13, which depend from claims 1, 5, and 10, respectively. Ground II fails to render obvious any of these claims for at least the reasons discussed in Section VII with respect to Ground I and parent claims 1, 5, and 10. (EX2019, ¶118.) The addition of the Chutorash reference, which relates generally to providing USB support in an automotive head unit,

cannot correct the deficiencies of the Chang and Chang II references, in view of the POSITA's knowledge. (*See* EX1064; EX2019, ¶118.) This is at least because the Chutorash reference is silent regarding USB routing or routing circuitry, let alone the particular routing logic or method steps recited in claim 1 and not taught by the remaining references, as described above. (EX2019, ¶118.)

Further, The POSITA would not have been motivated to modify Chang in view of Chang II, Chutorash, and the POSITA's knowledge to meet the claim limitations for at least the same reasons discussed above for Ground 1. (EX2019, ¶119.) That is, the proposed combination of Ground II suffers from the same defects discussed for Ground 1—*e.g.*, improper hindsight bias, rendering the prior art inoperable for its intended use, and introduction of complexity, redundancy, and additional costs—and the introduction of yet another reference, Chutorash, is irrelevant to and does nothing to mitigate those defects. (EX2019, ¶119.) Ground II fails for at least these reasons. (EX2019, ¶119.)

IX. SECONDARY CONSIDERATIONS FURTHER SUPPORT THAT THE CHALLENGED CLAIM IS NON-OBVIOUS

Courts have provided a number of additional considerations when determining whether a particular combination of references was obvious at the time of the claimed invention. These “objective evidence of nonobviousness includes copying, long felt but unsolved need, failure of others, commercial success, unexpected results created by the claimed invention, unexpected

properties of the claimed invention, licenses showing industry respect for the invention, and skepticism of skilled artisans before the invention[.]” *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998) (internal citations omitted).

A. There Are Numerous Objective Indicia Of Non-Obviousness As To The Patented Approach To Providing Persistent Downstream Connectivity

1. Long-felt but unsolved needs

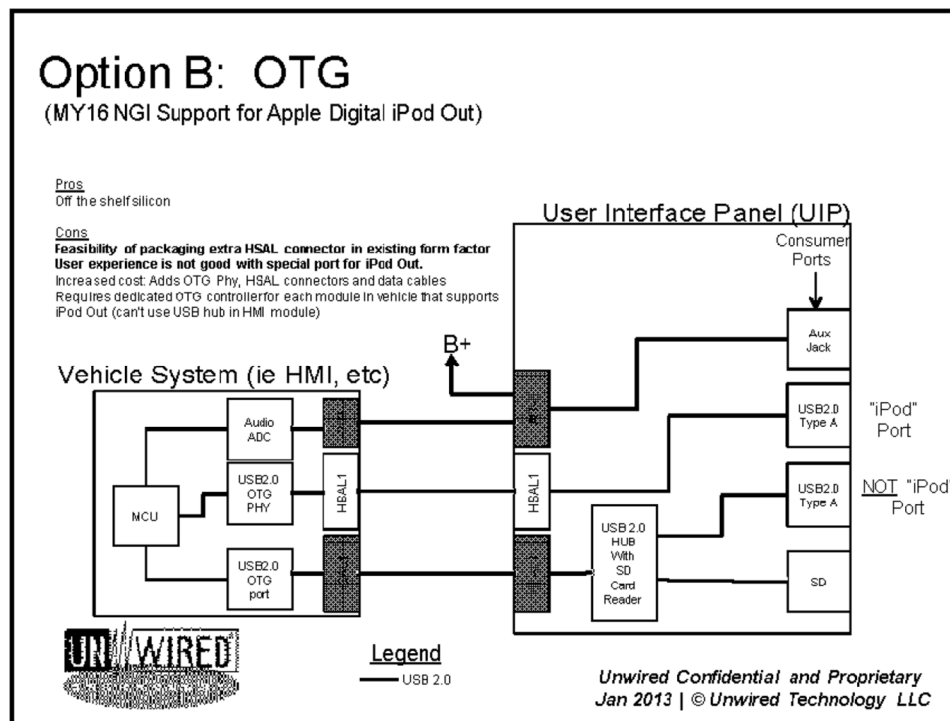
When Apple first introduced the ability to support a standardized iPod interface for in-car displays in 2010 with its “iPod Out” feature, automakers began looking for ways to support it. (EX2019, ¶141.) This interest only grew stronger once Apple announced its broad release of the feature (later known as CarPlay) in early 2013. (EX2019, ¶141; EX2040, 84:5-86:5 (“[in] early 2013, we began to hear that the automotive market had interest in enabling CarPlay”).) This was a difficult proposition because the traditional arrangement automakers used for allowing interaction between a vehicle’s infotainment system and a mobile phone was a single USB network with the infotainment system acting as the host. (EX2019, ¶141; EX2040, 89:3-11; EX2041, 91:19-92:4.) Both iPod Out and CarPlay, however, required that the iPhone act as a USB host. (EX2019, ¶141; EX2040, 86:1-5.)

As Microchip’s own expert explained in his trial testimony, automakers laid out three requirements for any CarPlay solution: (1) a “single lane to the head

unit,” (2) “CarPlay enabled on all downstream ports,” and “persistent USB connections when CarPlay is activated.” (EX2003, 70:2-12; EX2032, 139:16-141:22; *see also* EX2033, 181:17-182:9.) Microchip’s contemporaneous internal emails likewise acknowledge this pressure from automakers. (*See* EX2008 (“The real takeaway here is that the car makers want ‘Flex’ on every port and connectivity with the smart phones throughout the car – and they are willing to pay for it.”); *id.* “[Aptiv’s] solution offers ‘Flex’ on every port and connectivity throughout the car. Both of these features are highly desirable by the car makers. We will have to deal with the ‘Flex’ on every port. There is no way to defeat the competitive threat without accomplishing this.”); EX2005, 2 (Chrysler did “not want to lose data capability on the other ports not tied to the Apple device.”); EX2006, 2 (“[OEMs] want CarPlay AND they want additional connectivity to [*sic.*] head unit to other devices”).) Despite this clear mandate, no company, including Microchip, was able to provide a solution that satisfied all three requirements.

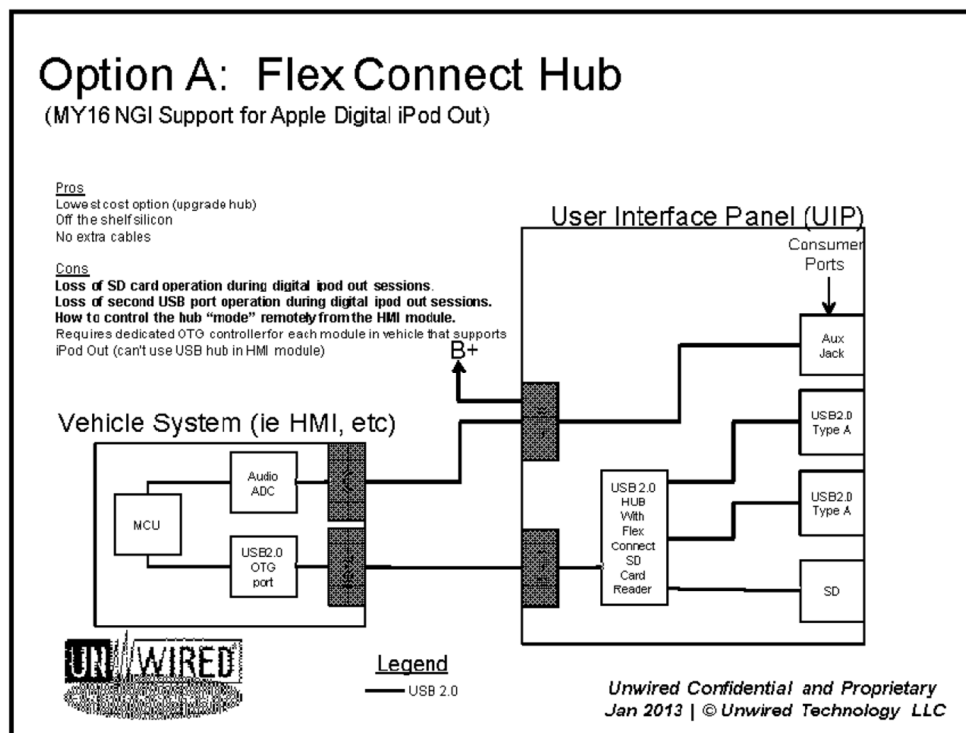
Prior to Aptiv’s innovative solution, there were two generally acknowledged approaches to providing CarPlay support. The first was to have two separate USB networks—one in which the head unit acts as the USB host for downstream ports and a second with OTG capability that would allow a connected device to act as a

host and the head unit to act as a device. (EX2019, ¶143; EX2037, 19; EX2029, 1.)



(EX2029, 1.) There were, however, two drawbacks to this solution. First, it would require a second USB port/cable in the head unit. (EX2019, ¶143; EX2037, 19; EX2029, 1.) This was costly for the Big 3 automakers both because they would need to redesign their existing head units which had a single upstream connection and because the solution would require additional components (port and cables) in a product with thin cost tolerances. (*Id.*; EX2041, 140:7-16.) Second, only ports on the OTG network would be capable of supporting CarPlay; all others would be USB Device-only ports. (EX2037, 19; EX2029, 1.)

The second recognized solution, which did not require a second upstream data connection, was the use of port-reversal technology that would effectively cause the head unit to act as a device. (EX2019, ¶143; EX2037, 20; EX2029, 1.)



(EX2029, 1.) This was unpalatable to the automakers because, while it allowed CarPlay on multiple ports, it would disrupt data connectivity on all non-CarPlay ports because the head unit was no longer acting as a USB host. (EX2019, ¶143; EX2037, 20; EX2029, 1.)

Summary

- Neither option A or B complies fully with existing functional requirements.
 - Option A does not allow access to the SD card or the second USB port if a iOS device is plugged in. Eg can't run vehicle nav app when iphone is connected (which is likely all the time).
 - Option B forces the user to 'find the right port' to make the phone work. Eg K2 vehicles have 5 ports in reach of the driver but only one will work. 80% chance to get it wrong.
- Option B may not package.
- Option B is expensive.

Conclusion: Neither option looks good. Need another option.



*Unwired Confidential and Proprietary
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(EX2029, 2.)

Aptiv's² dual role hub provided a third solution which satisfied all three of the automakers' requirements, as Microchip's expert acknowledged during his trial testimony. (EX2041, 139:16-141:22, 327:17-328:8 (multi-host architecture was "very important" and "uniquely" capable of satisfying "Big 3 demand for single-

² This solution was originally conceived of by Unwired Technology LLC ("Unwired"), which was acquired by Delphi Automotive Systems ("Delphi") in 2014. Delphi later changed its name to Aptiv. Accordingly, for the purposes of this response, "Unwired," "Delphi," and "Aptiv" generally refer to Patent Owner.

lane CarPlay with persistent USB); *see also*, EX2025 (presentation to Apple outlining the “unique benefits of Delphi/Unwired Hub”); EX2029, 2.)

Key System Considerations	Two USB Paths	Port Reversal Hub	Delphi Dual Role Hub
Head Unit used “Host” port (OTG not required)	No	No	Yes
CarPlay™ available on any USB port	No	Yes	Yes
Other hub ports work during CarPlay™	Yes	No	Yes
Impact to USB signal integrity	Severe	Some	None
Vehicle System Cost	Highest	Moderate	Lowest
Head Unit Software Drivers Required	No	Yes	Yes

(EX2037, 22.)

2. Failure of others/skepticism of skilled artisans

When CarPlay was announced, Microchip was the undisputed market leader in the field of automotive USB hub chips, controlling 100% of the market share for the Big 3 automakers. (EX2040, 211:23-212:6.) As of 2022, Microchip sold about eight billion chips per year and had at least 2,000 engineers working in its Networking and Data Center Business Unit, many of whom specialized in research and development for new products. (*Id.* at 195:17-21, 199:5-9, 200:12-20, 203:22-204:3.)

Despite these substantial advantages, Microchip was unable to provide the functionality automakers demanded. In particular, Microchip was not able to provide persistent downstream data connectivity for non-CarPlay ports. (EX2040, 237:22-238:8 (“what we couldn’t do was, at the point of the CarPlay connection, allow these other items to stay connected to the [head] unit, so that’s this

persistence. You could drop temporarily and come back, but you couldn't keep both active at the same time.”.) Microchip repeatedly acknowledged this limitation, both internally and externally to its customers:

- On June 18, 2014, Microchip declared that the problem was not solvable:

Some items may be *physically outside the capabilities of ANY USB system*. . . . With USB, you are only allowed 1 Host and multiple devices on a bus. This message is critical, so we need to make sure [Chrysler] understands this fact *We need to emphasize that you cannot do CarPlay AND own the other ports with one USB data lane* . . . No bus can serve two masters . . .

(EX2005, 1-2.)³

³ The author of this email, Brigham Steele, was an electrical engineer with over a decade of post-degree experience at the time he made these statements. See <https://www.linkedin.com/in/brigham-steele-2244a79/>, EX2040, at 308:1-4.

- During an April 2022 trial,⁴ Microchip admitted that it told customers that the problem was not solvable:

Q: So at this point in time, Microchip was telling its customers this one lane persistent USB thing isn't going to work and you should go with the FlexConnect solution instead?

A: That's about right.

(EX2002, 312:4-9.)

- On July 20, 2014, Microchip acknowledged that Aptiv had invented a solution to the problem that Microchip could not solve:

[Aptiv's] solution offers 'Flex' on every port and connectivity throughout the car. Both of these features are highly desirable by the car makers. . . . There is no way

⁴ Once Microchip eventually developed a competing product (modeled after Aptiv's), it sued Aptiv in Delaware district court, alleging that Aptiv's product infringed several of Microchip's existing USB patents. At trial, the jury disagreed, finding conclusively that Aptiv's product did not infringe any of the patents that Microchip asserted. (EX2018.)

to defeat the competitive threat without accomplishing this.

(EX2008, 1 (July 20, 2014).)

- Even after Aptiv invented a solution, Microchip continued to maintain that no viable solution was possible:

This is completely NON-STANDARD USB. . . . ***This goes against the primary requirement of USB***; one bus / one Host. . . . These hosts will be acting independently of each other but will need to maintain USB specifications/ timing/time-outs/HID / adequate throughputs as if it was a single bus. Could be demo'd but ***no way it can be guaranteed.***

(EX2009, 1 (Aug. 11, 2014) (emphases added).)

- In October 2014, Microchip was still telling its customers that there was no feasible way to have persistent downstream connectivity:

“They somehow believe with carplay on one of the BOB’s ports that they can still have access(data connectivity) to the other BOB’s ports. . . . ***we advised that you can do***

[non-data charging downstream ports] on non-carplay ports if you wanted to but saw no way for it to actually work. It appears to me that the OEM's do not have a good understanding of what is possible with Carplay...all they know is they want Carplay AND they want additional connectivity to head unit to other devices. How is that possible with without an Iphone allowing it? I have no idea."

(EX2006, 2 (Oct. 1, 2014) (emphases added).)

- Even at the end of 2014, Microchip still had not been able to offer a system with persistent USB:

When persistent USB is a requirement *we definitely have run into a wall.*

(EX2007, 1 (Dec. 1. 2014) (emphasis added).)

"We looked at developing a solution for 1 upstream lane, persistent USB data and we don't have a solution. We wish we could provide a solution, but we don't have it.

(EX2010, 1 (Dec. 2 2014); *see also* EX2041, 12:8-15 (confirming the accuracy of this statement).)

Only in January 2015, after studying Aptiv’s solution in detail (*see infra* Section IX.A.5, “Copying”) did Microchip acknowledge that it was “technically feasible to develop a solution that competes with Unwired’s.” (EX2034, 1 (Jan. 26, 2015).) And even then, Microchip cautioned that “[t]he concept of supporting USB transactions between two hosts via bridged peripheral endpoints is unique, and as such poses risk.” (EX2026, 11.)

Skepticism regarding the ability to address each of these requirements was not limited to Microchip and its engineers. Automakers, too, had struggled with this same problem and were surprised by Aptiv’s success. (EX2042, 202:14-203:14 (Hyundai engineers “didn’t believe that [Aptiv] had done it. There was a lot of skepticism and, quite frankly, they did not believe [Aptiv] had a solution. . . . even after the demo, they were quite skeptical, so it was an innovation that was almost unbelievable.”).)

3. Commercial success

When automakers learned of Aptiv’s ability to satisfy all three requirements for a viable CarPlay solution, they were understandably interested in using that solution in their upcoming vehicles. (*See* EX2008 (“The Unwired solution came up in most of the meetings . . . Unwired has gained traction at GM, Chrysler, and Ford.”).)

Despite initial concerns about Aptiv's ability to ramp up manufacturing to meet demand, Aptiv racked up contract after contract. Within months of Aptiv revealing its dual role hub concept to automakers, the Big 3 had switched from Microchip to Aptiv to source for upcoming model year products. (EX2040, 229:14-19 ("Q. And who won The Big 3 USB hub CarPlay business in 2014? A. Yeah, so – so we got to the middle of the year, and later in the year, as we learned more about Unwired, we learned that we had lost all three of them to Unwired."); EX2036, ¶ 10.) GM contracted Aptiv as their sole source supplier of media module hubs in every mid- and high-level infotainment system globally for model year 2015. (EX2037, 13.) Altogether, Aptiv captured 40% of the global Big 3 offerings for model year 2016, representing 10 million units. (*Id.*) Ultimately, Aptiv sold approximately 45 million units between 2015 and November 2021. (EX2041, 281:12-22; EX2036, ¶ 10.) This was an unquestionable commercial success for a new product launch in the automotive industry. (EX2036, ¶ 10.)

This sudden shift to an inexperienced chip manufacturer with a product not yet tested in the market was extraordinary. As Microchip's VP of Networking explained at trial: "[W]e were certainly surprised. Historically, the automotive industry is extremely conservative. They didn't want to put anything out there to start a problem in the field. So the fact that they would do something out of standard certainly is surprising." (EX2040, 241:4-15.)

Aptiv won this business because its innovative solution permitted it to satisfy the three automaker requirements: (1) single upstream connection, (2) CarPlay on all ports, and (3) persistent downstream connectivity on non-CarPlay ports. (EX2033; EX2042, 201:19-202:22.) Aptiv’s pitch to automakers for the dual role hub focused on this functionality. (*See, e.g.*, EX2027, 11; EX2028, 3.) Microchip repeatedly acknowledged the absence of any other solution capable of providing this capability as the reason for Microchip’s failure to secure sales. (*See, e.g.*, EX2007, 1 (“[w]hen persistent USB is a requirement we definitely have run into a wall.”); EX2007 (“We understand that [FCA] need[s] USB data on all ports even during CarPlay with one USB lane from the Head Unit to the Media Hub.”).)

4. Industry praise

Along with this commercial success, Aptiv achieved significant acclaim within the automotive industry for its dual role hub. Most notably, it was the winner of the 2016 PACE Award, an industry honor awarded by Automotive News in conjunction with Ernst & Young for an innovation (1) developed primarily by a supplier, (2) that is new to the automotive industry, (3) that is in use in a production vehicle, and (4) that “changes the rules of the game.” (EX2036, ¶4; EX2042, 184:23-185:6.) The PACE award is regarded in the automotive industry as the most prestigious award available to automotive suppliers. (EX2036, ¶3.) Its recipients are selected by a cross-disciplinary panel of independent judges after

conducting site visits to evaluate the importance of the innovation to the industry.

(*Id.*, ¶5.) Previous innovations that earned the award include adaptive cruise control and keyless push-to-start functionality. (*Id.* ¶3; EX2042, 185:7-24.)

Aptiv’s dual-role hub received the PACE award because of its ability to allow persistent downstream USB connectivity to non-CarPlay devices while CarPlay was active without requiring an alteration to the head unit hardware to permit a second upstream connection. (EX2036, ¶9.) The award citation for Aptiv’s 2016 PACE award states that the Dual Role Hub “solved [the] vexing problem” of permitting an iPhone to operate as a host while also allowing a driver “to access music on another device, play video on a passenger’s tablet or listen to music on a passenger’s Android phone.” (EX2038; EX2036, ¶7.) The video shown at the award ceremony, a screenshot of which is provided below, explained the innovation as allowing “a driver [to] connect their Apple iPhone to the radio head unit to host navigation, music and messaging, and also connect a second or third device, say an Android phone or a tablet.”⁵ (EX2039; EX2036, ¶8.)

⁵ A copy of this video is publicly available at

<https://www.autonews.com/article/20160411/VIDEO/304119865/2016-pace-award-winners>.

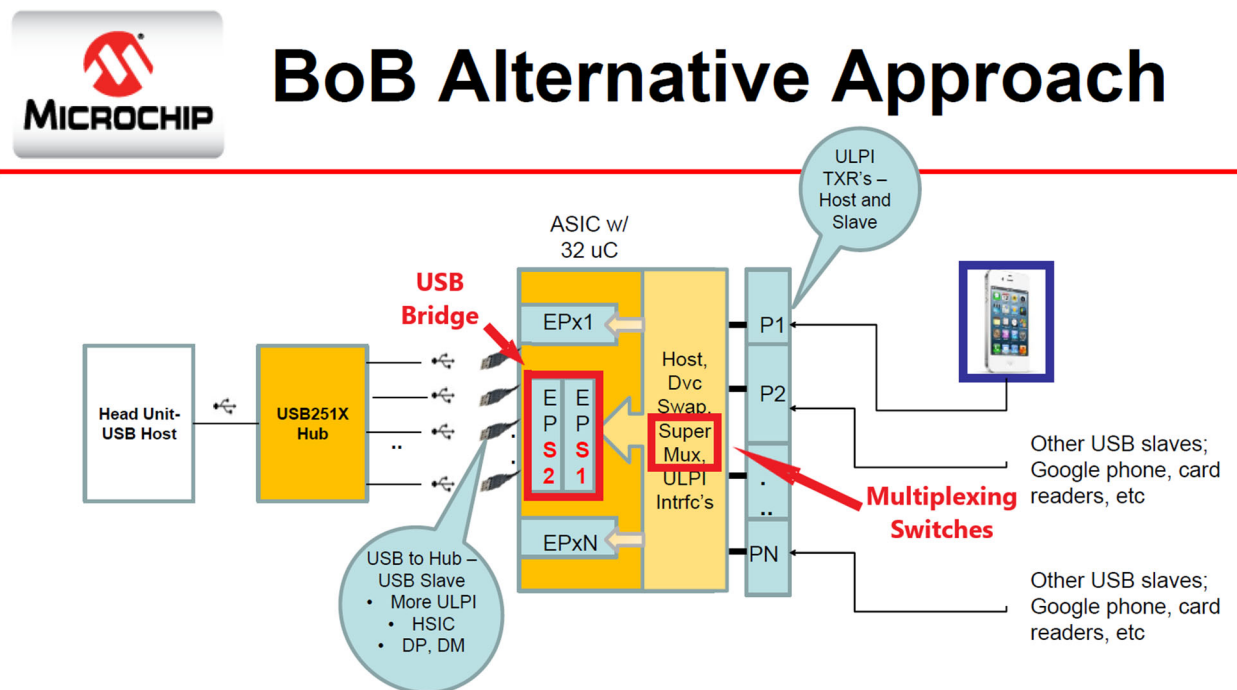


5. Copying

When others in the industry learned of Aptiv’s product and the success it was experiencing, they began to develop products that copied the core operation of Aptiv’s solution, including its host-to-host bridge and multiplexing switches.

At the time, Microchip offered two solutions for CarPlay that mirrored the generally acknowledged approaches to CarPlay at the time—a dual-upstream solution with designated CarPlay ports and a “FlexConnect” solution with role reversal, but no persistent downstream USB connectivity. (EX2040, 230:4-10, 294:18-11.) Before Aptiv entered the marketplace, “pretty much every car manufacturer” had planned to use one of these solutions. (*Id.* at 230:4-10.) Once Aptiv’s dual role hub entered the market, automakers began pressing Microchip for a competing solution that provided the same benefits. (*Id.* at 233:22-9; EX2033, 1 (“Chrysler came to us very aggressively to look at doing a spoofed device.”).)

Microchip responded by investigating the Unwired solution. (EX2040, 234:10-235:6 (“Q. And after Delphi’s request, did Microchip investigate Unwired’s solution and response to Aptiv? A. Yes, we certainly did.”).) Its engineers spoke to automakers and head unit manufacturers that had seen demonstrations of the Unwired solution and pieced together enough information to prepare a presentation for automakers disparaging the solution. (See EX2031.) This presentation contained diagrams showing that Microchip understood the basic structure of Unwired’s product, including the host-to-host USB bridge and multiplexing switches that help enable persistent downstream USB connectivity:

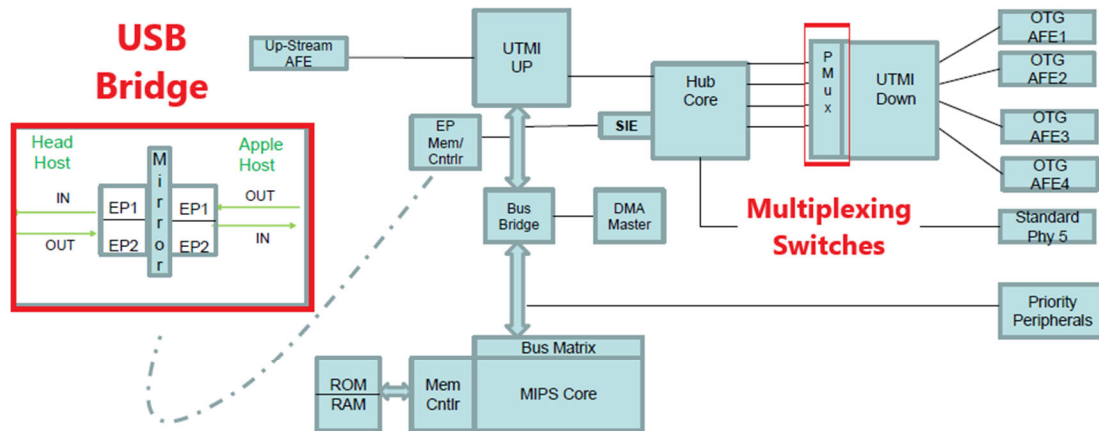


(EX2031, 6 (annotated).)

As Microchip began investigating how it could provide a CarPlay solution capable of competing with Aptiv's, it realized that it would need to copy Aptiv. Microchip's Vice President in charge of its networking group testified during trial: "[A]s we thought about it, we said well, okay, we can't do it a different way, then what is Unwired doing?" (EX2040, 240:1-241:3.) In late 2014, Microchip launched a program codenamed "Sandia" aimed at developing its own version of the Aptiv solution. From the very beginning, the lead architect of that project, Santosh Shetty, relied on the diagram above depicting Aptiv's product. (*See e.g.*, EX2032 (Dec. 22, 2014 email with "a few questions regarding the unwired solution PPT you send [sic]" and including a functional block diagram of the Aptiv product).) Unsurprisingly, the initial internal block diagrams of Microchip's own product were quite similar, including both a host-to-host USB bridge and multiplexing switches:



Multi-Host Device Controller



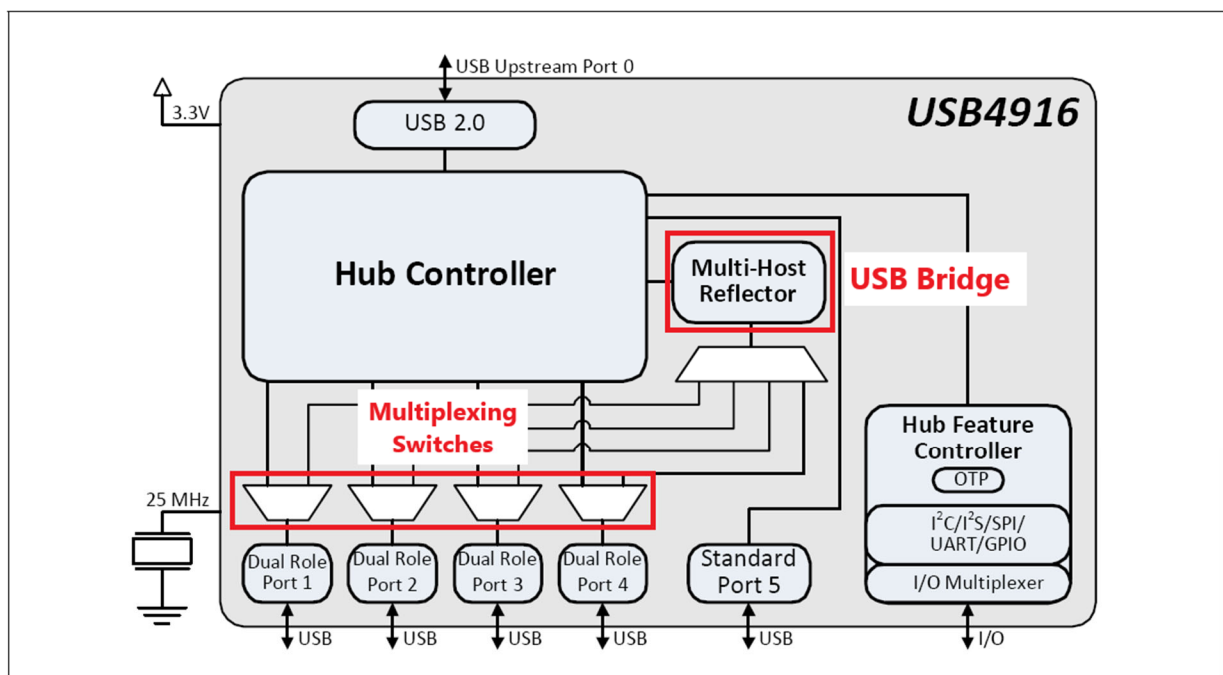
- Single upstream port
- 5 downstream ports; 4 CarPlay capable, 1 standard (CR or hub expansion)
- Priority peripherals – I2C, SPI, UART, I2S

(EX2034, 5 (annotated).)

In addition to attempting to understand the Aptiv solution by speaking with automakers and head unit manufacturers that had seen demonstrations, Microchip also obtained one of Aptiv's chips from a competitor and analyzed it to understand its capabilities. (EX2040, 186:22-188:12.) Microchip's engineer explained at trial that Microchip had "decapped" Aptiv's Boston 2 chip, which is the process of etching away the cover from the integrated circuit, allowing the inner workings of the chip to be studied. (*Id.*; EX2019, ¶153.) As Petitioner's expert explained, this type of reverse engineering is generally only necessary if the way that a product works is not obvious. (EX2021, 191:8-192:17; *accord* EX2019, ¶153.)

Several years later, Microchip introduced what it referred to as a “multi-host endpoint reflector,” which—like Aptiv’s product—used a host-to-host USB bridge and multiplexing switches to provide CarPlay support using a single upstream connection while still providing persistent downstream data connectivity on the non-CarPlay ports:

FIGURE 2-1: INTERNAL BLOCK DIAGRAM



(EX2030, 1, 6 (Annotated).) As one of Microchip’s engineers testified at trial, this structure enables persistent downstream USB connectivity, enables CarPlay on all ports, and enables the two separate hosts, head unit and the iPhone, to both be active at the same time. (EX2040, 105:3-13.)

B. There Is A Clear Nexus Between The Persistent Downstream Connectivity Claims And Objective Indicia

The law requires that “the evidence of secondary considerations must have a ‘nexus’ to the claims, *i.e.*, there must be ‘a legally and factually sufficient connection’ between the evidence and the patented invention.” *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) (quoting *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332 (Fed. Cir. 2019)). While the patentee bears the burden of showing nexus, there exists “a rebuttable presumption of nexus between the asserted evidence of secondary considerations and a patent claim if the patentee shows that the asserted evidence is tied to a specific product and that the product ‘*is the invention disclosed and claimed.*’” *Id.* (quoting *Demaco Corp. v. F. Von Langsdorff Licensing, Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988)). Even if the patentee cannot establish facts supporting a presumption of nexus, it may nevertheless show “that the evidence of secondary considerations is the ‘direct result of the unique characteristics of the claimed invention.’” *Id.* at 1373-74 (quoting *In re Huang*, 100 F.3d 135, 140 (Fed. Cir. 1996)).

In the present case, the challenged claims are tied to Aptiv’s commercial “dual-role hub” containing its Boston-2 chip. The combination of a host-to-host USB bridge with specific routing logic allowed the dual role hub to provide CarPlay support on each downstream port without the need for a second upstream connection with the head unit and without interrupting USB connectivity on the non-CarPlay downstream ports. (EX2042, 201:19-202:10-13.) It was therefore the

specific arrangement claimed in the patent that provided a solution to the “vexing problem” facing automakers and their suppliers and which ultimately drove demand for Aptiv’s product. (*Id.*, 202:14-22.) As a result, Aptiv has established that the secondary considerations are the “direct result of the unique characteristics of the claimed invention”—specifically, the configuration of the USB bridge and routing logic circuit, which are directly tied to enabling the persistent downstream USB connectivity on all ports via a single upstream head unit connection that was desired by automakers.

The requisite nexus between the claimed invention and Aptiv’s product is supported by the Supplemental Declaration of Dr. Houh, who provides on a per-limitation basis how Aptiv’s Dual Role Hub meets all limitations of claim 1. (EX2019, ¶156.)

X. THE CHALLENGED CLAIMS ARE NOT INDEFINITE UNDER 35 U.S.C. § 112

Contrary to Petitioner’s assertions, none of the challenged claims are indefinite. Petitioner argues that the following terms in the ’643 Patent render claims 1-15 indefinite:

- “the USB hub and USB bridge have different components and functionality” (claims 1, 5, and 10);
- “routing logic circuit” (claims 1, 5, and 10);
- “signal detection circuit” (claims 1 and 5); and

- “wherein the USB routing switch includes the signal detection circuit”
(claims 4 and 9).

A patent’s claims are indefinite only if the “claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014); *In re Packard*, 751 F.3d 1307, 1311 (Fed. Cir. 2014) (holding indefinite claims containing words or phrases that are “unclear in describing and defining the claimed invention”). Here, Petitioner fails to meet its burden to establish that any of the challenged claims are indefinite.

A. “The USB Hub and USB Bridge Have Different Components and Functionality” (Ground 3)

As the district court recognized in the related litigation, the term “the USB hub and USB bridge have different components and functionality” is not indefinite. *Aptiv Techs. Ltd. v. Microchip Tech., Inc.*, No. 1:23-cv-00307-JDW, 2024 WL 3400109, at *7 (D. Del. July 12, 2024). This term is non-technical, providing general descriptive language that means simply what it says: that the claimed USB bridge and the claimed USB hub must have different components and different functionality from each other. (EX2019, ¶121.)

Petitioner nevertheless contends the word “different,” as used in the term renders claims 1-15 indefinite because it is unclear *how* the USB hub and USB bridge are different. (Petition, 88-89.) Petitioner argues that it does not understand what difference, *e.g.*, a structural difference or otherwise, the word “different” requires. (*Id.* at 89.) But this is a complaint about the breadth of the claim, not about what meaning the word “different” imparts. A claim term is not indefinite merely because it is broad: “breadth is not indefiniteness.” *BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1367 (Fed. Cir. 2017) (citation omitted). Indeed, “the inference of indefiniteness simply from the scope finding is legally incorrect.” *Id.*; *see also Microchip Tech. Inc. v. Aptiv Techs. AG*, PGR2024-00011, Paper 9, 42-43 (P.T.A.B. Apr. 18, 2024) (listing cases for the proposition that breadth and indefiniteness are separate concepts).

Petitioner’s contention that there “is no context that could provide clarity” to the term because the limitation was added by amendment in response to an Examiner Interview mischaracterizes the record. (Petition, 92.) This term was added as part of an amendment *by the Examiner* “to better place the claims in condition for allowance, particularly adding the limitation that prior art[] fail[s] to teach.” (EX1012, 202-203.) The law “presume[s] that an [E]xaminer would not introduce an indefinite term into a claim when he/she chooses to amend the claim for the very purpose of putting the application in a condition for allowance.”

Tinnus Enters., LLC v. Telebrands Corp., 733 F. App'x 1011, 1020 (Fed. Cir. 2018); *accord Sonix Tech. Co v. Publ'ns Int'l, Ltd.*, 844 F.3d 1370, 1380 (Fed. Cir. 2017) (“application [of a claim term] by the [E]xaminer . . . provide[s] evidence that a skilled artisan did understand the scope of the invention with reasonable certainty”); *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1304 (Fed. Cir. 2008) (Patent Office is “presumed to have properly done its job, which includes one or more examiners who are assumed to . . . be familiar from their work with the level of skill in the art and whose duty it is to issue only valid patents” (quoting *Am. Hoist & Derrick Co. v. Sowa & Sons*, 725 F.2d 1350, 1360 (Fed. Cir. 1984), *overruled on other grounds*)).

A POSITA would be able to ascertain the scope of the term with reasonable certainty. According to Dr. Houh, a POSITA would understand that any difference in components and functionality would satisfy the language of the term. (EX2019, ¶¶120-128.) In the context of the invention, USB signals emanating from the consumer device are routed through both the USB hub and USB bridge when the consumer device is determined to be in a USB host mode, whereas the USB signals are routed directly to the USB hub, thereby bypassing the USB bridge, when the consumer device is determined to be in a USB device mode. (EX1011, 4:25-33.) The bridge must therefore perform some function not performed by the hub to facilitate communication between a pair of USB hosts. (EX2019, ¶¶123-124.)

Petitioner acknowledges as much, conceding that “drilling down on how the hub and bridge function to connect ports will result in some differences.” (Petition, 90-91.) The specification confirms some of those differences, identifying functions performed by the bridge that are not performed by the hub. (EX1011, Figs. 6, 7; 4:44-53; 6:3-5, 14-17, 44-59; 7:22-8:42.) In other words, so long as the USB bridge and the USB hub do not have the exact same components and do not have the exact same functionality, they meet the limitation that “the USB hub and USB bridge have different components and functionality.” (EX2001, ¶ 97; *see also id.* at 98-99; EX2019, ¶¶120-128.)

Moreover, none of the claims, the specification, or the prosecution history reveals any disavowal of claim scope that limits “different” beyond requiring different “components” and “functionality.” This straightforward reading, that any difference in components and functionality would satisfy the claim language, is consistent with Federal Circuit precedent construing the term “different.” *See, e.g., Sorensen v. Int’l Trade Comm’n*, 427 F.3d 1375, 1379 (Fed. Cir. 2005) (construing “different characteristics” to mean “any difference in characteristics” where the term “different” in view of the entire claim connoted such meaning and there was “no disavowal of claim scope” in the specification or prosecution history).

B. “Routing Logic Circuit” (Ground 4)

The term “routing logic circuit” does not render claims 1-15 indefinite. The district court agreed with Aptiv that a POSITA would understand that this term refers to a class of structures that directs signals from one input/output interface to another. *Aptiv*, 2024 WL 3400109, at *9; (*accord* EX2001, ¶100; EX2019, ¶¶129-132.)

The claims recite functions performed by the “routing logic circuit.” Claim 1 is representative. There, the “routing logic circuit” “rout[es] the USB signals emanating from the USB device” in accordance with a determination as to whether the consumer USB device is operating in host or device mode. (EX1011, Claims 1, 5, 10.) This claim language identifies the class of structures to which the term applies: circuits that route signals. *See MIT v. Abacus Software*, 462 F.3d 1344, 1355 (Fed. Cir. 2006) (noting that the qualifier “aesthetic correction” before “circuit” adds further structure by describing operation of the “circuit”). As Petitioner acknowledges (Petition, 101), the specification discloses multiple configurations in which routing logic circuitry may be implemented. (EX2001, ¶103.) For example, routing logic circuitry may be a discrete device, it may be present inside a USB multiplexing switch, or it may include circuitry to implement “USB routing logic.” (EX1011, 4:35-38, 4:40-43; Figs. 4-6; EX2001, ¶103.)

Petitioner’s assertions that this term is indefinite run contrary to the claim language itself, the embodiments disclosed in the specification, and statements by

its own expert. Additionally, Petitioner again ignores that this term was added *by the Examiner* in order to place the claims in position for allowance, creating a presumption that it is not indefinite. (EX1012, 107-108); *see Tinnus Enters.*, 733 F. App'x, at 1020.

A POSITA, reading the claims in light of the specification, would be able to ascertain the scope of the term “routing logic circuit” with reasonable certainty. A POSITA would understand that “routing logic circuit” in the claims identifies what is routed where—signals emanating from the consumer device are routed to the USB bridge or directly to the USB hub. (EX2001, ¶ 102; EX2019, ¶¶129-132.) The specification further informs a POSITA how this routing could be implemented using various circuit components, such as switches, logic gates, control lines, port identifiers, etc. (EX2001, ¶103.) The term itself recites the specific operation of the claimed routing logic circuit (*e.g.*, to route signals), and the specification provides examples that assist a POSITA in identifying exemplary structures that perform that operation. (*Id.* ¶¶102-03; EX2019, ¶¶129-132.) Petitioner’s expert agrees. (EX2021 (Welch Dep.) 226:2-15 (stating that a USB routing switch “has a functional structure”—“it does something and you can define what it does by the—the operation of the switching elements, the operation of the control elements, the net effect of that switch operation on the end-to-end connectively through a device.”))

C. “Signal Detection Circuit” (Ground 5)

Petitioner asserts that claims 1-9 are indefinite because they recite the term “signal detection circuit,” which Petitioner argues is a “means-plus-function” term that lacks corresponding structure for performing its recited function as required under § 112 ¶ 6. (Petition, 94.) The district court considered and correctly rejected these arguments. *Aptiv*, 2024 WL 3400109, at *7-8. As the district court concluded, the term “signal detection circuit” does not render claims 1-9 indefinite. *See id.*; EX2019, ¶¶133-138.

1. 35 U.S.C. § 112 ¶ 6 does not apply because “signal detection circuit” does not recite “means” or a similar nonce word

“Signal detection circuit” does not recite the word “means,” hence it is presumed that § 112 ¶ 6 does not apply. *See Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015) (“failure to use the word ‘means’ [] creates a rebuttable presumption [] that § 112 ¶ 6 does not apply”).

Nor does the term “signal detection circuit” use “a similar nonce word that can operate as a substitute for ‘means.’” *MTD Prods. Inc. v. Iancu*, 933 F.3d 1336, 1341 (Fed. Cir. 2019) (citation omitted). Critical to this determination is “whether the claim term is used in common parlance or by persons of [ordinary] skill in the pertinent art to designate structure, including either a particular structure or a class of structures.” *Id.* (citations omitted). Here, the term “circuit” is well understood

by a POSITA as conveying structure. (See EX2001, ¶¶104-105, 107; EX2019, ¶¶129-132.)

Courts have repeatedly held the same. See, e.g., *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, 711 F.3d 1348, 1364 (Fed. Cir. 2013) (“We have previously held on several occasions that the term ‘circuit’ connotes structure.”); *Abacus*, 462 F.3d at 1355 (“[D]ictionary definitions establish that the term ‘circuitry,’ **by itself**, connotes structure.” (emphasis added)); *Linear Tech. Corp. v. Impala Linear Corp.*, 379 F.3d 1311, 1320 (Fed. Cir. 2004) (“Technical dictionaries, which are evidence of the understandings of persons of skill in the technical arts, plainly indicate that the term ‘circuit’ connotes structure. . . . The *Dictionary of Computing* 75 (4th ed. 1996) defines ‘circuit’ as ‘the combination of a number of electrical devices and conductors that, when interconnected to form a conducting path, fulfill some desired function.’”).

Petitioner’s expert also agrees. (EX2021 (Welch Dep.), 30:25-31:6 (POSITA in 2013 would know what an integrated circuit is), 32:3-13 (POSITA “would understand that an integrated circuit included functional components put together to perform some function”), 34:10-14 (“POSITA would know that there are transistors in an integrated circuit”), 41:2-43:1 (circuit elements known to a POSITA as of 2013 include transistors, pull-up resistors, pull-down resistors, and devices that detect digital or analog signals).)

This is consistent with general-reference texts and prior art patents in the field. The *Wiley Electrical and Electronics Engineering Dictionary* defines “circuit” as “[o]ne or more conducting paths which serve to interconnect electrical elements, in order to perform a desired function such as amplification or filtering” (EX2015, 112.) Multiple patents filed before the ’643 Patent’s September 26, 2013 priority date use “signal detection circuit” to describe components within their respective inventions. (See, e.g., EX2012 (U.S. 7,282,965, claims directed to a “signal detection circuit” for detecting an input signal); EX2013 (U.S. 5,838,875, describing a “signal detection circuit” for discriminating between analog and digital signals); EX2014 (U.S. 6,441,627, describing a “signal detection circuit” for detecting a power characteristic of a signal).)

2. Petitioner cannot overcome the presumption that “signal detection circuit” is not a means-plus-function term

First, as discussed above, the term “signal detection circuit” is well understood by a POSITA as conveying sufficient structure.

Second, representative Claim 1 includes the adjectival qualifier “signal detection” before “circuit,” (EX1011, Claim 1), which indicates that the circuit operates to detect signals and “adds further structure by describing the operation” of the “circuit.” *Abacus*, 462 F.3d at 1355-56. The “signal detection circuit” at issue here is akin to the “aesthetic correction circuitry” at issue in *Abacus*. There, the Federal Circuit held that the adjectival qualification “aesthetic correction”

connotes sufficient structure to avoid means-plus function because the qualifier “adds further structure by describing the operation of the circuit,” which “is sufficient to avoid 112 ¶ 6.” *Id.*; accord *Phenix Longhorn, LLC v. Wistron Corp.*, No. 2:17-cv-00711-RWS, 2019 WL 2568476, at *15 (E.D. Tex. June 21, 2019) (quoting *Power Integrations*, 711 F.3d at 1365) (“circuits for programming” conveys sufficient structure). As the district court recognized, the same holds true here: “[A] POSITA putting together the terms ‘signal detection’ and ‘circuit’ would find a sufficiently definite structure because ‘signal detection’ limits the type of circuit claimed.” *Aptiv*, 2024 WL 3400109, at *8; (EX2019, ¶¶129-138).

Throughout this proceeding, Petitioner’s own expert has provided opinions confirming (expressly and implicitly) that the term “signal detection circuit” provides sufficient detail to connote a class of structures. He acknowledged that dual-role USB products are supported by dual-role ports, which “require[] detection circuitry that determines whether the connecting product is in host or device mode.” (EX1013, ¶74.) According to Petitioner’s expert, “this detection circuitry was well known, and was available in various forms” circa 2013. (*Id.*). For example, “[i]t was well-known to POSITAs circa 2013 that detecting the presence/values of the resistors using, *e.g.*, a voltage divider, indicated whether a host or device was connected.” (*Id.*, ¶76.) Petitioner’s expert offered additional exemplary structures for signal reception and classification: a “pull up resistor” on

a data line (Bohm ’759), a “sensing mechanism” for sensing impedance changes (Bohm ’885), and passive monitoring of data lines (Castleberry). (*Id.*, ¶¶77.) These examples are consistent with the structural components of circuits known to a POSITA that Petitioner’s expert identified during his deposition. (EX2021 (Welch Dep.) at 41:2-43:1 (transistors, pull-up resistors, pull-down resistors, and devices that detect digital or analog signals).) Petitioner’s expert also explained that the “use of resistors can be thought of as producing signals on the data lines that a detection circuit detects.” (EX1013, ¶¶80.) The exemplary structures provided by Petitioner’s own expert are members of the class of structures that perform the claimed signal reception and detection functions of the “signal detection circuit.” (See EX2001, ¶¶111, *see also id.* ¶¶107-110.)

Third, the surrounding claim language further describes the signal detection circuit’s operation, which provides sufficient detail to connote structure to a POSITA. The claims recite that the “signal detection circuit” receives USB signals from the consumer USB device and determines whether the consumer USB device is operating in a USB host mode or in a USB device mode. (EX1011, Claims 1, 5.) This description provides sufficient detail to “suggest structure to persons of ordinary skill in the art” such that the term should not be deemed a means-plus-function limitation. *See Linear Tech.*, 379 F.3d at 1320-21 (“[W]hen the structure-connoting term ‘circuit’ is coupled with a description of the circuit’s operation,

sufficient structural meaning generally will be conveyed to persons of ordinary skill in the art, and § 112 ¶ 6 presumptively will not apply.”); (EX2019, ¶128-132.)

Because the term “signal detection circuit” refers to sufficient structure, Petitioner cannot overcome the presumption that it is not a means-plus-function term, and therefore cannot demonstrate that “signal detection circuit” renders claims 1-9 indefinite.

D. “Wherein the USB Routing Switch Includes the Signal Detection Circuit” (Ground 6)

The term, “wherein the USB routing switch includes the signal detection circuit” does not render claims 4, 9, and 15 indefinite.

1. Petitioner’s contention that its argument also extends to dependent Claim 15 is baseless

As an initial matter, Petitioner relies exclusively on its expert’s declaration to argue this ground. (Petition, 99.) This is an improper incorporation by reference. But neither Claim 15 nor any of the claims from which Claim 15 depends *even recite a signal detection circuit*, let alone the entire phrase “wherein the USB routing switch includes the signal detection circuit.” (EX1011, Claims 10-15.) Neither Petitioner nor its expert offer any explanation (let alone citation to the patent or its prosecution history), for their bald assertions that Claim 15 should be read to include limitations that the applicant chose to include in dependent Claims 4 and 9, but not in Claim 15. *See Tandon Corp. v. U.S. Int’l Trade*

Comm’n, 831 F.2d 1017, 1023 (Fed. Cir. 1987) (“There is presumed to be a difference in meaning and scope when different words or phrases are used in separate claims.”).

Undeterred by the applicant’s decision not to add a “signal detection circuit” in Claim 15, Petitioner’s expert attempts to import a “signal detection circuit” into Claim 15 through Claim 15’s recitation of a “USB routing switch.” According to Petitioner’s expert, “[b]ecause claim 15 recites that the switch performs the detection functionality. . . . Claim 15 would be understood to require that the switch includes the signal detection circuit in some way, because the switch performs the signal detection functionality.” (Petition, 99; EX1013, ¶ 341.) This circular, *ipse dixit* argument finds no support within the claims, the specification, or prosecution history, and the Board should reject it out of hand.

2. “Includes” has a straightforward meaning

Petitioner’s contention that it is unclear “what it means for the ‘routing switch’ to **include** ‘the signal detection circuit’” (Petition, 99) lacks credibility. The word “includes” itself has a straightforward, plain meaning: “to take in or comprise as part of a whole or group.” (EX2011 (*Include*, Merriam-Webster Online Dictionary (Apr. 3, 2024), <https://www.merriam-webster.com/dictionary/includes>)); *accord Entropic Commc’ns, LLC v. Charter Commc’ns, Inc.*, No. 22-CV-00125-JRG, 2023 WL 4181266, at *7 (E.D. Tex. June

26, 2023) (construing “a data networking engine implemented in a first circuit that includes at least one processor” to have its plain meaning). Based on its plain meaning, a POSITA would understand that this claim term requires simply that the USB routing switch comprises the signal detection circuit as part of a whole or group. (EX2001, ¶114.)

The surrounding claim language confirms that the routing switch and signal detection circuit are part of a whole or group of components that receive USB signals from the consumer device and route those signals to the USB hub. Claim 1 recites that the signal detection circuit receives USB signals from the consumer device and determines whether the consumer device is operating in a USB host or a USB device mode, and Claim 3 recites that a USB routing switch routes signals emanating from the consumer device to the USB hub based on the determination of the signal detection circuit. (EX1011, Claims 1, 3.)

The Examiner likewise understood during prosecution that “includes” indicates membership within a group of components. For example, the Examiner cited a prior art reference’s “combination of hub logic 38, mux 72B and transceiver 34B,” and the connections between those elements (depicted in Figures 4 and 5) as disclosing a USB routing switch that performs the function of bypassing the USB bridge, wherein the USB routing switch includes the signal detection circuit. (EX1012, 68; EX1047.)

3. Petitioner’s contention relates to implementation-level details, not definiteness

Petitioner contends that this term is indefinite because Petitioner fails to understand “how,” from a structural standpoint, the USB switch includes the signal detection circuit. (Petition, 99-102.) But the word “includes” does not impart a narrow structural requirement.

Additionally, there is no disclaimer or disavowal of claim scope that would further narrow the plain meaning of “includes.” None of the claims, specification, or the prosecution history limits the scope of the claim to a particular structural arrangement beyond the USB routing switch including the signal detection circuit. *See Sorensen*, 427 F.3d at 1379 (holding that “different characteristics” meant “any difference in characteristics” where there was no disavowal of claim scope). “Includes” thus indicates any structural limitation where the routing switch includes the signal detection circuit within a group.

Even *assuming arguendo* that there is a lack of disclosure of implementation-level details it does not give rise to indefiniteness. *See, e.g., Microchip Tech. Inc. v. Aptiv Techs. AG*, PGR2024-00011, Paper 9, 55-56 (P.T.A.B. Apr. 18, 2024) (collecting cases). As Petitioner’s own exemplary implementations illustrate, the claims, read in light of the specification, inform a POSITA to about the claim scope with reasonable certainty. *See Nautilus*, 572 U.S. at 909. The Petition identifies one implementation in which the word

“includes” in the claim term “indicates that the ‘signal detection circuit’ is inside the ‘switch’ or that the ‘switch’ uses the same circuitry as the ‘signal detection circuit.’” (Petition, 99-100.) Alternatively, the effect of “includes” may be that “the ‘routing switch’ and ‘signal detection circuit’ are simply on the same IC,” “that the transistors that comprise the ‘switch’ and ‘signal detection circuit’ [are] intermingled,” or further still, that “the switch transistors themselves [] also function as a ‘signal detection circuit.’” (Petition, 100.) Each of Petitioner’s proposed structural implementations satisfies the claim because each implementation is configured such that the USB routing switch includes the signal detection circuit as part of a whole or group.

A POSITA would understand the scope of the invention with reasonable certainty. Claims 4, 9, and 15 are not indefinite.

XI. THE CHALLENGED CLAIMS HAVE SUFFICIENT WRITTEN DESCRIPTION UNDER 35 U.S.C. § 112

1. Petitioner’s contention that its argument extends to dependent Claim 15 is baseless

At the outset, Petitioner repeats its unfounded assertion that its argument for this term extends to dependent Claim 15, which does not recite the term, nor does it recite claim limitations that Petitioner seeks to read in. For the same reasons discussed above, Petitioner’s Ground 7 arguments apply only to dependent claims 4 and 9, and not to dependent Claim 15.

2. Claims 4 and 9 have adequate written description

The term “wherein the USB routing switch includes the signal detection circuit,” does not render dependent claims 4 and 9 invalid for lack of written description.

To satisfy the written description requirement under 35 U.S.C. § 112, the specification must “reasonably convey[] to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010). The written description inquiry turns not on “the presence or absence of literal support in the specification for the claim language,” *In re Kaslow*, 707 F.2d 1366, 1375 (Fed. Cir. 1983) (citation omitted), but instead, upon whether the specification conveys to a POSITA possession of the “complete and final invention with all its claimed limitations,” *Ariad*, 598 F.3d at 1353.

Petitioner’s primary contention is that the term lacks written description support because the specification “provides no structural description” of how the USB routing switch might include the signal detection circuit. (Petition, 102.) But the specification need not disclose routine implementation details or exemplary implementations of the invention to satisfy written description. *See, e.g., Univ. of Rochester v. G.D. Searle & Co.*, 358 F.3d 916, 923 (Fed. Cir. 2004). Petitioner’s argument also ignores that a POSITA reviewing the specification and claims may

rely on his or her knowledge and skill in the art. *See Boston Sci. Corp. v. Johnson & Johnson*, 647 F.3d 1353, 1366 (Fed. Cir. 2011) (“Because the specification is viewed from the perspective of one of skill, in some circumstances, a patentee may rely on information that is ‘well-known in the art’ for purposes of meeting the written description requirement.”). When Petitioner’s own expert reviewed the specification (relying on his knowledge and skill in the art), he recognized that Patent Owner had possession of a number of implementations of the claimed “signal detection circuit,” as discussed above, and identified two implementations of “wherein the USB routing switch includes the signal detection circuit.” (Petition, 99-100 (citing EX1013); EX1013, ¶342 (routing switch and signal detection circuit on the same IC or that transistors comprising the switch additionally function as signal detection circuit)). In so doing, he confirmed that a POSITA would understand the inventor to be in possession of at least two implementations of this limitation.

A POSITA would understand, based on the specification’s disclosure and his or her general understanding of routing switches and signal detection circuits in the field of USB, that the inventors had possession of the claimed subject matter. (EX2001, ¶¶118-122.) The claims and specification explain that the function of the USB routing switch is to route signals emanating from the consumer device to the USB hub such that the signals bypass the USB bridge upon a determination

that the consumer device is in a USB host mode, and further that the signal detection circuit functions to receive USB signals from the consumer device and determine whether the consumer device is acting in a USB host mode or a USB device mode. (EX1011, 4:45-57, Claims 1, 5, 10.) Based on this disclosure, a POSITA would understand that the claims identify what is routed where (*i.e.*, signals emanating from the consumer device are routed to the USB bridge or directly to the USB hub), that this routing is performed in accordance with a determination by a signal detection circuit, and that these routing and signal detection functions can be implemented using a group of devices. (EX2001, ¶¶102, 118.)

To the extent Petitioner argues that Claims 4 and 9 lack written description for failure of the specification to contain the same literal language as recited in the claims (*see* Petition, 102-03), that is irrelevant. *See, e.g., Nalpropion Pharms., Inc. v. Actavis Lab'ys., FL, Inc.*, 934 F.3d 1344, 1350 (Fed Cir. 2019) (“It is not necessary that the exact terms of a claim be used *in haec verba* in the specification, and equivalent language may be sufficient.”).

Accordingly, Petitioner fails to demonstrate that the specification does not reasonably convey to a POSITA that the inventors had possession of the claimed subject matter. Claims 4, 9, and 15 are not invalid for lack of written description.

XII. CONCLUSION

For the foregoing reasons, claims 1-15 of the '643 patent are not unpatentable.

Dated: October 23, 2024

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Certification of Word Count (37 C.F.R. § 42.24)

I hereby certify that this PATENT OWNER'S RESPONSE has 15,979 words (as counted by the Word Count feature of the Microsoft Word™ word-processing system), exclusive of a table of contents, a table of authorities, mandatory notices under § 42.8, a certificate of service or word count, or appendix of exhibits or claim listing.

Dated: October 23, 2024

By: /Bryan Blumenkopf/
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CERTIFICATE OF SERVICE

I hereby certify that the attached PATENT OWNER'S RESPONSE was served as of the below date via electronic mail by agreement to the following counsel of record for the Petitioner:

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