UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

KaiJet Technology International Limited, Inc.
Petitioner

v.

Sanho Corp.
Patent Owner

IPR2021-00886
U.S. Patent No. 10,572,429

PORT EXTENSION APPARATUS

PETITION FOR *INTER PARTES* REVIEW

LIST OF EXHIBITS

Exhibit	Description
EX1001	U.S. Patent 10,572,429 ("the '740 patent")
EX1002	File history of the '429 patent
EX1003	Declaration of Paul Franzon
EX1004	*Curriculum Vitae* of Paul Franzon
EX1005	U.S. Patent Application Publication No. 8,649,169 to Kwon et al. ("Kwon")
EX1006	U.S. Patent Application Publication No. 2018/0165053 to Kuo et al. ("Kuo")
EX1007	U.S. Patent No. 7,503,808 to O'Shea ("O'Shea")
EX1008	U.S. Patent Application Publication No. 2012/0003852 to Chang ("Chang")
EX1009	Wikipedia Page for "USB-C" (https://en.wikipedia.org/wiki/USB-C)
EX1010	Wikipedia Page for "Lightning (connector)" (https://en.wikipedia.org/wiki/Lightning_(connector)
EX1011	Wikipedia Page for "USB hub" (https://en.wikipedia.org/wiki/USB_hub)
EX1012	Wikipedia Page for "Digital Visual Interface" (https://en.wikipedia.org/wiki/Digital_Visual_Interface)
EX1013	Plaintiff Sanho Corporation's Disclosure of Asserted Claims and Infringement Contentions, Case No. 1:20:cv-02150
EX1014	First Amended Joint Claim Construction and Prehearing Statement, Case No. 1:18-cv-05385 (consolidated with Case No. 1:20:cv-02150)
EX1015	Petitioner's Opening Claim Construction Brief, Case No. 1:18-cv-05385
EX1016	Patent Owner's Opening Claim Construction Brief, Case No. 1:18-cv-05385
EX1017	Docket Navigator Report for N.D. Ga. on motions to stay pending IPR
EX1018	Docket Navigator Report for N.D. Ga. on case timelines
EX1019	Microsoft Computer Dictionary Excerpt
EX1020	U.S. Design Patent No. D320,196 to Carter et al.
EX1021	U.S. Patent No. 5,569,052 to Belt et al.
EX1022	US Patent No. 6,697,892 to Laity et al.
EX1023	Amazon Listing for "Pluggable Universal Docking Station" (https://www.amazon.com/Plugable-Universal-Docking-Station-Ethernet/dp/B00ECDM78E/)
EX1024	Universal Serial Bus Specification Revision 2.0 April 27, 2000

EX1025	Universal Serial Bus 3.2 Specification, September 22, 2017
EX1026	Tech Crunch, "The new MacBook Pro is here," October 27, 2016 (https://techcrunch.com/2016/10/27/return-of-the-mac/)
EX1027	Tech Crunch, "Apple's new MacBook Pro kills off most of the ports you probably need," October 27, 2016 (https://techcrunch.com/2016/10/27/apples-new-macbook-pro-just-killed-off-most-of-the-ports-you-probably-need/)
EX1028	MacBook Pro (13-inch, 2017, Two Thunderbolt 3 ports) - Technical Specifications (https://support.apple.com/kb/SP754)
EX1029	U.S. Design Patent No. D806,700 to Akana et al.
EX1030	*Sanho Corp. v. KaiJet Technology Int'l Ltd., Inc.*, No. 1:18-cv-05385, ECF 258, Order Granting Joint Motion to Amend Scheduling Order
EX1031	Declaration and Report of R. Jacob Baker, Ph.d., P.E. in Case No. 1:18-cv-05385
EX1032	*Sanho Corp. v. KaiJet Technology Int'l Ltd., Inc.*, No. 1:18-cv-05385-SDG, Second Amended Joint Claim Construction and Prehearing Statement

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I. INTRODUCTION

Petitioner KaiJet Technology International Limited, Inc. ("Petitioner") requests *inter partes* review ("IPR") of claims 1-6 and 13-17 ("challenged claims") of U.S. Patent 10,572,429 ("the '429 patent", EX1001).

The '429 patent describes a docking station for expanding the ports of a host, like a laptop computer. *See* EX1001, Abstract. EX1003, ¶34. Specifically, it claims a "many-to-many" port replicator having two input ports connecting to two corresponding ports of the host computer and expanding those two ports into multiple additional output ports for peripheral devices. *Id*. But docking stations have been around since the 1980s, and many-to-many port expanders were known long before the '429 patent. *See* EXS1005, 1007; EX1003, ¶24. The preferred embodiment has its port configuration selected for compatibility with a 2017 Apple MacBook Pro, which has two adjacent USB Type-C/Lightning ports. *See* EX1001, 4:65-67, 5:15-16, 5:24-31; EXS1025-1028; EX1029, FIG. 13; EX1003, ¶33. But this does not make the '429 patent claims patentable, as prior art discloses selecting the ports of a docking station to match the port configuration of the host computer with which the docking station is intended to interface. *See, e.g.*, EX1006, ¶¶[0007], [0023]; EX1007, 3:1-5; EX1003, ¶152.

II. MANDATORY NOTICES

A. Real parties-in-interest

Under 37 C.F.R. § 42.8(b)(1), Petitioner KaiJet certifies that KaiJet Technology International Limited, Inc., Kaijet Technology International Corporation, Starview Global Limited, and Magic Control Technology, are the real parties-in-interest in this proceeding.

B. Related matters

Patent Owner Sanho Corporation is the assignee of record for the '429 patent. The '429 patent is at issue in the following district court matters:

- *Sanho Corporation v. Kaijet Technology International Limited, Inc. d/b/a j5create*, No. 1-20-cv-02150 (N.D. Ga. May 19, 2020);
- *Sanho Corporation v. Alogic USA LLC*, No. 4-20-cv-03182 (N.D. Cal. May 8, 2020); and
- *Sanho Corporation v. intelliARMOR a/k/a intelliARMOR Inc.*, No. 8-20-cv-00735 (C.D. Cal. Apr. 14, 2020) (dismissed)

C. Lead and back-up counsel and service information

Petitioner identifies the following lead and back-up counsel:

Lead Counsel	Back-up Counsel
James D. Stein (Reg. No. 63,782) Lee & Hayes P.C. 75 14th Street NE Suite 2500 Atlanta, GA 30309 Phone: 404.736.1918 james.stein@leehayes.com	Ryan Gentes (Reg. No. 73,697) Lee & Hayes P.C. 75 14th Street NE Suite 2500 Atlanta, GA 30309 Phone: 404.736.1922 ryan.gentes@leehayes.com Andrew Strickland (Reg. No. 67,755) Lee & Hayes P.C. 75 14th Street NE Suite 2500 Atlanta, GA 30309 Phone: 404.736.1925 andrew.strickland@leehayes.com William B. Dyer III (Reg. No. 41,725) Lee & Hayes P.C. 75 14th Street NE Suite 2500 Atlanta, GA 30309 Phone: 404.736.1857 bill.dyer@leehayes.com

Petitioner consents to e-mail service at the email addresses listed above.

III. GROUNDS FOR STANDING

Petitioner certifies that the '429 patent is available for IPR and that Petitioner is not barred or estopped from requesting IPR challenging the Challenged Claims.

IV. PRECISE RELIEF REQUESTED

A. Claims for which review is requested

Petitioner requests IPR and cancelation of claims 1-6 and 13-17 as unpatentable.

B. Statutory grounds

Ground 1: Claims 1-6 and 13-17 are obvious under AIA 35 U.S.C. § 103(a) over U.S. Patent No. 8,649,169 to Kwon et al. ("Kwon," EX1005) and U.S. Patent Application Publication No. 2018/0165053 to Kuo et al. ("Kuo," EX1006).

Ground 2: Claims 1-6 and 13-17 are obvious over Kwon and Kuo, further in view of U.S. Patent Application Publication No. 2012/0003852 to Chang ("Chang," EX1008).

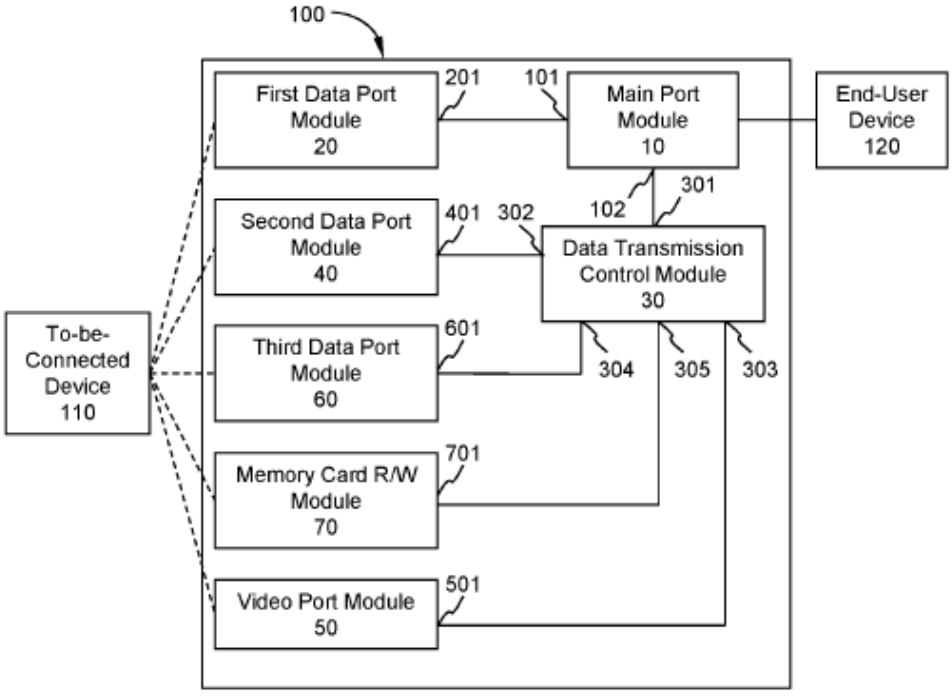
Ground 3: Claims 1-6 and 13-17 are obvious over U.S. Patent No. 7,503,808 to O'Shea ("O'Shea," EX1007) and Kuo.

Ground 4: Claims 1-6 and 13-17 are obvious over O'Shea and Kuo, further in view of Chang.

Kwon, O'Shea, and Chang—patent documents filed and published before the '429 patent's claimed priority date of April 7, 2017—qualify as prior art under § 102(a)(1), (2). Kuo qualifies as prior art under § 102(a)(2) as a published U.S. patent application filed before the '429 patent's claimed priority date.

V. THE '429 PATENT

The '429 patent describes a many-to-many "port extension apparatus" for expanding two ports of an end-user device, like a laptop, into multiple output ports. *See* EX1001, Abstract. As shown in Figure 1 below, the apparatus 100 has "a main port module 10 for connecting to ports of the end-user device 120" and additional port modules 20-70 for connecting to-be-connected devices 110 to the end-user device. EX1001, 3:1-10. Examples of to-be-connected devices include a "USB flash drive, mobile phone, or display device." *Id.*, 3:51-52.



'429 Patent, FIG. 1

As shown in Figure 2 below, the main port module is a separate component containing two port units 11, 12—such as USB-C or USB male or female ports.

EX1001, 3:5-30, 3:39-42, 5, 24-35, FIG. 2; EX1002, 67. A first data port module 20, such as female USB-C or Lightning port, connects to the first port unit 11, forming a transmission path between the to-be-connected device and end-user device. EX1001, 3:21-25, 4:65-67. The other port modules 40-70—e.g., a female USB port 30, an HDMI port 40, and a memory card reader 70—connect to the second port unit 12 via a data transmission control module 30 ("DTCM"). *Id.*, 3:7-4:11, 4:47-51, 5:7-8.

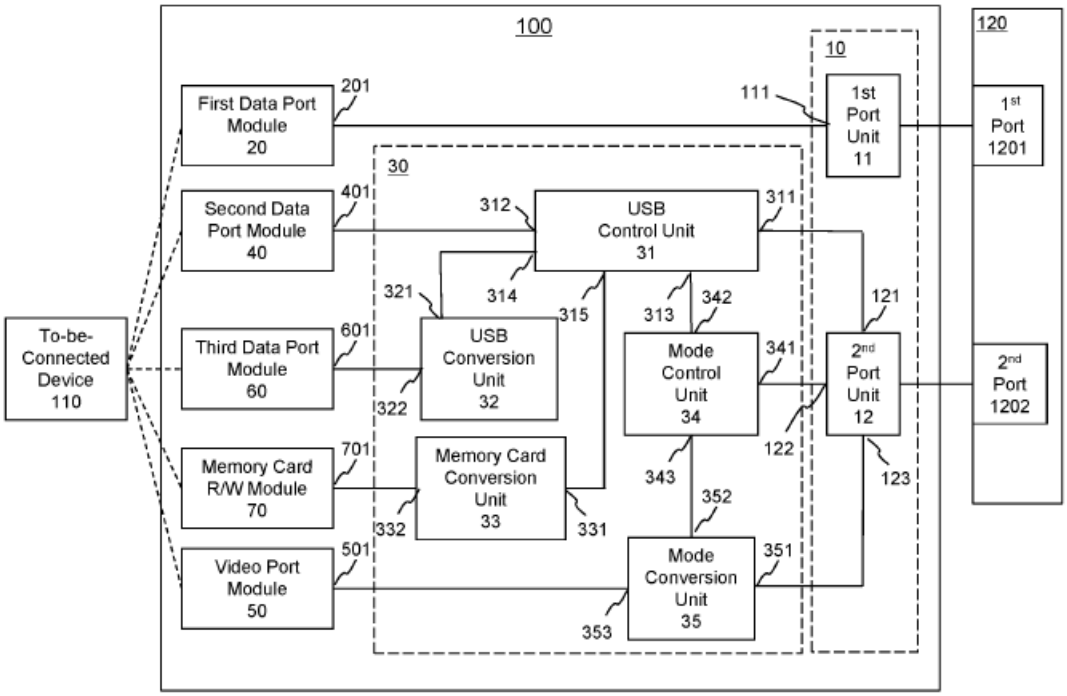


FIG. 2

'429 Patent, FIG. 2

The DTCM has data ports 302-305 for connecting the data port modules 40-70, via another data transmission port 301, to the second port unit 12. *Id.*, 3:11-20,

3:61-65, 4:20-46, FIG. 1. The DTCM controls data transmission between devices that connect to port modules 40-70 and the end-user device. *See* EX1001, 3:5-5:23. *See, e.g.*, *id.*, 4:61-64 (the DTCM "convert[s] the to-be-displayed information to the proper format for the display device to display"), 3:31-36, 5:50-61, 6:5-8.

In the first action, the Office rejected the original claims over prior art. EX1002, 73-87. The applicant amended claim 1 to add the "wherein" clause reciting that the first data port module and main port module form a transmission path between a device connected to that module and the end-user device, and that the DTCM controls data transmission between a device connected to the other port modules and the end-user device. *See id.*, 60. The applicant differentiated claim 1 from the prior art for its different "interior configuration"—the claimed "first and second port units are contained in the main port module" while the cited reference had two extension interfaces uncontained by any module. *Id.*, 66-67. The Office then allowed the claims. *Id.*, 33-41. None of the references in Grounds 1-4 was considered during prosecution. *See* EX1001, 1. The references applied in this Petition disclose the allegedly allowable feature—a main port module where first and second port units are contained in the main port module—and render the challenged claims obvious.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art ("POSITA" or "skilled artisan") at the claimed priority date of the '429 patent would have had at least a bachelor's degree in electrical engineering or equivalent coursework, and at least a year of experience developing electronic device accessories including port hubs and port extenders. Less work experience may be compensated by a higher level of education, such as a Master's degree, and vice versa. EX1003, ¶23.

VII. CLAIM CONSTRUCTION

In IPR, claims are given their plain meaning under *Phillips v. AWH Corporation*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b). The Board only construes the claims when necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Sys., Inc.*, IPR2015-00633, Paper No. 11 at 16 (Aug. 14, 2015). Except for one term addressed below, no express constructions are necessary to assess the patentability of the challenged claims over the asserted prior art.[1] For the Board's reference, Petitioner submits the parties'

[1] Petitioner reserves the right to raise claim construction and other arguments in this and other proceedings as relevant and necessary. Petitioner does not concede that any claim of the '429 patent satisfies any patentability requirement not addressed here, including those under Sections 101 and 112.

proposed constructions in the related litigation and related briefing. *See* EXS1014-1016.

A. "A main port module for connecting to an end-user device, the main port module having first and second port units"

To the extent it is not indefinite and construction is required, the claimed main port module requires a distinct module, separate from other modules, that contains a first port unit and a second port unit for connecting to an end-user device. EX1003, ¶38. The claim language supports this construction, as claim 1 recites various distinct modules having distinct functions: a main port module, a first data port module, a data transmission control module, a second data port module, and video port module. EX1001, 6:48-60; *see also* EX1019, p.4 (defining "module" as a "self-contained component" of a system); EX1015, 7-12. Claim 1 recites that the main port module is "for connecting to an end-user device" and "ha[s] first and second port units" to do so. EX1001, 6:48-49.

Likewise, the specification states "main port module 10 includes a first port unit 11 and a second port unit 12," *id.*, 4:5-6, and Figure 2 shows the main port module separate and distinct from the other modules and containing the two port units:

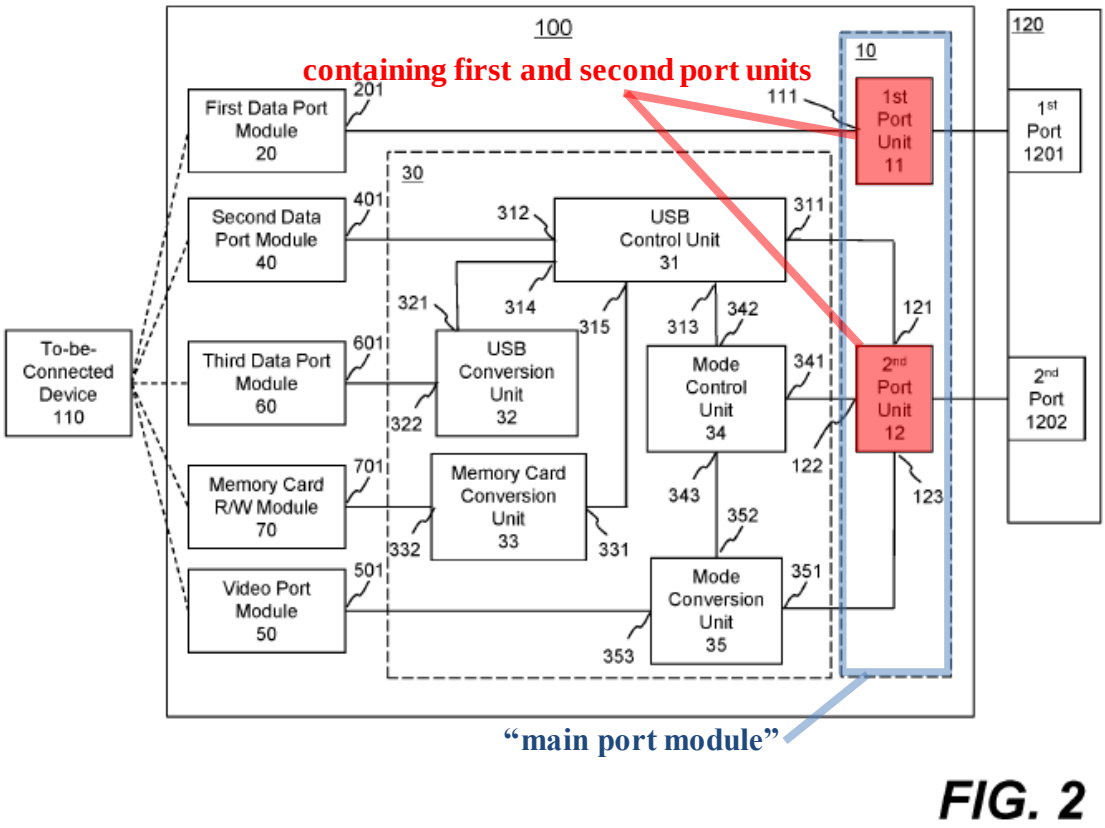


FIG. 2

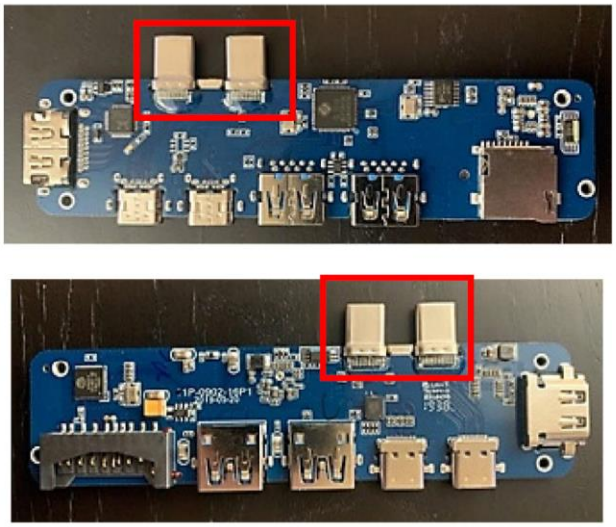
'429 Patent, FIG. 2*[2]

The prosecution history supports this construction. In response to the first Office Action, the applicant differentiated claim 1 from the prior art because the claimed "first and second port units are contained in the main port module"[3] while the cited reference merely had two extension interfaces with no module containing them. *Id.*, 66-67.

[2] Modified figures identified with "*".

[3] Emphasis added unless otherwise specified.

Patent Owner's construction—"one physical communication access point of a circuit board having only first and second interface connectors to which an end-user device may directly connect"—vitiates the main port module from the claim, reducing the term to just two port units for connecting to the end-user device. *See* EX1015, 10-12; EX1003, ¶42. It also adds confusion because the '429 patent does not define or give context to "point," and it is unclear how a "point" can hold two "interface connectors." *Id.* Rather than base its construction on the '429 patent, Patent Owner seeks to support its infringement contentions which simply draw a box around two ports on a circuit board and call the box a main port module:

a main port module for connecting to an end-user device, the main port module having first and second port units;		The accused device as pictured herein is shown to embody a main port module having first and second port units.

EX1013, 8. Though Patent Owner's construction is unclear, Petitioner addresses it below as best understood.

VIII. GROUND 1: KWON AND KUO RENDERS OBVIOUS CLAIMS 1-6 and 13-17

A. Independent Claim 1

1. [Preamble] "*A port extension apparatus for extending ports of an end-user device comprising:*"

To the extent the preamble is limiting, Kwon discloses or renders it obvious. EX1003, ¶¶43, 44. Kwon discloses a docking station system 200 (claimed port extension apparatus) for a laptop computer 600 (claimed end-user device). EX1005, 4:66-5:2; EX1003 ¶43.

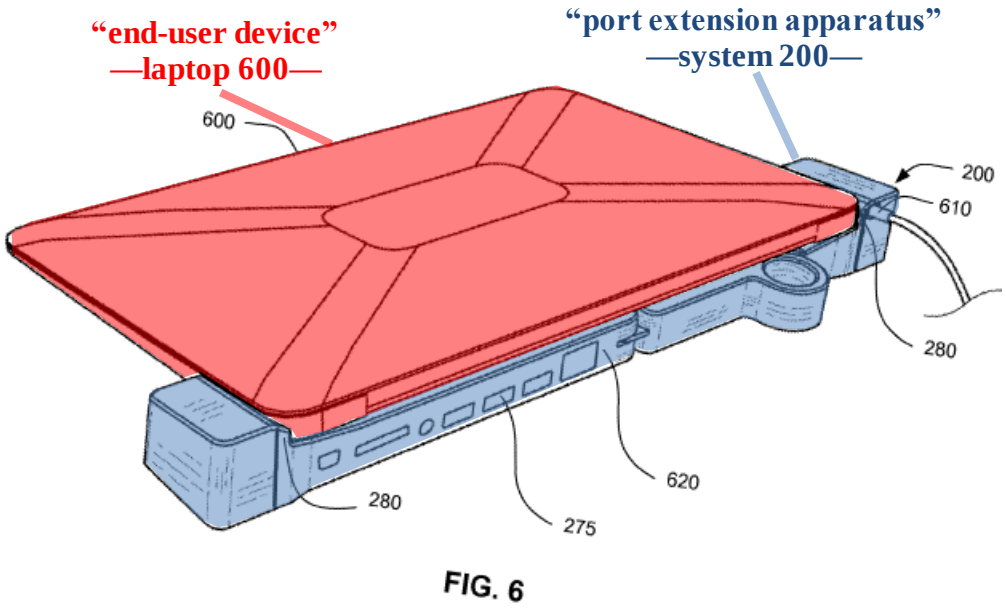


FIG. 6

Kwon, FIG. 6*

The system 200 has a mechanism, peripheral to the discussion in the Petition, for "lock[ing] the computing device to the system 200 and to a structure such as a table or wall." *Id.*, 7:41-46; FIGS. 4, 5; EX1003, ¶43.

The laptop of Kwon has ports which the system extends to "outward-facing female electrical connectors 275" on the docking station. *Id.*, 7:1-24. As shown in Figure 6 above and in Figure 2, the housing of the system includes a second end member 215 hosting male electrical connectors 270" (*id.*, 6:44-54), and "the electrical connectors 260, 270 are configured to engage with respective female electrical connectors of the computing device" (*id.*, 7:1-24). The female electrical connectors of the laptop correspond to the "extend[ed] ports" recited in the preamble. EX1003, ¶44.

2. [1.1] "*a main port module for connecting to an end-user device, the main port module having first and second port units*"

Kwon discloses or renders this element obvious. EX1003, ¶¶45-49. As shown in Figure 2, reproduced below, Kwon has two male electrical connectors 270 that connect to the laptop when docked on the system—one corresponding to the claimed first port unit and the other corresponding to the claimed second port unit. EX1005, 6:44-7:24; EX1003, ¶45.

The second end 215 of Kwon's housing discloses the main port module under Petitioner's construction because, as shown in Figures 2 and 4 of Kwon below, the second end 215 is a distinct module separate from, for example, the crossbeam module 250 of the housing. *Supra* Section VII.A; EX1003, ¶46. Kwon explains that the second end 215 module slidably translates toward and away from the crossbeam

module 205, along a longitudinal axis 220, to secure the laptop to the docking station. *See, e.g.*, EX1005, 5:33-37, 6:63-6:6, 6:48-53, 6:55-67. Thus, the second end module 215 is separate and distinct from the crossbeam module 205. EX1003, ¶46. And as highlighted in the Figures below, the second end 215 of the housing contains the two connectors 270 (claimed first and second port units). EX1005, 6:44-48, 6:59-63.

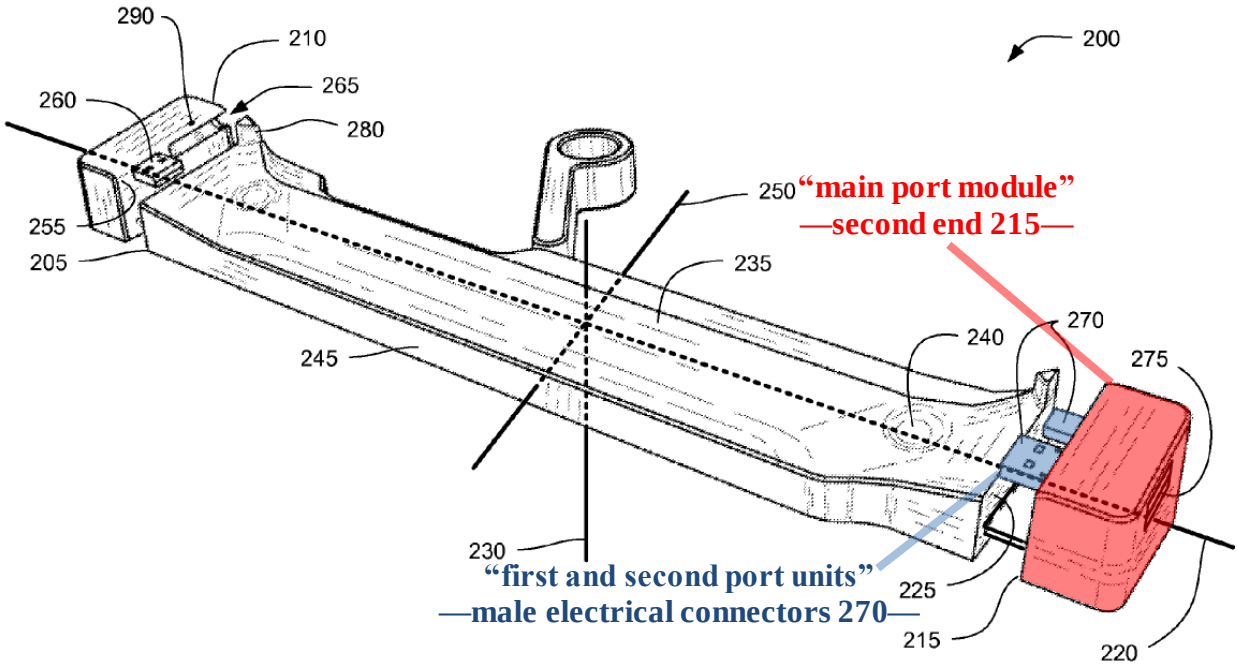


FIG. 2

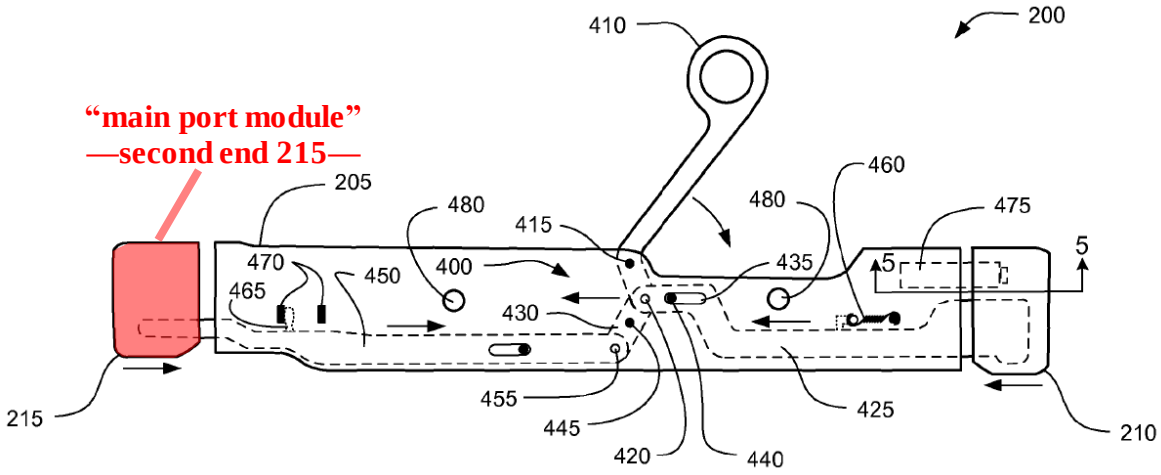


FIG. 4

Kwon, FIGS. 2, 4*

Kwon further renders obvious the claimed main port module under Patent Owner's construction, as best understood. EX1003, ¶47. The two male connectors 270 comprise one physical access point having only first and second interface connectors. *Supra* Section VII.A; EX1003, ¶47. As shown in the Figures above, the two connectors 270 are mounted on the second end housing module 215 of the docking station in the same physical area. And like the '429 patent's two port units, Kwon's connectors 270 sit side-by-side on the docking station. *Compare* EX1001, FIG. 2 (11, 12) *with* EX1005, FIG. 2; EX1003 ¶47. The '429 patent explains that the particular port configuration of the end-user device dictates the physical position and spacing of the first and second port units. EX1001, 1:14-24, 40-42. The same is true of Kwon, whose docking station slides closed to engage the laptop and "lock the

computing device to the system 200," which can be secured to a structure such as a table or wall. EX1005, 7:41-44. As the docking station slides closed, "the electrical connectors 260, 270 … engage with respective female electrical connectors of the computing device." *Id.*, 7:1-11; *see also id.*, 6:23-29. Thus, in both Kwon and the '429 patent, the port configuration of the host computer requires the two port units to sit side-by-side and occupy the same physical space so they can mate with the host computer's ports. EX1003, ¶47.

Kwon also renders obvious the aspect of Patent Owner's construction requiring that the main port module corresponds to one physical access point "of a circuit board." *Id*. ¶48. Kwon teaches that, inside the second end housing module 215, the two adjacent male connectors 270 (claimed first and second port units) may connect to "a flexible substrate, such as Kapton, sometimes referred to as flexible printed circuits." EX1005, 7:12-18.

3. [1.2] "*a first data port module operatively connecting to the first port unit;*"

[1.3] "*when a to-be-connected device connects to the first data port module, the first data port module and the main port module form a transmission path enabling data transmission between the to-be-connected device and the end-user device*;

Kwon discloses or suggests these elements. EX1003, ¶¶50-53. As highlighted in blue in Figures 2 and 6 of Kwon below, any of the "outward-facing female electrical connectors 275" on the docking station—except one for an external

monitor that corresponds to the claimed video port module discussed in element [1.5] below—may correspond to the claimed first data port module. EX1005, 7:1-24; EX1003, ¶50. "These connectors 275 can include, for example, any or all of a VGA output port for an external monitor, an Ethernet port, a FireWire port, a mini DisplayPort, a Thunderbolt port, a port to receive a flash memory card (e.g., SD Card, Memory stick, or xD card), and a USB hub, as well as others." EX1005, 10:34-39.

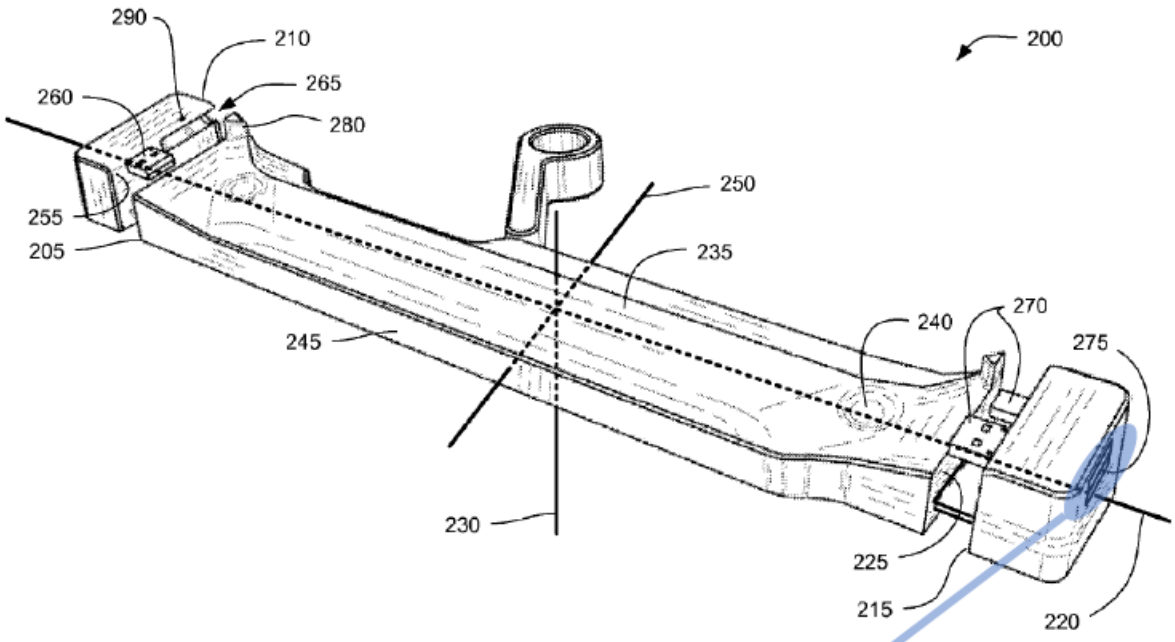


FIG. 2

"first data port module"
—female electrical connectors 275—

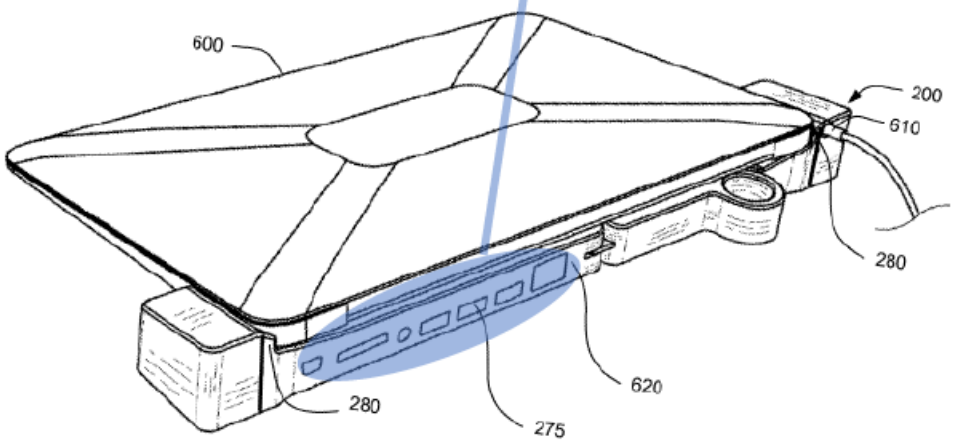


FIG. 6

Kwon, FIGS. 2, 6*

Kwon discloses that when a peripheral device (claimed to-be connected device) connects to one of the female electrical connectors 275 (claimed first data port module), the female connector 275 and one of the male connectors 270 on the second end 215 (claimed main port module) form a transmission path between the peripheral device and the laptop (claimed end user device), as claimed. EX1003, ¶51.

> Since the electrical connectors 260, 270 are configured to engage with respective female electrical connectors of the computing device, the system 200 also includes outward-facing female electrical connectors 275 in electrical communication with the electrical connectors 260, 270 so that a peripheral device can be attached to the system 200 to communicate with the computing device through one of the electrical connectors 260, 270.

EX1005, 7:1-8; *see also id.*, 7:12-24.

4. [1.4] "*a data transmission control module operatively connecting to the second port unit via a first data transmission port of the data transmission control module*"[4]

Kwon and Kuo renders this element obvious. EX1003, ¶¶54-56. Kwon discloses a "hub, switching circuitry, or splitting circuitry" (referred to herein as "the

[4] If DTCM invokes Section 112(f) and is not indefinite as argued by defendant Star View, *see* EX1032, 5, it may be construed to include one or more of the USB control unit 31, USB conversion unit 32, memory card conversion unit 33, mode

hub") that corresponds to the claimed DTCM. EX1005, 7:19-24; EX1003, ¶54. Kwon discloses two ways a female electrical connector 275 (corresponds to the later-recited port modules) connects to a corresponding male electrical connector 270 (claimed second port unit), so a peripheral device connected to the female electrical connector 275 on the docking station may electrically communicate with the laptop. EX1005, 7:1-24; EX1003¶54. In the first way, "[t]here can be a 1:1 correspondence of female electrical connectors 275 to male electrical connectors … 270," such that one and only one female electrical connector 275 connects directly to one and only one corresponding male electrical connector 270. *Id.*, 7:19-21. And, in the second way, "multiple female electrical connectors 275 connect to one male electrical connector … 270 through [the] hub …." *Id.*, 7:21-24.

Accordingly, Kwon discloses or suggests that one male electrical connector 270 (claimed first port unit) may directly connect to a corresponding female electrical connector 275 on the docking station while the other male electrical connector 270 may connect to multiple female connectors 275 via the hub. EX1003, ¶56. Kwon shows nine female electrical connectors 275 on the side and rear surfaces

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control unit 34, and/or mode conversion unit 35. EX1001, 4:16-64, 5:9-23, 5:45-6:15. Petitioner notes that these additional elements are recited in claim 4, *see* EX1001, 7:19-24, which Petitioner addresses below.

of the docking station but shows only three total male electrical connectors 260, 270 for connecting to the laptop. *See* EX1005, FIGS. 2, 6. Thus, the docking station does not have enough male connectors 260, 270 to offer a one-to-one correspondence between each of the male connectors 260, 270 and female connectors 275. EX1003, ¶56. For example, if two of the male connectors 260, 270 had one-to-one connections with two of the female connectors 275, that leaves seven remaining female connectors 275 that must connect to one the remaining male connector 260, 270 through the hub. *Id*. Thus, a POSITA would have recognized that, to utilize all three male connectors 260, 270 and all nine female connectors 275, Kwon's docking station requires both one-to-one and many-to-one (i.e., via the hub) connections between the male and female connectors. *Id*.

a. Kuo's control system 22 discloses the claimed data transmission control module

Kwon focuses on the mechanism by which the docking system physically locks the laptop computer and therefore limits its description of the hub to the details discussed in the preceding section. *See* EX1005, 7:19-24; EX1003, ¶57. Thus, Kwon omits description of the specific details about the hub and how it connects the multiple female connectors 275 to one male connector 270. EX1003, ¶57.

Kuo, however, discloses a similar docking station with a hub (control system 22) that extends a USB-C port of a laptop or other host into multiple output interface ports 24, 25 for connecting to various peripheral devices. *See* EX1006, Abstract,

¶¶[0023]-[0026]; EX1003 ¶58. As highlighted in Figure 1 of Kuo below, the USB-C cable 23, which connects to the host, corresponds to the claimed second port unit while the output interface ports 24, 25 correspond to the later-recited port modules, discussed below. EX1003, ¶58.

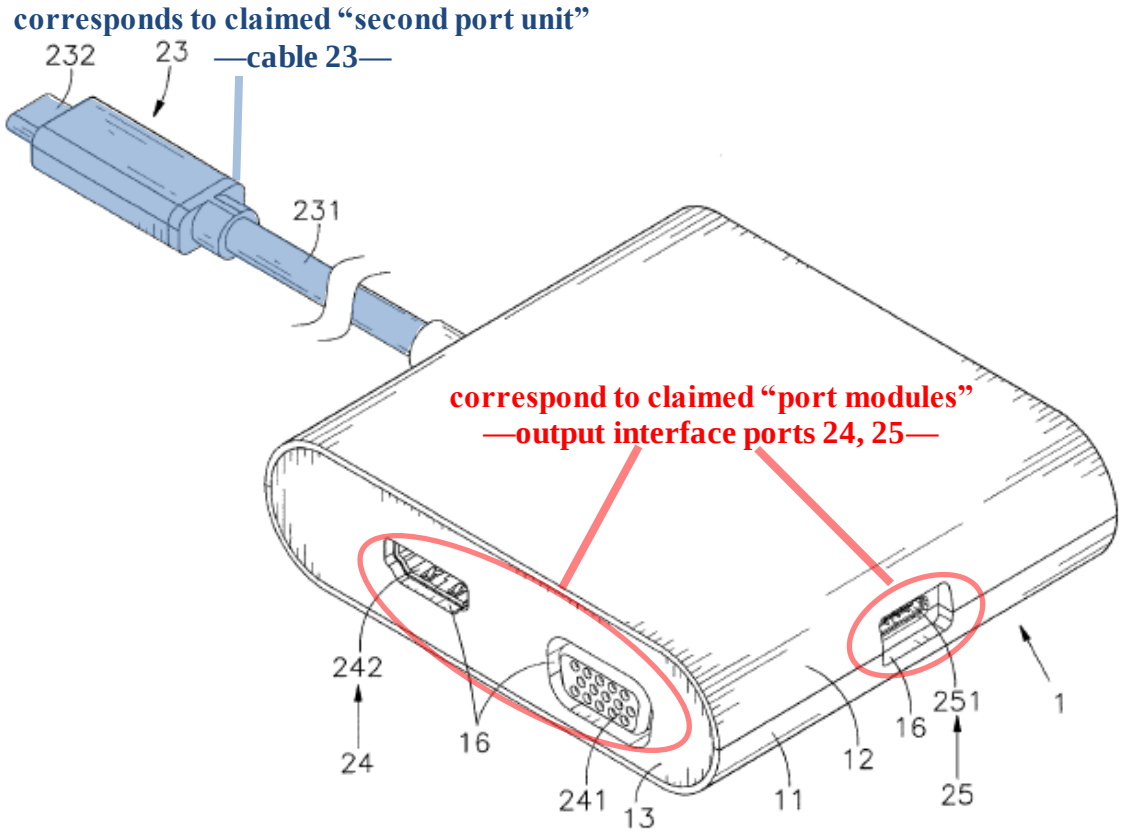


FIG. 1

Kuo, FIG. 1*

In Figure 2, reproduced below, Kuo shows that the docking station has an internal "circuit board 21 with … a control system 22 installed in the circuit board 21." EX1006, ¶[0021]; *see id.*, ¶¶[0022]-[0026] (further discussing the control system 22). As highlighted in red below, the control system 22 corresponds to the claimed DTCM. EX1003, ¶59.

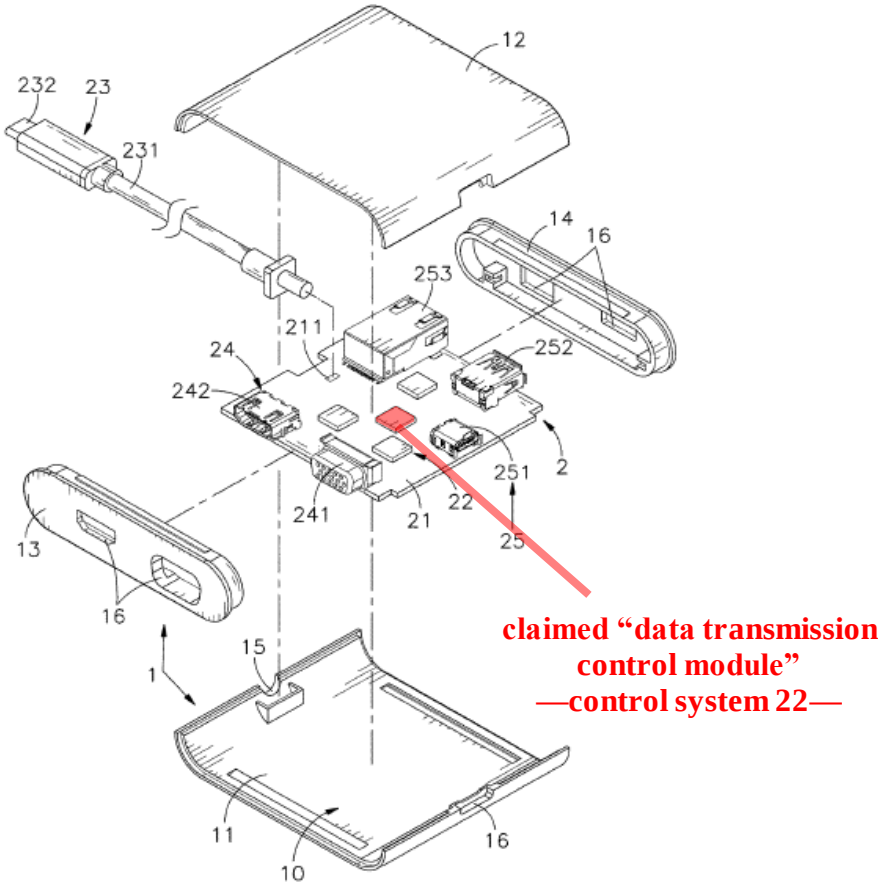


FIG. 2

Kuo, FIG. 2*

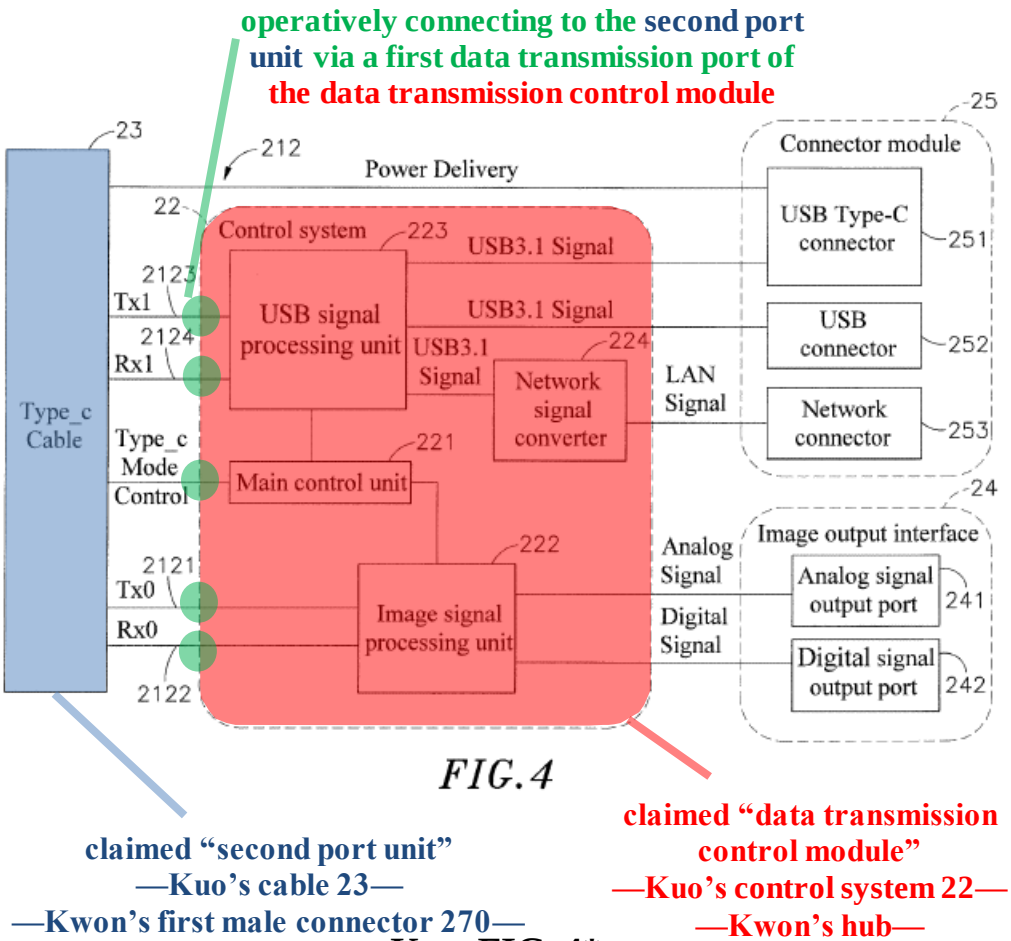


FIG. 4

Kuo, FIG. 4*

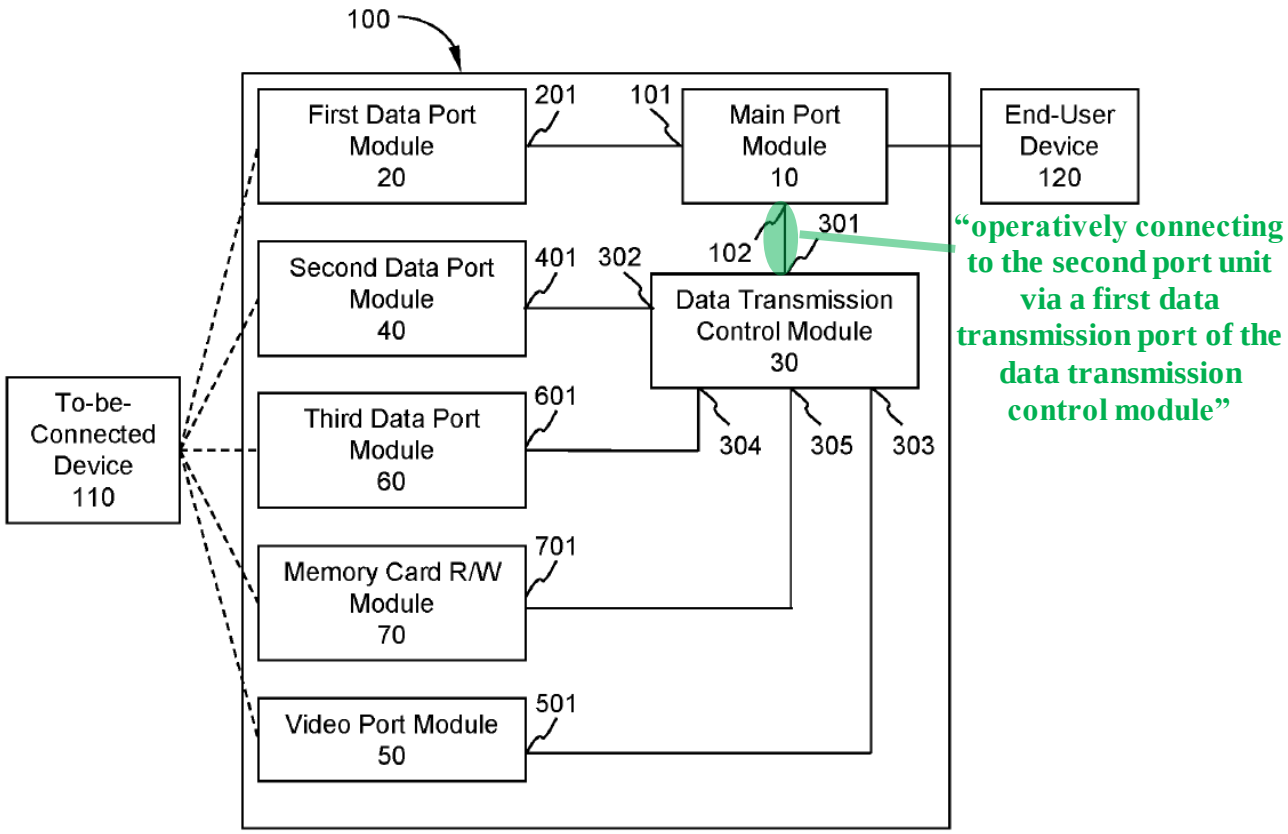
As discussed below, the control system 22 of Kuo controls data transmission between peripheral devices connected to the output interface ports 24, 25 and the cable 23 for the host computer. *See, e.g.*, EX1006, ¶[0021] (discussing the general operation of the control system 22); EX1003, ¶59.

As highlighted in blue in the above figure, when Kuo's control system 22 is incorporated as the hub in Kwon, Kuo's cable 23 corresponds to the first male connector 270 which discloses claimed second port unit. EX1003, ¶60. The channels 2121-2124 of Kuo operatively connect the cable 23 to the control system 22. *Id.*; *see*

also EX1006, ¶¶[0022], [0025] (discussing the specific connections of the channels 2121-2124 and signals carried thereon). As highlighted in green, any connections of the channel(s) 2121-2124 to the control system 22 disclose the claimed first data transmission port. EX1003, ¶60. Thus, the Kwon-Kuo hub (claimed DTCM) operatively connects to the first male connector 270 (claimed second port unit) via a first data transmission port, as claimed. *Id*.

Petitioner notes that the first data transmission port of the Kwon-Kuo hub, identified in green above, tracks that of the '429 patent. EX1003, ¶61. The '429 patent gives no detail about the configuration or structure of the claimed port. Rather, the '429 patent merely mentions that the first data transmission port connects the DTCM to the second port unit. *See, e.g.*, EX1001, 3:11-15. In the Figures, the '429 patent simply identifies as the claimed port 301 the point at which a line connecting boxes for the DTCM 30 and the main port module 10 meets the former box:[5]

[5] The same is true of the claimed second through fourth "data transmission ports" (elements [1.5], [1.7], [2.1]) of the data transmission control module, the claimed memory card R/W (read/write) module (element [2.2]), and the claimed first and second data ports of the USB control unit (elements [5.1], [6.1]). That is, the '429 patent only briefly mentions that the ports connect one particular component to another. And, in the Figures, the '429 patent simply identifies as the claimed port



'429 patent, FIG. 1*

b. Rationale to use Kuo's control system 22 as Kwon's hub

A POSITA would have found it obvious and been motivated to use the functionality of Kuo's control system 22 in the hub of Kwon (i.e., the claimed

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the point at which a line, representing a connection between two components, contacts a box representing one of the components. *See, e.g.*, EX1001, 3:15-20, 4:20-27, FIG. 1, 2 (reference numerals 302-305, 311, 341, 351).

DTCM) so Kwon's docking station worked as Kwon intends. EX1003, ¶¶66-73. Several rationales support the combination.

First, the references provide teaching, suggestion, or motivation for making this combination. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (2007). Although Kwon teaches that multiple female connectors 275 may connect to a single male connector 270 via the hub, Kwon does not describe the specific configuration and operation of the hub to facilitate the many-to-one connections. *See* EX1005, 7:19-24. These aspects, however, were conventional and well-known before the '429 patent. EX1003, ¶67; EX1031, ¶¶54-71, 100. To make Kwon's hub operational, a POSITA would have looked to prior references, like Kuo, describing similar docking stations with hubs supporting many-to-one connections between peripheral devices and the host. EX1003, ¶67.

Kuo's control system 22 has the functionality needed in Kwon's hub. *Id.*, ¶68. For example, Kwon's male connectors 260, 270 that connect the docking station to the laptop may be USB connectors, while the female connectors 275 for connecting an external monitor to the docking station may include VGA, mini DisplayPort, and/or Thunderbolt ports. *Compare* EX1005, 6:13-20, FIG. 2 *with id.*, 10:34-39. But Kwon does not explain how, in operation, the hub processes and transmits video data between the male USB connector 260, 270 and female VGA/mini

DisplayPort/Thunderbolt connectors 275, which use different protocols than USB. EX1003, ¶68.

But Kuo's docking station, like Kwon's, supports video connections between the host computer and an external monitor. *Compare* EX1005, 10:34-39 ("any or all of a VGA output port for an external monitor, … a mini DisplayPort, [and] a Thunderbolt port") *with* EX1006, ¶[0023] (a VGA, HDMI, and/or DVI port). And Kuo goes further than Kwon to describe how its control system 22 implements these connections. EX1003, ¶68.

Kuo explains that the control system 22 of the docking station has a main control unit 221 that "executes a USB Type-C mode control" to transmit the display port signal through specific channels of the cable 23 to an image signal processing unit 222. EX1006, ¶[0024]. The image signal processing unit 222 converts the display port signal into a VGA signal, HDMI signal, and/or DVI signal and synchronously transmits these respective signals through the video output ports 241, 242 of the docking station. *Id.*; *see also id.*, ¶[0021] (the "image signal processing unit 222 electrically connected to the main control unit 221 and adapted for receiving a display port signal (DP signal) and converting it into an analog signal, such as video graphics array (VGA, standard D-sub connector) and a digital signal, such as high-definition multimedia interface (HDMI) signal or digital visual interface (DVI) signal for synchronous output"). Thus, a POSITA would have looked to Kuo and its

control system 22 as an example of how to configure Kwon's hub to process and transmit video information between the docking station's male connector 270 and female video connector 275. EX1003, ¶69.

And the Kwon and Kuo docking stations both have ports for network connections (e.g., Ethernet). *Compare* EX1005, 10:34-39 *with* EX1006, ¶¶[0023], [0035] (network connector 253). Thus, while Kwon does not describe how its hub processes network data and transmits it between the female network port 275 and male USB port 270 of the docking station, a POSITA would have looked to Kuo's relevant disclosure about the control system 22. EX1003, ¶70. As shown in Figure 4 of Kuo, the control system 22 has "a network signal converter 224 … adapted for converting a USB signal (for example, USB3.0 signal) into a network signal (LAN signal, such as Gigabit Ethernet signal) for output." EX1006, ¶[0021]; *see also id.*, ¶[0025] ("the network signal converter 224 … converts the USB signal into a network signal (such as LAN Signal)"). After converting the USB signal into a network signal, the signal "is then transmitted to the network connector 253." *Id.*, ¶[0025]; *see also id.*, ¶[0023] ("[the] network connector 253 (such as RJ45 connector) electrically connected to the network signal converter 224 of the control system 22"), FIG. 4.

Another example, both docking stations offer multiple USB output ports for peripheral devices. *Compare* EX1005, 10:34-39 (discussing female connectors 275),

FIGS. 2, 3, 6 *with* EX1006, ¶¶[0023], [0025] (USB Type-C connector 251 and USB connector 252), FIG. 4. In Kuo, the control system 22 has a USB signal processing unit 223 that converts one type of USB signal to another type of USB signal, such as USB 3.0 into USB 3.1. *See* EX1006, ¶[0021], FIG. 4. Because Kwon shows several female connectors 275 that are USB ports (*see, e.g.*, EX1005, FIGS. 2, 6), to improve the utility of Kwon's docking station, a POSITA would have sought to make some of the USB female connectors 275 have different USB protocols (e.g., USB 2.0, 3.0, 3.1, etc.) to support peripheral devices operating according to various USB protocols. EX1003, ¶71. And, to make this improvement, the POSITA would have relied on and incorporated Kuo's disclosure of USB signal processing unit 223. *Id*.

Given Kwon's limited discussion of how the hub operates, a POSITA would have sought to incorporate Kuo's analogous control system 22 as the hub in Kwon. *Id*. The combination merely involves applying a known technique (of Kuo's control system 22) to a known device (Kwon's hub) ready for improvement to yield predictable results. *KSR*, 127 S. Ct. 1727, 1740-41. The hub of Kwon plays the same role as the control system in Kuo. EX1003, ¶72. Each sits between the docking station's various output ports for the peripheral devices and USB input port for its host computer. *Id*. And each facilitates the many-to-one connections between the output ports and an input port, including converting signals from one format to

another. *Id*. And because Kwon omits description of exactly how the hub functions, the hub stands ready for improvement based on Kuo's disclosure of the control system 22 that fills this gap. *Id.* The combination would yield predictable results because, when added to Kwon, the control system 22 would operate as it operates in Kuo and as Kwon's hub needs to operate for the docking station to work properly. *Id.* Thus, the combination could be made through only routine skill in the art and without undue experimentation, with a reasonable expectation of success.

For the reasons above, it would have been obvious to incorporate Kuo's control system, and/or its functionality, as the hub in Kwon.

5. [1.5] "*a second data port module operatively connecting to a second data transmission port of the data transmission control module;*"

[1.6] "*when a to-be-connected device connects to the second data port module, the data transmission control module controls data transmission between the to-be-connected device and the end-user device;*"

The combination of Kwon and Kuo renders these elements obvious. EX1003, ¶¶74-77. As explained above for element [1.2], any "outward-facing female electrical connectors 275" of Kwon's docking station, except for one corresponding to the video port module discussed below for element [1.7], may correspond to the claimed first data port module. *Supra* Section VIII.A.3; *see also* EX1005, 7:1-24; EX1003, ¶74. Kwon has nine female electrical connectors 275 on the side and rear

surfaces of the docking station, *see* EX1005, FIGS. 2, 6, leaving seven that may correspond to the claimed second data port module. EX1003, ¶74.

The following figure illustrates the proposed combination of Kwon and Kuo. With the control system 22 of Kuo incorporated as the hub in Kwon, the connectors 241-251 of Kuo correspond to female connectors 275 of Kwon's docking station. EX1003, ¶75. As highlighted in red, in the combination, any of Kwon's female connectors 275 mapping to Kuo's connectors 251-253 corresponds to the claimed second data port module. *Id*.

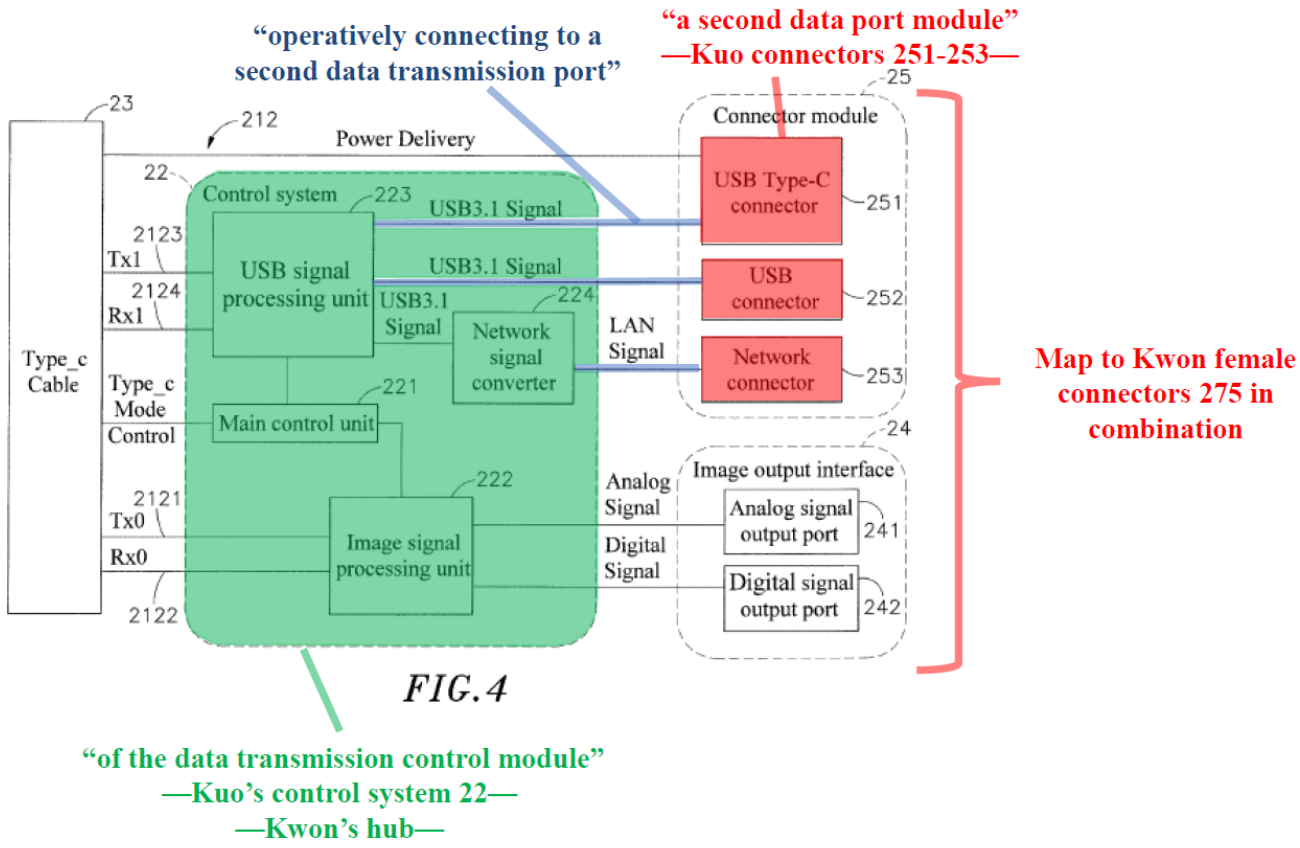


FIG. 4

Kwon-Kuo Combination

As highlighted in blue, Kuo's connectors 251-253 (claimed second data port module) electrically connect to components of the control system 22 (claimed DTCM) via respective ports of the control system. EX1006, ¶[0023]. Specifically, "[the USB Type-C connector 251 and [the] USB connector 252 (such as USB3.0, Mini USB or Micro-USB connector) respectively electrically connect[] to the USB signal processing unit 223." *Id*. Additionally, "[the] network connector 253 (such as RJ45 connector) electrically connect[s] to the network signal converter 224 of the control system 22." *Id*.

In the Kwon-Kuo combination, when a peripheral device (claimed to-be-connected device) connects to one of Kwon's connectors 275 corresponding to the Kuo connectors 251-253 (claimed second data port module), the hub/control system (claimed DTCM) controls data transmission between the peripheral device and the host computer (claimed end-user device), as claimed. EX1003, ¶77. For example, Kwon explains that multiple female connectors 275 connect to the male connectors 270 via the hub. EX1005, 7:19-24. The control system 22 of Kuo has a main control unit 221, a network signal converter 224, and a USB signal processing unit 233 that control data transmission between the connectors 251-253 and the host computer:

- **Main control unit 221:** This "supports USB Type-C (USB-C) interface specification," EX1006, ¶[0021]. And "[w]hen the main control unit 221 … executes a USB Type-C mode control, the electronic apparatus 3 can transmit power supply through the USB

power delivery (PD) … to the USB Type-C connector 251 of the connector module 25 and a USB signal … to the USB signal processing unit 223, … for transmission to the USB Type-C connector 251, the USB connector 252 and the network signal converter 224." *Id*. ¶[0025].

- **Network signal converter 223**: This "convert[s] a USB signal (for example, USB3.0 signal) into a network signal (LAN signal, such as Gigabit Ethernet signal) for output." *Id*., ¶[0021],
- **USB signal processing unit 233:** "The USB signal processing unit 223 [] convert[s] the received USB signal (such as USB3.0 Signal) into many USB signals (such as USB3.0 signal, USB3.1 signal, etc.) for transmission to the USB Type-C connector 251, the USB connector 252 and the network signal converter 224." *Id*.; *see also id*., ¶[0026]; *see also id*., ¶[0025].

6. [1.7] "*a video port module operatively connecting to a third data transmission port of the data transmission control module; wherein*"

[1.8] "*when a to-be-connected device connects to the video port module, the data transmission control module receives the to-be-displayed information from the end-user device to the to-be-connected device to display*"

The Kwon-Kuo combination renders these elements obvious. EX1003, ¶¶78-80. In Kwon, any female electrical connector 275 for an external display corresponds to the claimed video port module. *See* EX1005, 10:34-37 (The female dock connectors 275 may include "a VGA output port for an external monitor, … a mini DisplayPort, a Thunderbolt port"); EX1003, ¶78. In the combination, Kuo's analog signal output port 241 and/or digital signal output port 242 match with Kwon's

external monitor connector(s) 275 that corresponds to the claimed video port module:

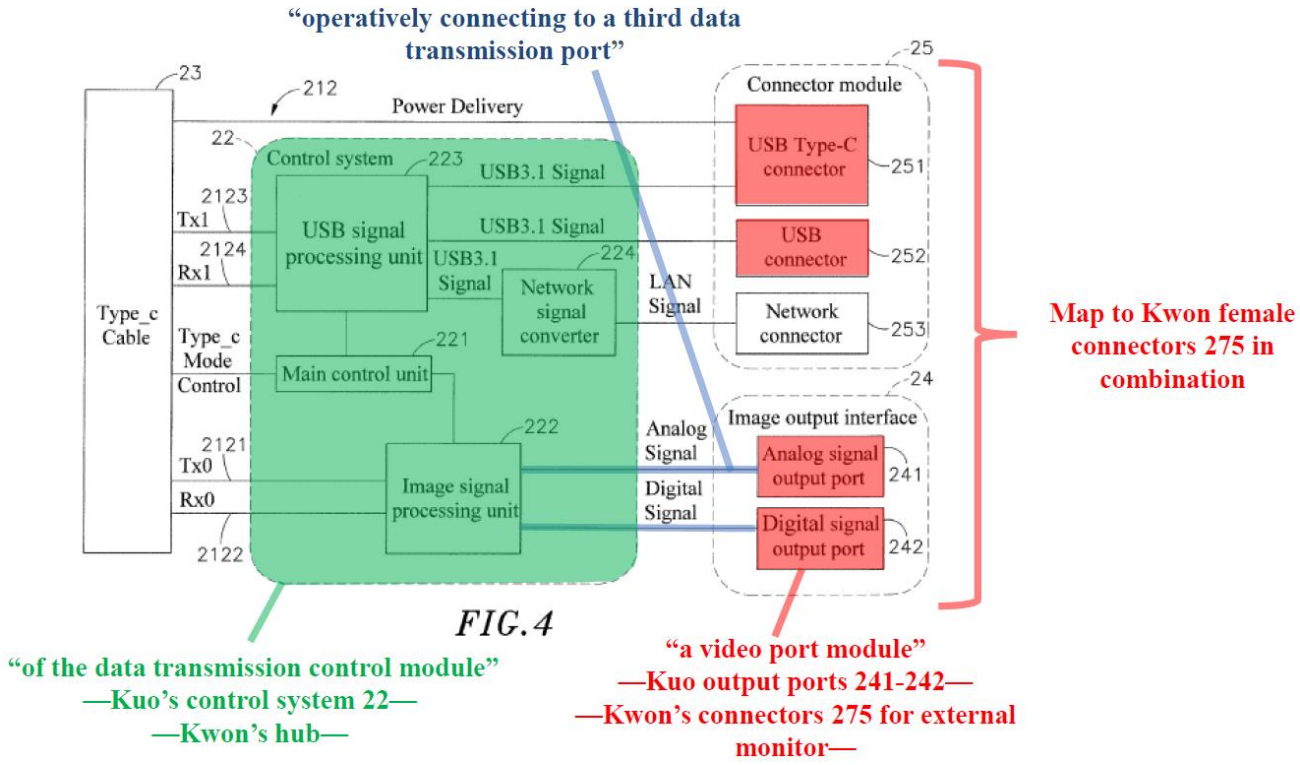


FIG. 4

Kwon-Kuo Combination

As highlighted above in blue, Kuo's video ports 241-242 (claimed video port module) electrically connect to the image signal processing unit 222 of the control system 22 (claimed DTCM) via respective ports of the control system. EX1006, ¶[0023]; *see also id.*, ¶[0021] ("an image signal processing unit 222 electrically connected to the main control unit 221").

In the combination, when an external monitor (claimed to-be-connected device) connects to one of Kwon's external monitor connectors 275 corresponding

to Kuo's connectors 241-242 (claimed video port module), the hub/control system (claimed DTCM), the hub/control system 22 (claimed DTCM receives the to-be-displayed information from the host computer (claimed end-user device) to the external monitor to display, as claimed. EX1003, ¶80. Kwon's monitor connectors 275 connect to the male connectors 270 via the hub. EX1005, 7:19-24, 10:34-37; EX1003, ¶80. And the main control unit 221 and image signal processing unit 222 of Kuo's control system 22 receive and process to-be-displayed video information:

- **Main control unit 221:** "When the main control unit 221 executes USB Type-C mode control and provides signals and USB power delivery (PD) to the four channels (such as Tx0,Rx0,Tx1,Rx1) of the circuit layout 212, a display port (DP) signal can be transmitted through two channels (such as Tx0,Rx0) to the image signal processing unit 222 and the converted by the image signal processing unit 222 into an analog signal (such as VGA) and a digital signal (such as HDMI or DVI) for synchronous output to two display devices 4 for display." EX1006, ¶[0026].
- **Image signal processing unit 222:** "[The] image signal processing unit 222 … adapted for receiving a display port signal (DP signal) and converting it into an analog signal, such as video graphics array (VGA, standard D-sub connector) and a digital signal, such as high-definition multimedia interface (HDMI) signal or digital visual interface (DVI) signal for synchronous output." *Id*. ¶[0021]; *see also id*., ¶[0026].

B. Claim 2

1. [2.1] "*The port extension apparatus as described in claim 1, further comprising: a third data port module operatively connecting to a fourth data transmission port of the data transmission control module; and*"

[2.2] "*a memory card R/W (read/write) module operatively connecting to at least one data read/write port of the data transmission control module*"

The combination of Kwon and Kuo renders these elements obvious. EX1003, ¶¶81-84. Claim 1 requires two output ports electrically connected to the DTCM: the second data port module (element [1.5]) and the video port module (element [1.7]). Elements [2.1] and [2.2] add a third and fourth—the third data port module and the memory card read/write module, respectively. *Supra* Sections VIII.A.5, 6. Thus, the port modules of claims 1 and 2 may be allocated:

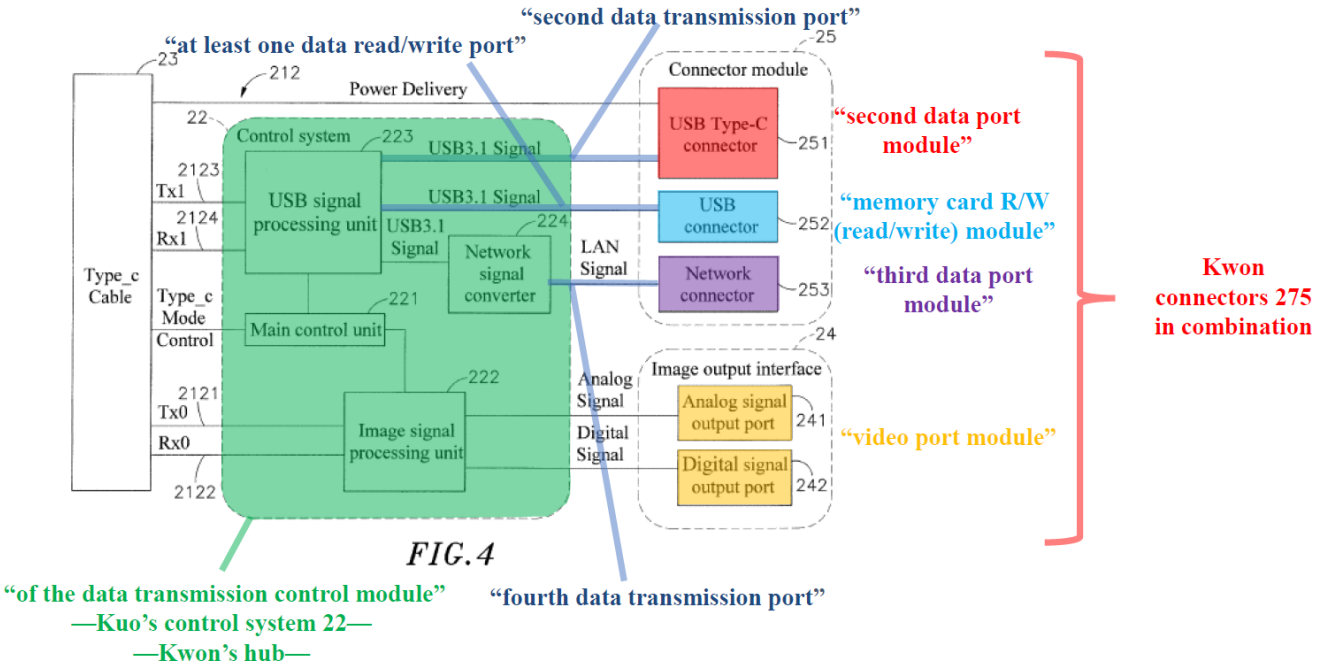


FIG. 4

Kwon-Kuo Combination

Consistent with element [1.5], the USB-C connector 251 (red) of Kuo may be the second data port module, with its connection to the control system 22 corresponding to the claimed second data transmission port. *Supra* Section VIII.A.5; EX1003, ¶82. For element [2.1], the network connector 253 (purple) of Kuo corresponds to the third data port module, and its connection to the control system 22 (claimed data port module) is the fourth data transmission port. *Id*. Finally, for element [2.2], the USB connector 252 (blue) of Kuo corresponds to the claimed memory card r/w module, with its connection to the control system 22 as the claimed at least one data read/write port. *Id*.

Kwon discloses the claimed memory card module of element [2.2] because Kwon teaches the female connectors 275 may include a memory card reader. EX1005, 10:37-39 ("a port to receive a flash memory card (e.g., SD Card, Memory stick, or xD card)"). When incorporating the control system 22 of Kuo as the hub in Kwon, a POSITA would have found it obvious to accommodate Kwon's memory card reader. EX1003, ¶83. For example, as shown in the figure above, it would have been obvious to implement Kuo's USB connector 252 as the memory card reader of Kwon because the control system 22 already accommodates the USB-C connector 251. *Id*. Rather than have a second USB port 252, a POSITA would have seen the benefit in accommodating Kwon's memory card reader to make the docking station more useful. *Id*.

The POSITA would have found it obvious to implement Kwon's memory card reader as an additional port supported by Kuo's control system 22. *Id.*, ¶84. Kwon has plenty of female connectors 275 to accommodate it: nine total connectors 275—four allocated for elements [1.2], [1.5], [1.7], and [2.1]—leaving five that may serve as the memory card r/w module of element [2.1]. *Id.* Thus, Kwon has enough connectors 275 to implement both the memory card reader and USB port 252. *Id.* This would require modifying Kuo's control system 22 to support the additional connection, but such a modification would require only routine skill in the art and could be made with a reasonable expectation of success. *Id.* For example, the USB signal processing unit 223 could be modified to add an additional connection port for Kwon's memory card reader and to convert data between USB and the particular format of the memory card supported by the reader (e.g., SD memory) for read/write operations. *Id.*

C. Claim 3

1. [3.1] "*The port extension apparatus as described in claim 2, wherein the to-be-connected device comprises a memory card, which connects to the end-user device via the memory card R/W module and the data transmission control module*"

The Kwon-Kuo combination renders this element obvious. EX1003, ¶85. *See, e.g.*, EX1005, 10:37-39 ("a port to receive a flash memory card (e.g., SD Card, Memory stick, or xD card)"); *see also supra* Section VIII.B.

D. Claim 4

1. [4.1] "*The port extension apparatus as described in claim 2, wherein the data transmission control module comprises a USB (Universal Serial Bus) control unit, a USB conversion unit, a memory card conversion unit, a mode control unit and a mode conversion unit*"

The Kwon-Kuo combination renders this element obvious. EX1003, ¶¶86-91. It would have been obvious to incorporate Kuo's control system 22 as the hub in Kwon. *Supra* Section VIII.A.4.b. And Kuo's control system's units correspond to those recited in claim 4:

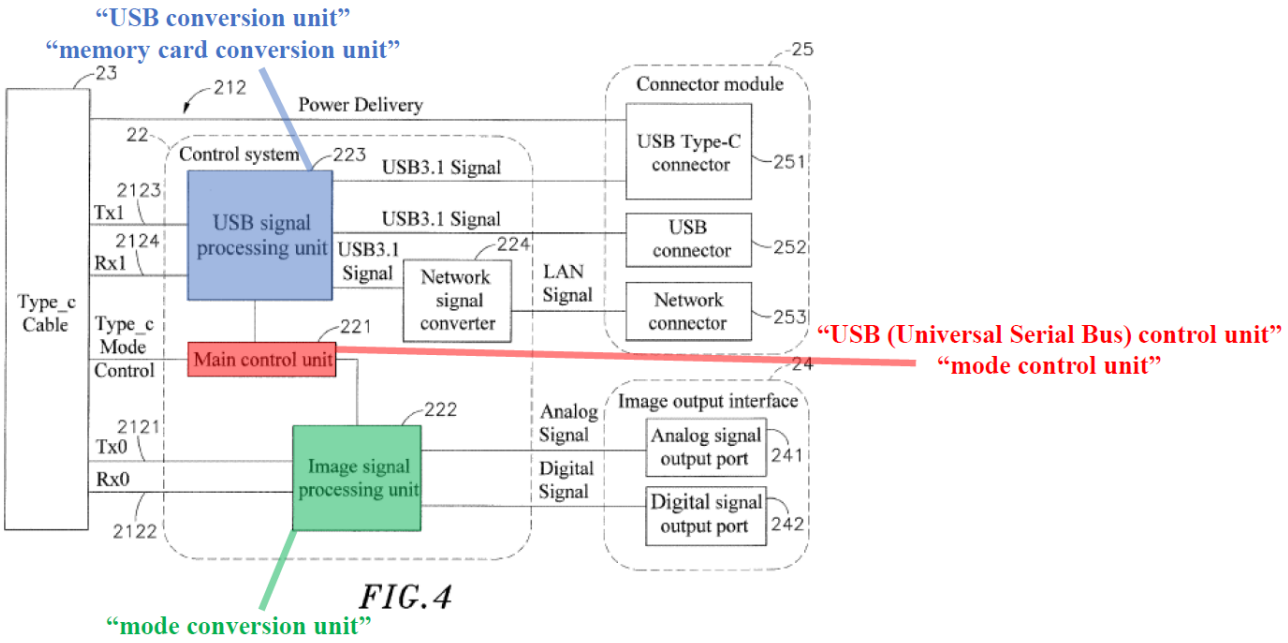


FIG. 4

Kwon-Kuo Combination

USB control unit

As highlighted in red above, Kuo's main control unit 221 discloses the claimed USB control unit. EX1003, ¶87. The '429 patent briefly mentions that

"[w]hen the to-be-connected device 110 connects to the port extension apparatus 100 via the second data port module 40, the USB control unit 31 controls the data transmission between the to-be-connected device 110 and the end-user device 120." EX1001, 5:45-49. Similarly, Kuo's main control unit 221 controls data transmission between a connected peripheral device and the host computer. *See, e.g.*, EX1006, ¶[0026] ("the main control unit 221 executes USB Type-C mode control … [causing] a display port (DP) signal [to] be transmitted through two channels (such as Tx0,Rx0) to the image signal processing unit 222 … for synchronous output to two display devices 4 for display." EX1006, ¶[0026]; *see also id.*, ¶[0024].

USB conversion unit

As highlighted in blue, Kuo's USB signal processing unit 223 discloses the claimed USB conversion unit. EX1003, ¶88. The role of the USB conversion unit is not clear, but the '429 patent mentions it may be used "to charge the mobile phone" connected to the third data port module 60 and may convert the third data port module between a data transmission mode and a power supply mode. *See* EX1001, 4:16-46, 5:17-23. As shown in Figure 4 of Kuo, the USB signal processing unit 223 outputs USB 3.1 signals at each of its three ports, *see* EX1006, ¶¶[0025], [0021], and USB 3.1 requires charging capability. *Id.*, ¶[0006]; *see also* EX1003, ¶88. Kuo also teaches that the unit 223 converts between USB 3.1 (requires charging) and other USB protocols. EX1006, ¶[0025]. Thus, the unit 223 discloses the claimed

USB conversion unit under either party's construction. *See* EX1006, ¶[0026] (the USB conversion unit "perform[s] two-way charging and data transmission"); EX1003, ¶88-89.

Memory card conversion unit

In the Kwon-Kuo combination, the USB signal processing unit 233 discloses or suggests the claimed memory card conversion unit. EX1003, ¶90. According to the '429 patent, "[d]ata transmission (i.e., read/write) are … performed by the memory card conversion unit 33 with the memory card." EX1001, 6:9-14-16. As explained above for claim 2, it would have been obvious to modify Kuo's USB signal processing unit 223 to accommodate Kwon's memory card reader for reading/writing to memory cards—the function of the claimed memory card conversion unit. *Supra* Section VIII.B. Thus, it would have been obvious to implement the claimed memory card conversion unit as part of Kuo's USB signal processing unit 223 or as a separate unit. EX1003, ¶90.

Mode control unit and mode conversion unit

As highlighted in red, Kuo's main control unit 221 corresponds to the claimed mode control unit and the image signal processing unit 222 (green) discloses the claimed mode conversion unit. *Id.*, ¶91. In the '429 patent, "[t]he mode control unit 34 controls the mode conversion unit 35 to convert the to-be-displayed information to the proper format for the display device to display." EX1001, 4:61-64. Similarly,

in Kuo, the main control unit 221 performs USB type-C control to cause the image signal processing unit 222 to convert image information into the proper format for display. EX1006, ¶¶[0021], [0026]; EX1003, ¶91. Thus, the Kwon-Kuo combination renders obvious the claimed mode control and conversion units. EX1003, ¶91.

E. Claim 5

1. [5.1] "*The port extension apparatus as described in claim 4, wherein the first data transmission port of the data transmission control module comprises a first data port of the USB control unit, a first data port of the mode control unit, and a first data port of the mode conversion unit*"

The Kwon-Kuo combination renders this element obvious. EX1003, ¶92. As explained above for element [1.4], the termination(s) of channels 2121-2124 of Kuo's cable 23 at the control system 22 correspond to the claimed first data transmission port of the DTCM. *Supra* Section VIII.A.4; EX1006, ¶¶[0022], [0025]. As highlighted below in orange, these channels 2121-2124, within the control system 22, connect to the main control unit 221 (claimed first data port of the USB control unit and first data port of the mode control unit) and the image signal processing unit 222 (claimed first data port of the mode conversion unit):

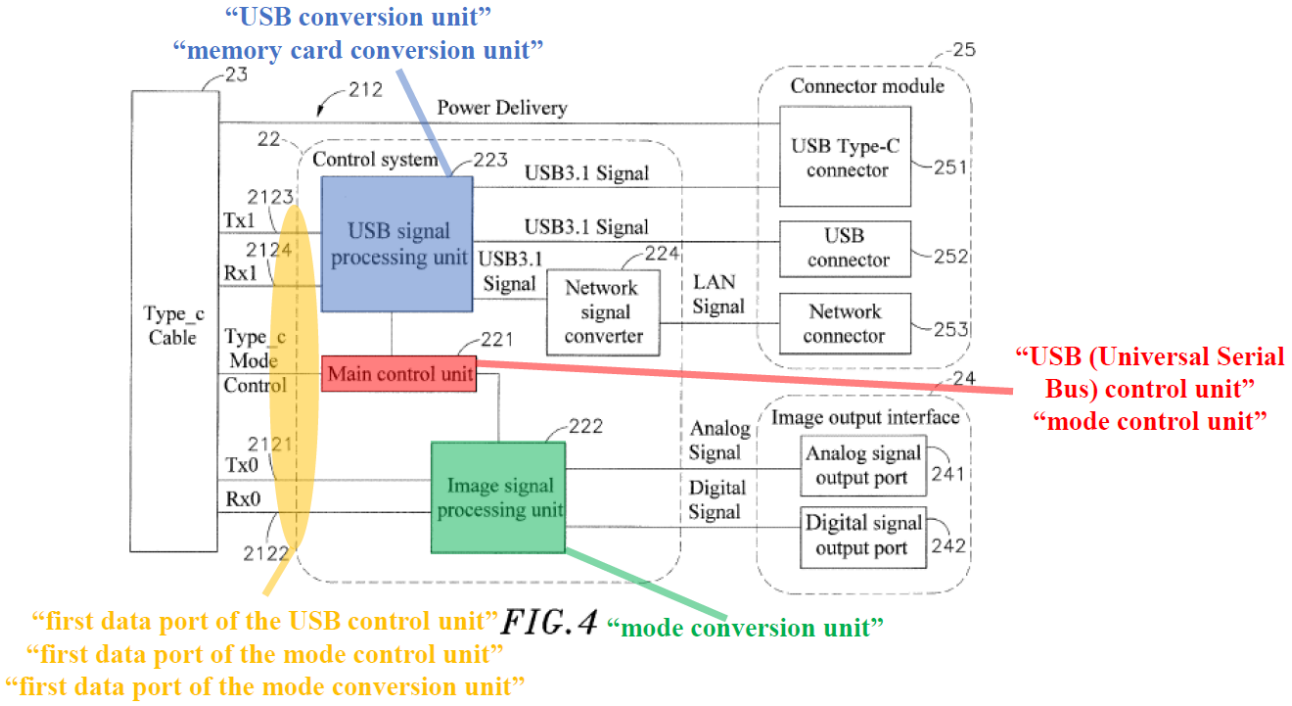


FIG. 4

Kwon-Kuo Combination

F. Claim 6

1. [6.1] "*The port extension apparatus as described in claim 5, wherein the second data transmission port of the data transmission control module is a second data port of the USB control unit*"

The Kwon-Kuo combination renders this element obvious. EX1003, ¶¶93-96. As explained above for elements [1.5], [2.1], and [2.2], the connection of Kuo's control system 22 to the USB-C connector 251 corresponds to the claimed second data transmission port. *Supra* Sections VIII.A.5 and VIII.B; EX1006, FIG. 4. Petitioner identifies the main control unit 221 of Kuo as the USB control unit for claim 4, *supra* Section VIII.D, so claim 6, which depends from claim 4, requires the

second data transmission port to also be a second data port of Kuo's main control unit 221. Inside Kuo's control module 22, however, Kuo shows the USB-C connector connecting to the USB signal processing unit 223 (claimed USB conversion unit) rather than to the main control unit 221 (claimed USB control unit). *See e.g.*, EX1006, ¶[0023], FIG. 4.

But rather than implement the USB signal processing unit 223 and main control unit 221 separately, it would have been obvious to implement them as a single unit having the functionality of both units. EX1003, ¶94. For example, Kuo teaches that the "USB signal processing unit 223 [is] electrically connected to the main control unit 221" and converts USB signals based on USB Type-C control signals from the main control unit 221. *See* EX1006, ¶[0021]; *see also id.*, ¶[0025]. Instead of having the main USB control unit 221 control a separate unit to convert USB signals, it would have been obvious to integrate the functionality of the USB signal processing unit 223 within the main control unit 221, or vice versa, so the main control unit 221 could convert the data itself. EX1003, ¶94. For example, this could reduce the number of components (e.g., computer chips) needed to make the docking station, decreasing cost. *Id.* And with fewer components, the size of the docking station might be reduced. *Id.*

The '429 patent gives no reason or benefit to making the USB control and conversion units 31, 32 separate units. Thus, implementing their functionality

separately or as a single unit amounts to a matter of obvious design choice. *In re Chu*, 66 F.3d 292, 298-99 (Fed. Cir. 1995) ("design choice" appropriate where an "applicant fails to set forth any reasons why the differences between the claimed invention and the prior art would result in a different function or give unexpected results"); EX1003, ¶95.

With Kuo's USB signal processing unit 223 and main control unit 221 combined into a single unit, the Kwon-Kuo combination satisfies claim 6. Specifically, the connection of the USB-C connector 251 to Kuo's control system 22 (claimed second data transmission port of the DTCM) becomes a second data port of the main control unit 221 (claimed USB control unit) rather than a data port of the USB signal processing unit 223. EX1003, ¶96.

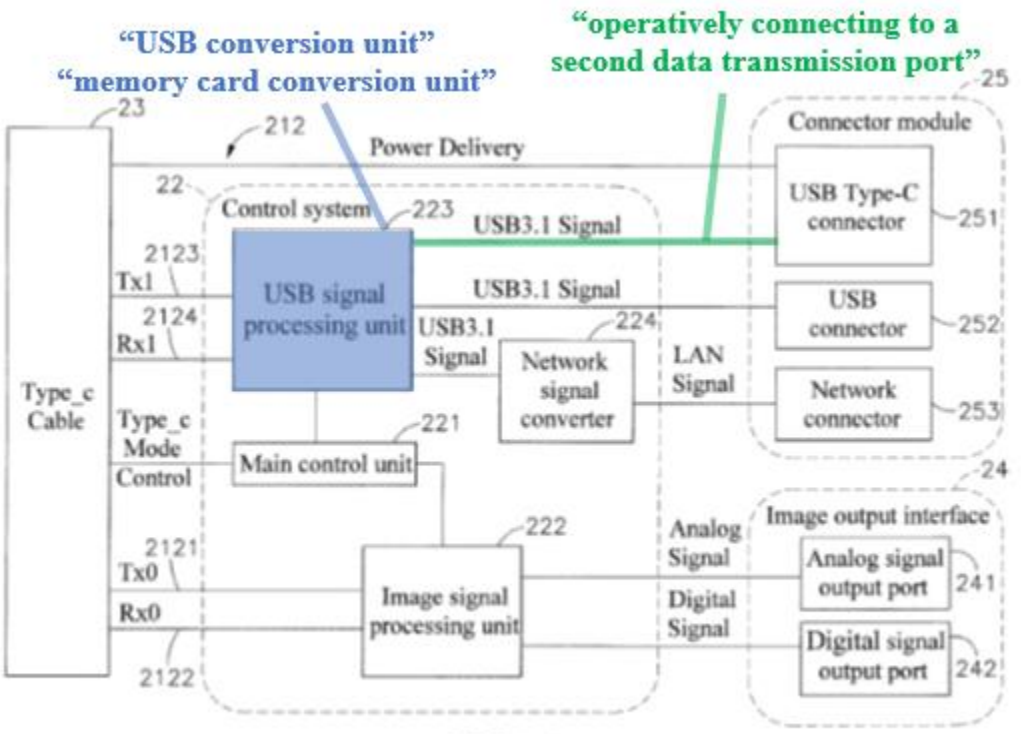


FIG. 4

Kwon, FIG. 4*

G. Claim 13

1. [13.1] "*The port extension apparatus as described in claim 2, wherein the video port module comprises a VGA (Video Graphics Array) port, a DVI (Digital Visual Interface) port, an HDMI (High-Definition Multimedia Interface) port, a Mini DP (Mini Display Port) or a DP (Display Port)*"

The Kwon-Kuo combination renders this element obvious. EX1003, ¶97. As explained for element [1.7], Kwon discloses that the female dock connectors may include a VGA port, mini DisplayPort, or Thunderbolt port. *Supra* Section VIII.A.6; *see also* EX1005, 10:34-37; EX1006, ¶¶[0023] (VGA port 241 and HDMI or DVI port 242).

H. Claim 14

1. [14.1] "*The port extension apparatus as described in claim 2, wherein the first data port module comprises a Type-C female port or a Lighting female port*"

The Kwon-Kuo combination renders this element obvious. EX1003, ¶¶98-100. Kwon discloses that its female connectors 275, corresponding to the claimed first data port module, include USB ports. EX1005, 10:34-39; FIGS. 2, 6; *see also supra* Section VIII.A.3. Kuo teaches the advantages of USB Type-C connectors and states that "USB3.1 Type-C is particularly expected by the market." EX1006, ¶[0006].

Kuo uses USB Type-C for its cable 23 that connects to the host and for dock connector 251. EX1006, ¶¶[0021]-[0026]. Kuo's control system 22 uses USB 3.1, which requires USB-C connectors and cables to support high-power charging and 10 Gbps data communication speed. *Id.*, ¶¶[0006], [0021], [0025]; EX1003, ¶99. The first USB-C Specification 1.0 published in August 2014—nearly three years before the earliest-claimed priority date of the '429 patent—and USB-C devices became more common thereafter. EX1009, 3; EX1003, ¶99; EX1031, ¶48. Unlike earlier USB form factors, USB-C accommodates in the same connector package USB transmission protocol, power delivery, and alternate mode communication. EX1009, 3; EX1003, ¶99. A POSITA would have found it obvious and had motivation to implement a remaining female connector 275 of Kwon—

corresponding to the claimed first data port module—as a USB-C port in combination with Kuo. EX1003, ¶99.

Apple introduced the Lightning connection in 2012—nearly five years before the claimed priority date of the '429 Patent—to connect Apple mobile devices to host computers and other devices. EX1010, 1-2; EX1003, ¶100. Lightning uses the symmetrical USB-C connector form factor, allowing for face-up or face-down insertion—a convenient feature for users. EX1010, 2; EX1003, ¶100. For added convenience and compatibility with Apple devices, and because Kuo already has USB-C connection ports, a POSITA would have found it obvious and been motivated to implement the third data port module as a Lightning port. EX1003, ¶100.

I. Claim 15

1. [15.1] "*The port extension apparatus as described in claim 2, wherein the second data port module comprises a USB (Universal Serial Bus) female port*"

The Kwon-Kuo combination renders this element obvious. EX1003, ¶101. Kwon discloses that its female connectors 275, corresponding to the claimed second data port module, include USB ports. EX1005, 10:34-39; FIGS. 2, 6; *see also supra* Section VIII.A.5. In the combination, Kuo's USB Type-C connector 251 corresponds to the claimed second data port module, which Kuo shows as a female connector in the figures. *See* EX1006, FIGS 1, 2; *supra* Section VIII.A.4 and VIII.B.

J. Claim 16

1. [16.1] "*The port extension apparatus as described in claim 2, wherein the third data port module comprises a Type-C female port or a Lighting female port*"

The Kwon-Kuo combination renders this element obvious. EX1003, ¶102. Above for element [2.1], Petitioner identifies the network connector 253 as the third data port module as an example. *Supra* Section VIII.B. But this need not be the case because, as discussed, Kwon has nine female connectors 275 (*see* EX1005, FIGS. 2, 6) and claims 1 and 2 combined recite only five port modules total: first, second, third, video, and memory r/w. With four female connectors 275 of Kwon allocated as the first, second, video, and memory r/w port modules, any of the five remaining female connectors in the Kwon-Kuo combination may correspond to the third data port module. EX1003, ¶102. And it would have been obvious to make this port module a Type-C or Lighting port. *Id*. As discussed, numerous references teach that Type-C and Lighting ports were common and popular long before the '429 patent. EX1003, ¶102; EX1009, 1-3; EX1006, ¶[0006]; EX1010, 1-2; *see also supra* Section VIII.H. Accordingly, a POSITA would have found it obvious and had motivation to implement a remaining female connector 275 of Kwon—corresponding to the claimed third data port module—as a USB-C port when combined with Kuo. EX1003, ¶102. Modifying the control system 22 of Kuo to accommodate this additional port would have required only routine skill in the art

and could have been done with a reasonable expectation of success. *Id*. For added convenience and compatibility with Apple devices, a POSITA would have found it obvious and been motivated to implement the third data port module as a Lightning port. EX1003, ¶102.

K. Claim 17

1. [17.1] "*The port extension apparatus as described in claim 2, wherein the first port unit comprises a Type-C male port or a USB male port and the second port unit comprises a Type-C male port or a USB male port*"

The Kwon-Kuo combination renders this element obvious. EX1003, ¶103. Kwon shows and describes the male connectors 270 (claimed first and second port units) as male USB ports. *See* EX1005, 6:14-20, 6:44-7:24, FIG. 2. And Kuo's cable 23, which corresponds to the first port unit, has a male USB-C connector. EX1006, ¶[0021], FIGS. 1-3. A POSITA would have known about the specifications of the 2017 Apple MacBook Pro and its two adjacent USB Type-C/Lightning input ports before the claimed invention. EX1003, ¶103; *see also* EXS1026-29. For the reasons discussed above for claim 16, it would have been obvious to implement the male connectors 270 of Kwon as a USB-C male ports. *Supra* Section VIII.J.

IX. GROUND 2: KWON AND KUO, FURTHER IN VIEW OF CHANG, RENDER OBVIOUS CLAIMS 1-6 AND 13-17

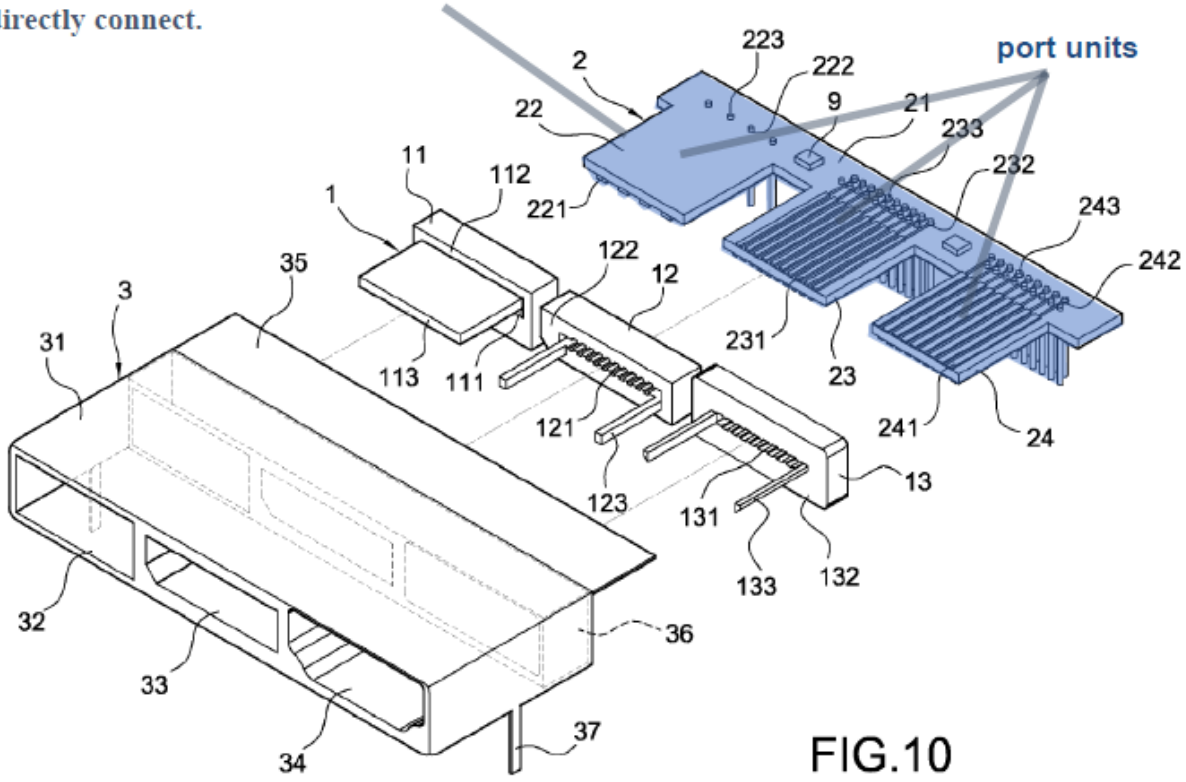
To the extent it is asserted that Ground 1 does not establish the obviousness of the claimed main port module, Kwon and Kuo, further in view of Chang, also renders this element obvious. EX1003, ¶¶104-113.

A. Under Either Party's Construction, Chang Discloses the Claimed Main Port Module

As shown in Figure 10 below, Chang discloses a multi-interface connector with an internal circuit board 2 providing side-by-side USB, DisplayPort, and HDMI ports. EX1008, ¶[0032], [0036]. The circuit board of Chang discloses the claimed main port module under either party's construction. EX1003, ¶104.

Petitioner's construction: self-contained component, separate and apart from other modules, that contains a first and second port unit for connecting to an end-user device

Patent Owner's construction: one physical communication access point of a circuit board having only first and second interface connectors to which an end-user device may directly connect.



Chang, FIG. 10*

The connector has a casing 3 surrounding respective housings 1 that insulate the three ports and have perforations 111, 121, 131 for receiving and supporting respective tongue plates 22-24 of the circuit board 2, which host the connector pins 221, 231, 241 of the ports. *Id.* ¶¶[0026]-[0031]. Three sets of conductive terminals 223, 233, 243 exit the bottom surface of the circuit board for connecting their respective ports to an underlying main board 51. *Id.*, ¶¶[0027], [0028], [0032], [0034]-[0035], FIGS. 5-10. Electrical circuits 9 for the ports—such as an "EMI

protection circuit, surge protection circuit, memory, control circuit, transmission circuit and receiving circuit"—can be added to the circuit board 2 during production. *Id.*, ¶[0037], FIG. 10.

In Chang, the circuit board 2 corresponds to claimed main port module and the tongue plates 22-24 with connector pins for their respective ports corresponds to the claimed first and second port units. EX1003, ¶106. Chang's circuit board satisfies Petitioner's construction of main port module because it is a self-contained component, separate from other modules, that contains first and second port units. EX1003, ¶106; *supra* Section VII.A. Additionally, consistent with Patent Owner's construction, the circuit board is one physical communication access point of a circuit board having only interface connectors to which an end-user device may directly connect. EX1003, ¶106; *supra* Section VII.A.

B. Rationale to Combine Chang With Kwon/Kuo for the Main Port Module

As explained above for claim 1, the two side-by-side male connectors 270 of Kwon's docking station correspond to the claimed first and second port units. *Supra* Section VIII.A.2. Although Chang's connector has female ports, it would have been obvious to use a separate, dedicated circuit board like Chang's to host the connection terminals of Kwon's male connectors 270 and couple them to the underlying circuit board as Chang discloses. EX1003, ¶107.

Chang provides teaching, suggestion, and motivation for this combination. EX1003, ¶108; *KSR*, 127 S. Ct. 1727. For example, Chang explains that sometimes the port housing and its connection pins are produced separately, making it "not so easy to assemble the conductive pins into the housing because the conductive pins are tiny and flexible." EX1008, ¶[0006]. Other times, the housing and pins are produced together by injection molding, which may cause misalignment between the contact terminals of a male plug and its female receptacle "if the compactness [between the housing and pins] is not good enough" in the injection molding process. *Id.* Additionally, adding circuits to a port requires redesigning it, which may increase the size of the connector so it no longer fits on the device and/or render the connector incompatible with the system. *Id.*, ¶[0007].

Chang's solution addresses the pin-delicacy and misalignment problems by "us[ing the] copper foil circuit of circuit board to replace traditional conductive pins of connector." *Id.*, ¶[0008]; *see also id.*, ¶[0037]. The circuit board substrate physically supports and protects the foil conductive pins from damage while allowing for precise pin alignment during the manufacturing process. EX1003, ¶109. Thus, using Chang's circuit board in Kwon would improve the durability and alignment of Kwon's male connectors 270. *Id.*

Additionally, Chang's circuit board 2 allows electrical circuits 9—such as "EMI protection circuit, surge protection circuit, memory, control circuit,

transmission circuit and receiving circuit"—to be added when producing the circuit board. EX1008, ¶[0037], FIG. 10. Thus, using Chang's circuit board in Kwon allows Chang's electronic circuits 9 to process signals received at the male connectors 270 before passing them on to Kwon's underlying circuitry or transmitting them externally. EX1003, ¶111. For example, EMI and/or surge-protection circuitry may condition the signals to prevent damage to Kwon's hub or other internal circuitry. EX1008, ¶[0037]; EX1003, ¶111. And using a common board for multiple ports reduces the number of boards needed and allows circuits to be easily added without redesigning connectors or undermining system compatibility. EX1008, ¶[0037]; EX1003, ¶111. A POSITA would have been motivated to implement Kwon's male connectors 270 on a common circuit board, as disclosed by Chang. EX1003, ¶111.

The combination involves applying Chang's known technique—implementing multiple ports with one board—to Kwon's docking station, which stands ready for improvement to yield predictable results. EX1003, ¶112; *KSR*, 127 S. Ct. 1727. Kwon stands ready for improvement by Chang because, like Chang's ports, its male connectors 270 sit side-by-side allowing Chang's common circuit board to be used. EX1003, ¶112. And Chang's circuit board has conductive terminals 223, 233, 243 that connect to an underlying main board 51. EX1008, ¶¶[0027], [0028], [0032], [0034]-[0035]; FIGS. 5-10. These terminals would also

allow for connecting Chang's board to Kwon's internal circuitry. *See* EX1005, 7:1-24 (discussing Kwon's internal circuitry).

Although Kwon's connectors 270 are male rather than female, male connectors (e.g., USB connectors) typically have internal substrates that hold the conductive pins of the connector. EX1003, ¶113. Rather than use a separate substrate for each connector 270, respective tongue portions 22-24 of Chang's circuit board 2 could serve as the substrates for the connectors 270. *Id*. And this would address the pin-delicacy, misalignment, and connector-circuitry problems identified by Chang within the context of the Kwon-Kuo docking station. Thus, the circuit board of Chang would install and operate generally the same way in Kwon, allowing for a routine and predictable combination. EX1003, ¶113.

X. GROUND 3: O'SHEA AND KUO RENDER OBVIOUS CLAIMS 1-6 AND 13-17

A. Independent Claim 1

1. [Preamble] "*A port extension apparatus for extending ports of an end-user device comprising:*"

O'Shea discloses a port extension apparatus for extending ports of an end-user device—a "connector device … for coupling to connectors associated with a laptop

computer." EX1007, Abstract; EX1003, ¶114. The connector device 12, 112 [6] includes a plurality of input ports for coupling to ports of a laptop computer and a plurality of output ports for transmitting and receiving electrical signals between the portable computer and external peripheral devices. EX1007, 1:49-55; EX1003, ¶114. The connector device engages the laptop and functions as a docking station to extend the computer's ports or connectors. EX1007, 1:49-55, 5:47-57, FIGS. 6, 7 (reproduced below).

[6] O'Shea uses reference numeral 12 to refer to a "functional block diagram" of the connector device shown in Figure 1 and uses reference numeral 112 to refer to the physical embodiment of the same connector device shown in Figures 2-7. *See* EX1007, 2:27-28, 2:28-44. Thus, Petitioner uses the two reference numerals interchangeably when discussing O'Shea. EX1003, ¶114.

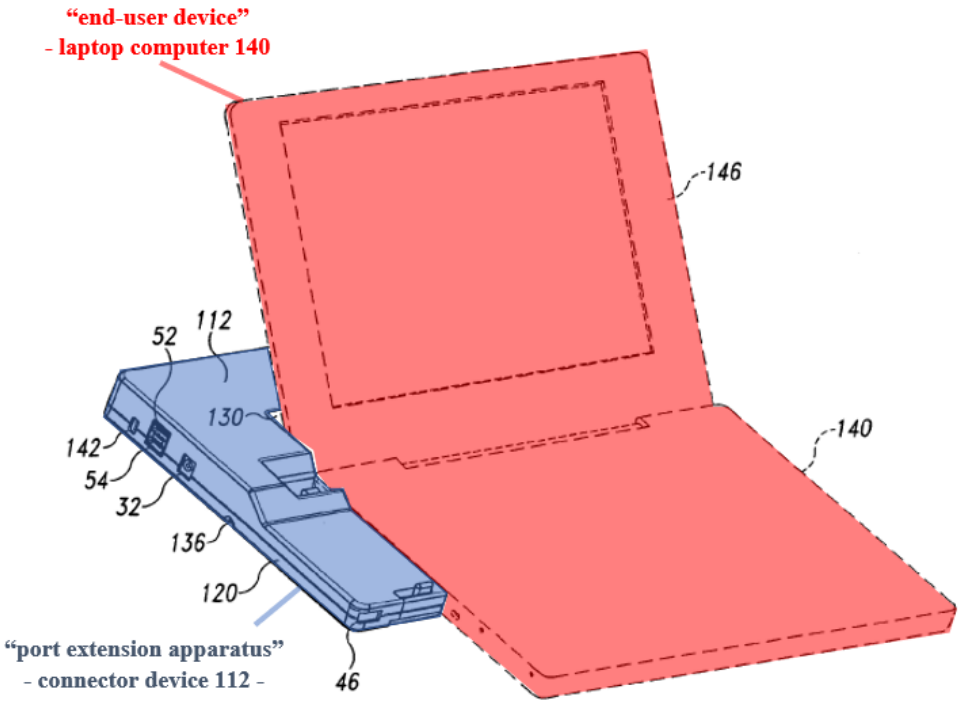


Fig. 7

O'Shea, FIG. 7*

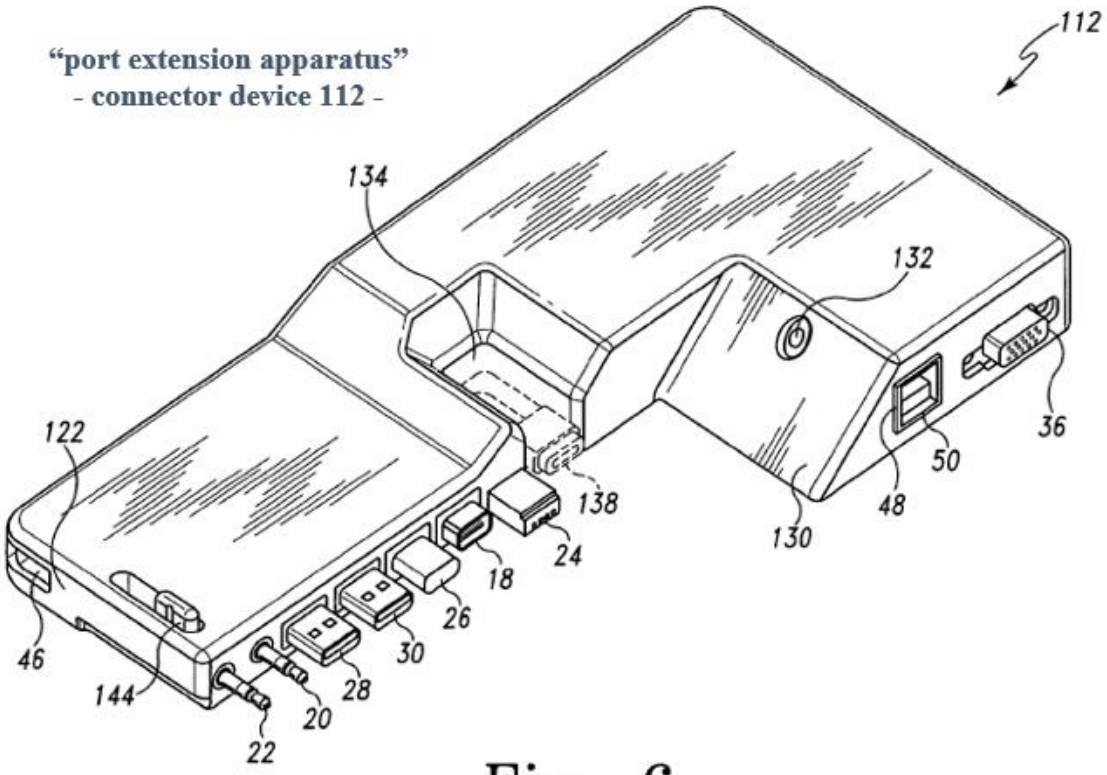


Fig. 6

O'Shea, FIG. 6

2. [1.1] "*a main port module for connecting to an end-user device, the main port module having first and second port units*"

O'Shea discloses or suggests this element under Patent Owner's construction.[7] EX1003, ¶¶115-121. O'Shea's device has a plurality of input ports 12 including a first port unit 28 and a second port unit 30, as shown in Figures 1 and 2

[7] Petitioner addresses Patent Owner's construction here and Petitioner's construction in Ground 4.

below, that correspond to the claimed first and second port units. EX1007, 2:57-67; EX1003, ¶115. In one embodiment, O'Shea explains these two ports may be "two USB (i.e., Universal Serial Bus) ports 28 and 30." EX1007, 2:57-67; *see* EX1001, 5:24-27 (explaining that the first and second port units may be "a Type-C male port or a USB male port").

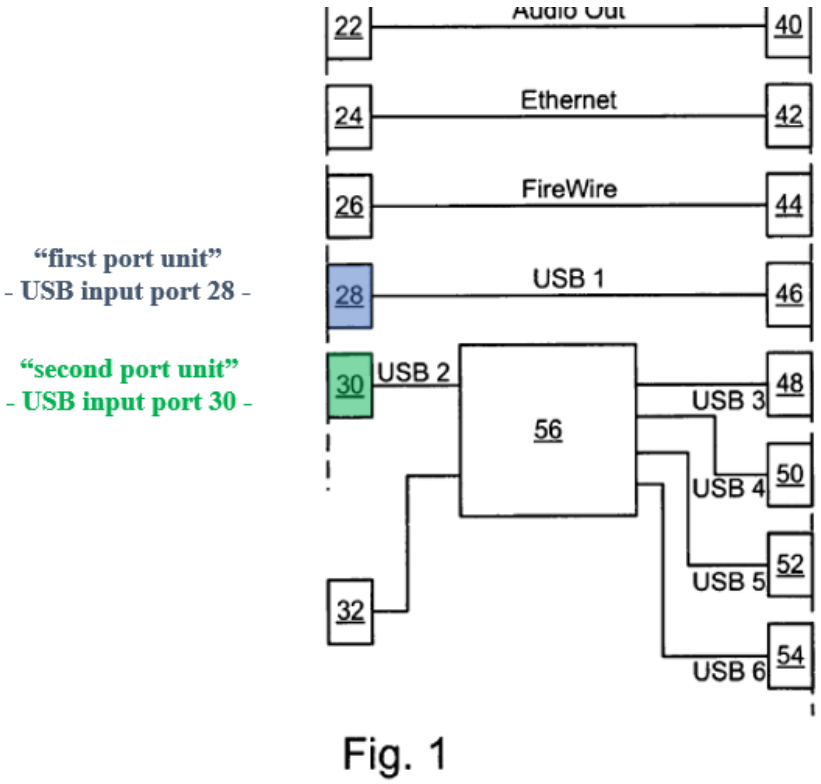


Fig. 1

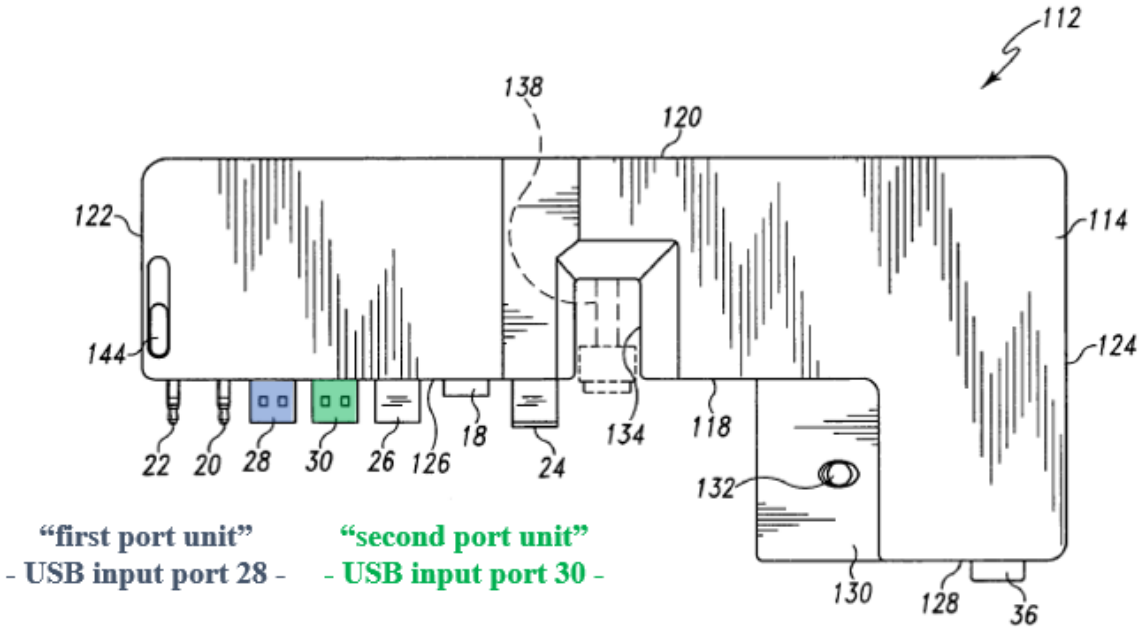


Fig. 2

O'Shea, FIGS. 1, 2*

According to Patent Owner, the claimed main port module is "one physical access point of a circuit board having only first and second interface connectors to which an end-user device may directly connect." *Supra* Section VII.A. To the extent that Patent Owner's construction can be understood, the input ports 28, 30 of O'Shea comprise one physical access point having only first and second interface connectors. EX1003, ¶116. As shown in the Figures above, O'Shea's input ports 28, 30 occupy the same physical area of the connector device. Like the '429 patent's two port units, O'Shea's input ports 28, 30 sit side-by-side on the docking station. *Compare* EX1001, FIG. 2 (11, 12) *with* EX1007, FIG. 2. The '429 patent explains

that the specific port configuration of the end-user device dictates the position and spacing of the first and second port units. EX1001, 1:14-24, 40-42; EX1003, ¶116. The same is true of O'Shea because the

> input ports 18-30 are spaced apart from each other by the same distance as the like ports provided by the portable or laptop computer. Moreover, the input ports 18-30 provide a receptacle or plug for properly connecting or mating with the like ports provided by the portable computer. As such, it should be understood that the invention could be used in connection with any portable or laptop computer by providing properly located connectors, on the housing of the connector device, of the proper shape or type that correspond with those of various other computers and their ports.

EX1007, 3:3-15. Thus, in both O'Shea and the '429 patent, the port configuration of the host computer requires the two port units to sit side-by-side and occupy the same "physical access point" so they can mate with the host computer's ports. EX1003, ¶116.

In O'Shea, the input ports 28, 30 directly connect to the end-user device: "[i]nput ports 18-30 are preferably compatible with like ports provided by a portable or laptop computer and thus directly connect or dock with the ports on the portable computer." EX1007, 3:1-3. Thus, O'Shea's input ports 28, 30 comprise first and second interface connectors to which an end-user device may directly connect. EX1003, ¶117.

If O'Shea does not expressly disclose that the input ports occupy the same physical access point "of a circuit board," Kuo renders it obvious. EX1003, ¶118. O'Shea discloses that its "USB port 28 is electronically coupled in a conventional manner to USB port 46 to provide a USB transmission path between the ports." EX1007, 4:15-19. But O'Shea omits description of the conventional manner for electronically coupling the ports.

Kuo, however, discloses a similar docking station with various output ports 24, 25 electronically coupled to an input port 23. EX1006, ¶[0023]. As highlighted in blue in Figure 4 of Kuo below, these ports are mounted to "a circuit board 21 with conducting contacts 211" that interconnect connect the ports. *Id.*, ¶[0026]. Thus, Kuo demonstrates that a circuit board was conventional way to electronically couple two ports of a docking station before the '429 patent. EX1003, ¶119.

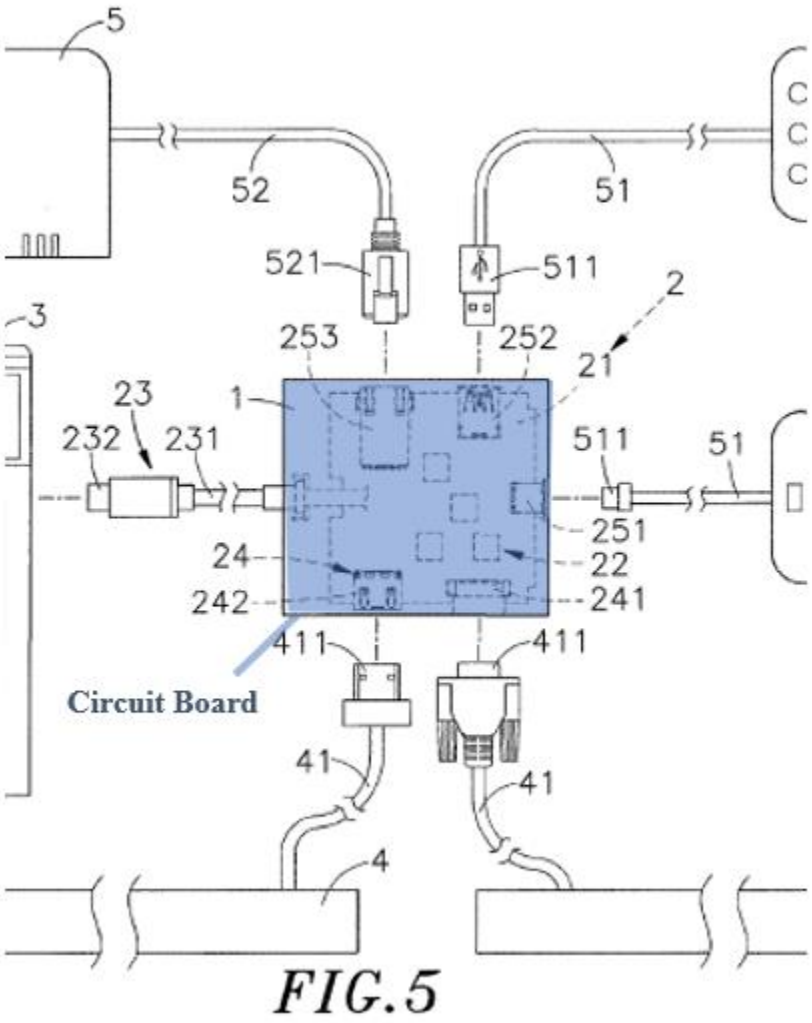


FIG.5

Kuo, FIG. 5*

A POSITA would have found it obvious to add the circuit board of Kuo to the device of O'Shea to interconnect its ports. EX1003, ¶120. The references provide teaching, suggestion, or motivation to make the combination. *KSR*, 127 S. Ct. at 1727. O'Shea explains that its "USB port 28 is electronically coupled in a conventional manner to USB port 46 to provide a USB transmission path between the ports." EX1007, 4:15-19. But O'Shea omits a full discussion because such

techniques were conventional, well-known, and peripheral to O'Shea's disclosure. EX1003, ¶120. A POSITA would have recognized that O'Shea requires a manner of electronically coupling ports to function, and Kuo demonstrates that using a circuit board was a conventional way to do so. *Id*. Thus a POSITA would have been motivated to make the combination. EX1003, ¶120.

The combination involves applying a known component or technique (Kuo's circuit board) to a known device (O'Shea's docking station) to yield predictable results. EX1003, ¶121; *KSR*, 127 S. Ct. 1727. Kuo shows circuit boards were known and used in port-expanding devices, like O'Shea's, to provide physical access and interconnection of their ports. Thus, a POSITA would have expected that the circuit board in Kuo could be added to O'Shea and the combination would work predictably. EX1003, ¶121. O'Shea's device is ready for improvement by Kuo's circuit board because O'Shea does not discuss the conventional but required mechanisms for electronically coupling its input and output ports. EX1003, ¶121. A POSITA could have made the combination without undue experimentation because it merely involves adding a conventional circuit board to a known docking station and requires the circuit board operate as intended. *Id*.

3. [1.2] "*a first data port module operatively connecting to the first port unit;*"

[1.3] "*when a to-be-connected device connects to the first data port module, the first data port module and the main port module form a transmission path enabling data*

***transmission between the to-be-connected device and the end-user device;*"**

O'Shea discloses or suggests these elements. EX1003, ¶¶122-124. Regarding element [1.2], O'Shea has a first data port module operatively connected to a first port unit, as shown in Figure 1 below. *Id*. The USB port 46 corresponds to the claimed first port unit. *Id*. The '429 patent and O'Shea respectively describe the first data port module and the USB port 46 as female USB ports. *Compare* EX1001, 4:65-67 *with* EX1007, FIG. 6; *see also* EX1003, ¶122.

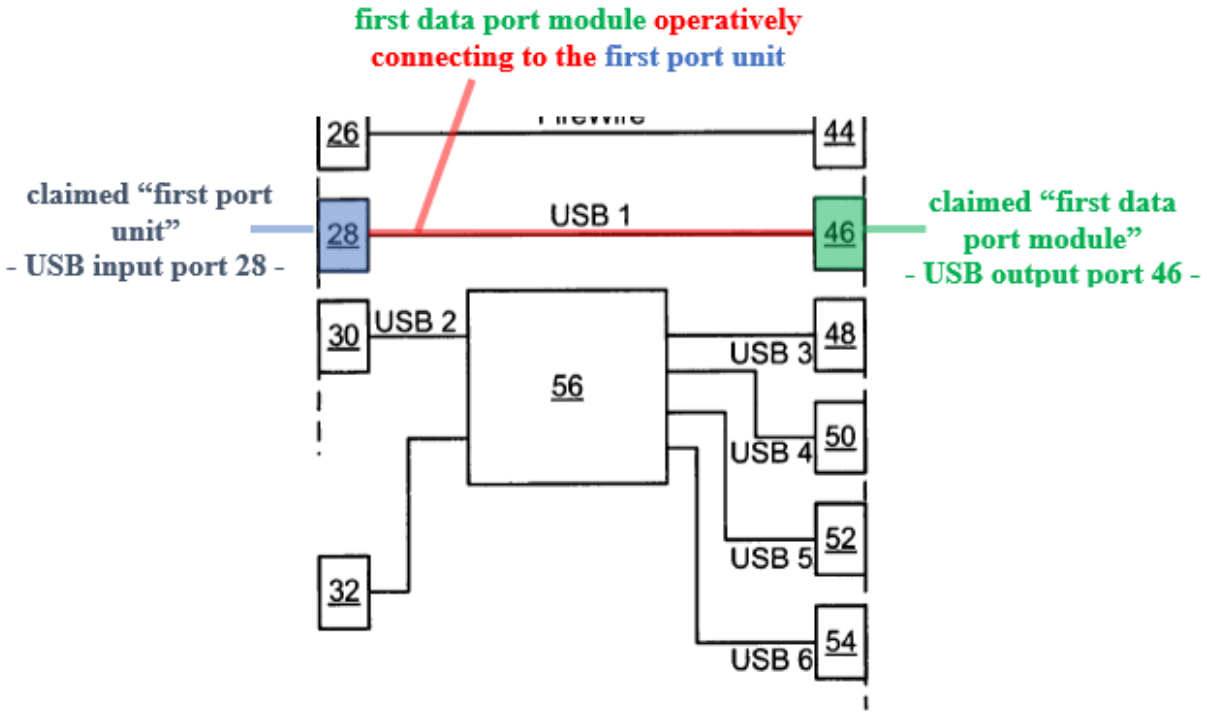


Fig. 1

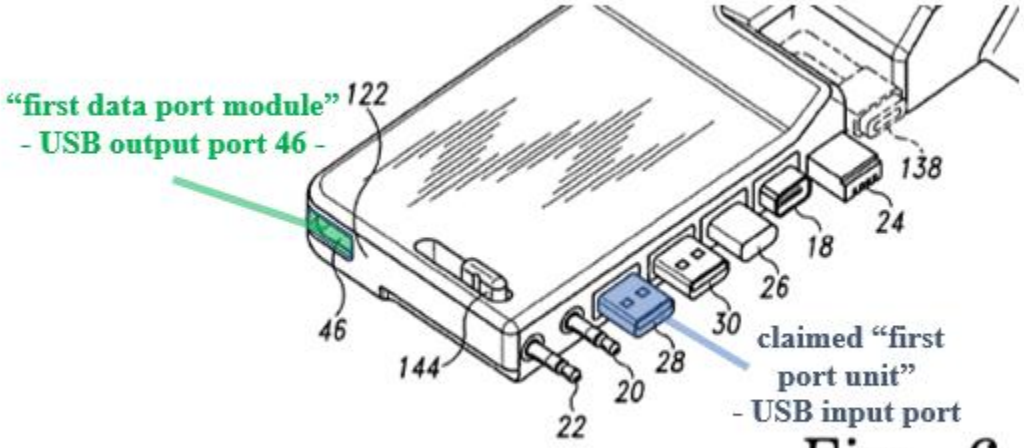


Fig. 6

Kuo, FIG. 1, 6*

As shown in red, the USB output port 46 (first data port module) of O'Shea is operatively connected to USB input port 28 (first port unit). EX1007, 4:15-19, FIG. 1; EX1003, ¶123.

Regarding element [1.3], O'Shea discloses when a peripheral device (to-be-connected device) connects to an output connector, like USB port 46 (first data port module), USB port 46 and USB port 28 (first port unit of the main port module) form a transmission path enabling data transmission between the peripheral device and the laptop computer (end-user device). EX1003, ¶124. O'Shea states that "USB port 28 is electronically coupled in a conventional manner to USB port 46 to provide a USB transmission path between the ports." EX1007, 4:15-19; EX1003, ¶124.

4. [1.4] "*a data transmission control module operatively connecting to the second port unit via a first data transmission port of the data transmission control module*"

O'Shea discloses or suggests this element. EX1003, ¶¶125-126. O'Shea discloses a USB hub 56 operatively connected to four USB output ports 48-56 via respective data transmission ports. EX1007, 4:20-28, 2:66, 5:13-17. As highlighted below in Figure 1 of O'Shea, the hub 56 discloses the claimed DTCM and the USB port 30 corresponds to the second port unit. EX1007, FIG. 1; EX1003, ¶125.

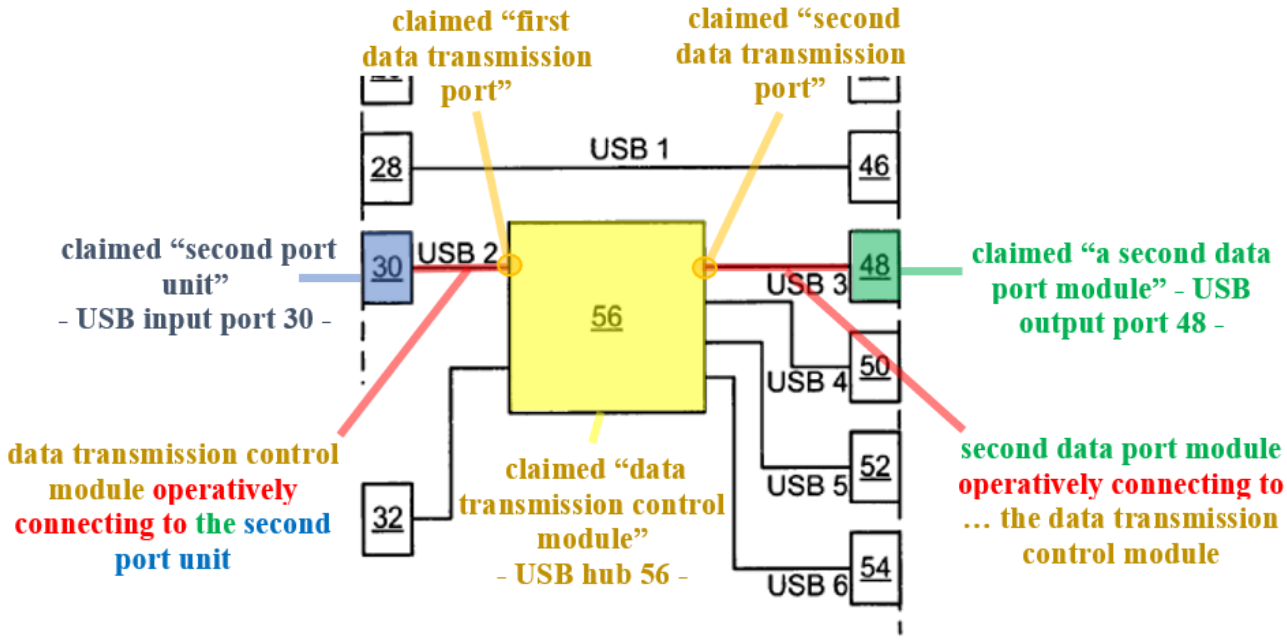


Fig. 1

O'Shea, FIG. 1*

The USB input port 30 (second port module) of O'Shea is attached to the USB hub 56 (DTCM), consistent with the internal connections of the components in the '429 patent. *Supra* Section VIII.A.4.a.

O'Shea's hub 56 is a DTCM because it is "a conventional device that allows many USB devices to connect to port [30] via ports 48-54." EX1007, 4:20-28; *see also id.*, 2:57-3:15, 4:35-38; EX1003, ¶126. Before the '429 patent, conventional USB hubs performed such operations as detecting the connection of new devices, configuring the devices with an address on the bus, and routing addressed data between host and USB devices connected to the hub during communication with the host computer. EX1011, 4; EX1003, ¶126.

5. [1.5] "*a second data port module operatively connecting to a second data transmission port of the data transmission control module;*"

[1.6] "*when a to-be-connected device connects to the second data port module, the data transmission control module controls data transmission between the to-be-connected device and the end-user device;*"

O'Shea discloses or suggests these elements. EX1003, ¶¶127-128. Regarding element [1.5], as shown in Figure 1 below, O'Shea discloses a USB output port 48 (claimed second data port module, green) operatively connecting (red) to a second data transmission port of the USB hub 56 (claimed DTCM, yellow). EX1007, 4:20-22 ("USB port 48, comprising a USB Type-A plug, is electrically coupled to a USB hub 56 along with USB ports 48-54 comprising conventional USB Type-A sockets"), FIG. 2; EX1003, ¶128.

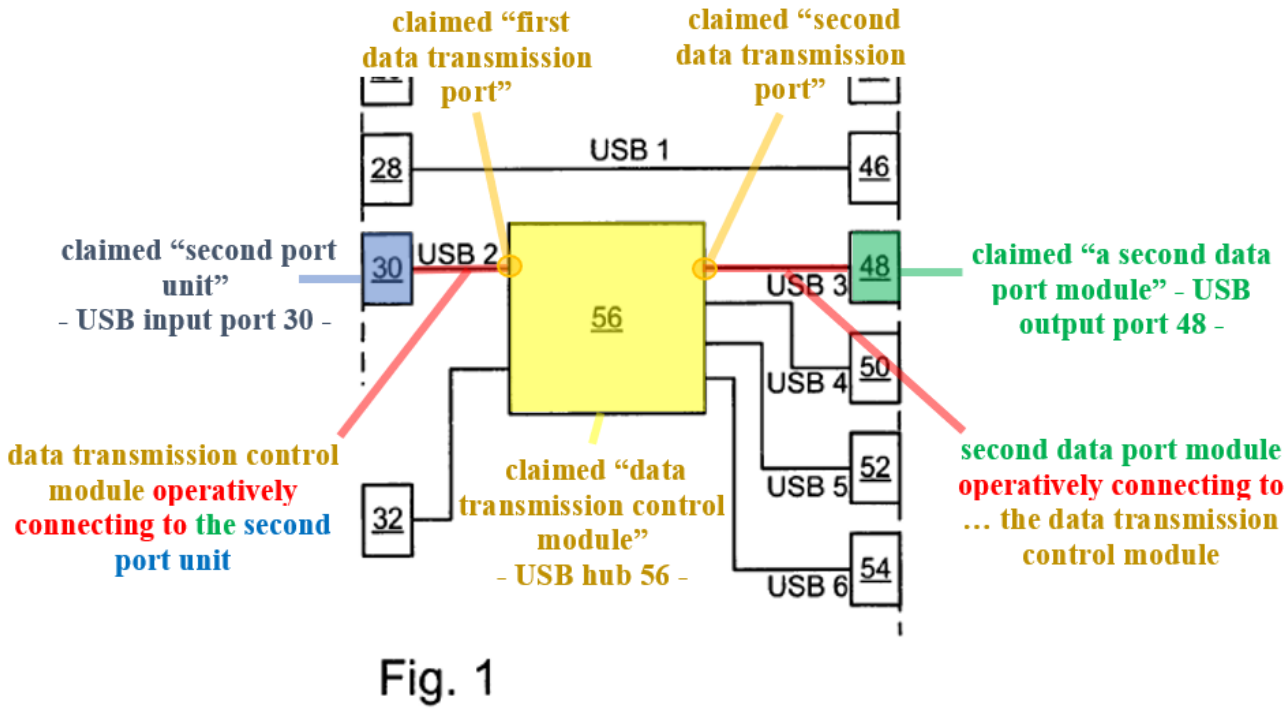


Fig. 1

O'Shea, FIG. 1*

Regarding element [1.6], as explained for element [1.2], O'Shea discloses input connectors, like USB port 30 (second port unit), coupling to a laptop computer (end-user device) and output connecters, like USB port 48 (second data port module), connecting to a peripheral device (to-be-connected device) for transmitting and receiving electric signals between the laptop and the external peripheral device via the USB hub (DTCM). *Supra* Section X.A.3; EX1007, 3:6-15; EX1003, ¶128.

6. [1.7] "*a video port module operatively connecting to a third data transmission port of the data transmission control module; wherein*"

[1.8] "*when a to-be-connected device connects to the video port module, the data transmission control module receives the to-be-displayed information from the end-user device to the to-be-connected device to display*"

a. Kuo discloses the claimed video port module

O'Shea and Kuo renders these elements obvious. EX1003, ¶¶129-136. Regarding element [1.7], O'Shea does not disclose a video port module operatively connecting to the hub 56. But Kuo's analog signal output port 241 and/or digital signal output port 242 for an external monitor discloses the claimed video port module:

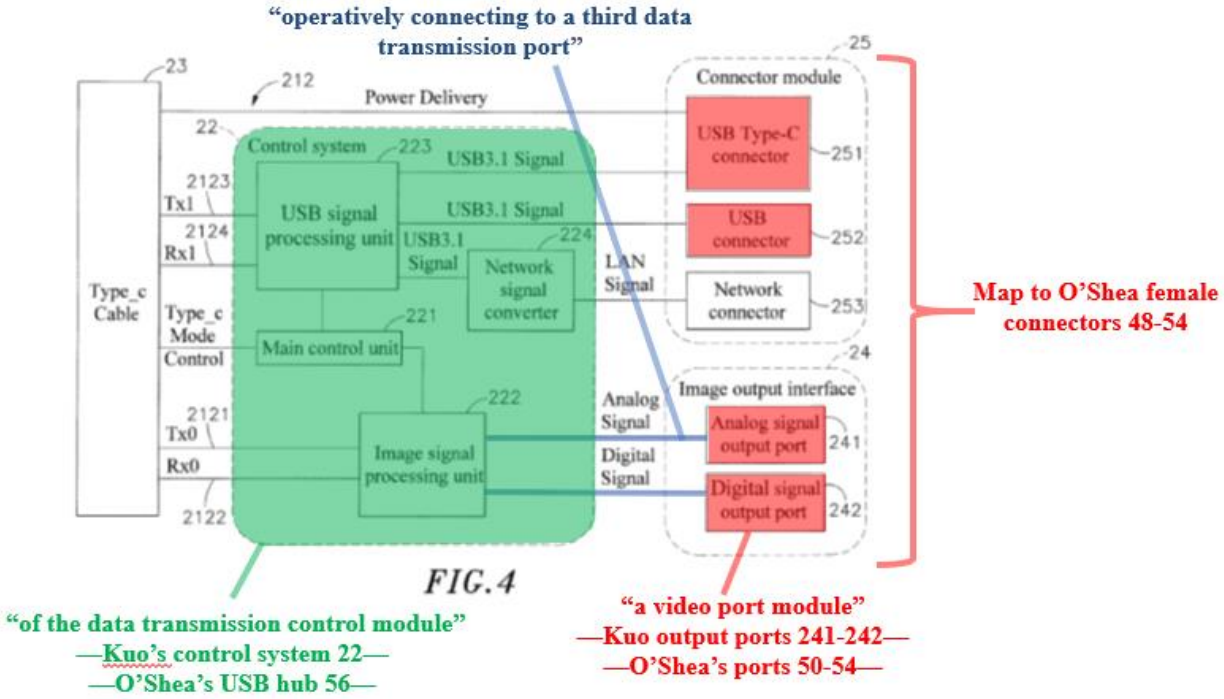


FIG. 4

Kuo, FIG. 4*

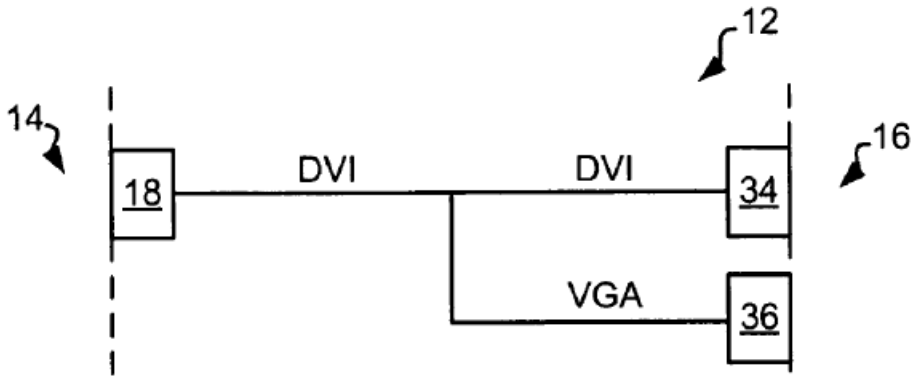
As examples, Kuo teaches that the analog signal output port 241 may be a VGA connector while the digital signal output port 242 may be an HDMI connector. EX1006, ¶[0023]. As highlighted above in blue, Kuo's connectors 241, 242 (claimed video port module) electrically connect to the image signal processing unit 222 of the control system 22—which corresponds to the claimed DTCM—via respective ports of the control system. EX1006, ¶[0023] ("an image output interface 24 electrically connected to the image signal processing unit 222 of the control system 22"); EX1003, ¶130.

Kuo discloses element [1.8] because, when an external monitor (claimed to-be-connected device) connects to Kuo's video connectors 241-242 (claimed video port module), the control system 22 (claimed DTCM) receives the to-be-displayed information from the host computer (claimed end-user device) and outputs it to the external monitor to display, as claimed. *See* EX1006, ¶¶[0021], [0026] (discussing the receiving and processing of video signals by the control system 22); EX1003, ¶131.

b. Rationale to implement Kuo's HDMI port 242 as one of O'Shea's output ports 50-54

The references provide teaching, suggestion, or motivation to incorporate Kuo's HDMI port 242 (claimed video port module) as one of O'Shea's output ports 50-54 to update O'Shea's docking station with modern display technology. *KSR*, 127 S. Ct. at 1741 (2007); EX1003, ¶132. O'Shea's docking station has a mini-DVI

input port 18 for the laptop that splits into a full-size DVI output port 34 and a VGA output port 36 for an external monitor (EX1007, 2:57-67, 3:16-38):



O'Shea, FIG. 1

But O'Shea was filed in 2007—when DVI was prevalent and monitors supported DVI and VGA connections—and O'Shea specifically designed the docking station to interface with a 13" DVI MacBook. *Id*., 3:1-5. By the time of Kuo nearly a decade later, DVI had fallen out of favor and HDMI and DisplayPort had superseded DVI. EX1012, 1; EX1006, ¶¶[0007], [0023]; EX1003, ¶132. And laptops now supported dual-monitors—a capability O'Shea lacks. EX1006, ¶[0007], EX1003, ¶132.

Thus, a POSITA considering O'Shea's docking station in 2017 would have wanted to modernize its decade-old video technology for compatibility with the new laptops and displays with which it would be interfacing. EX1003, ¶133. The POSITA would have looked to Kuo, which omits DVI in favor of HDMI and adds dual-monitor capability, for guidance on how to do so. *Id*. O'Shea does not necessarily need all five USB output ports 46-48, so the POSITA would have wanted

to trade one or more of the USB ports 50-54 on the hub 56 for modern video ports like Kuo's. EX1003, ¶133; *see also* EX1007, 3:41-43, 4:17-19, 5:15-17 (O'Shea repeatedly mentions that its ports can, "but not necessarily," be the type of port O'Shea lists as an example (e.g., USB).). Thus, it would have been obvious to replace at least one of O'Shea's hub USB ports 50-54 with the HDMI output port 241 of Kuo (claimed video port module). EX1003, ¶133.

Kuo uses a control system 22, in a similar role to O'Shea's hub 56, coupled to an image output interface 24 with an HDMI output port 242. EX1006, ¶¶[0023], [0024], FIG. 4. Thus, as part of the combination, the POSITA would have updated O'Shea's hub to include the necessary video functionality of Kuo's control system. EX1003. ¶134. Specifically, the POSITA would have added the image signal processing unit 222 and main control unit 221 of Kuo as components of the O'Shea hub. *See* EX1006, ¶¶[0021]-[0026] (discussing operation of the units 221, 222); EX1003, ¶134. As an added benefit, O'Shea's docking station would now support dual-monitors if a second USB port 50-54 were replaced with another video output port 241-242 from Kuo. *See* EX1006, ¶[0023]. EX1003, ¶134. This would have further motivated the POSITA to make the combination. EX1003, ¶134.

The POSITA would have made the above-described combination rather than try to update one of O'Shea's DVI or VGA output ports 34, 36 to a modern interface. EX1003, ¶135. Because DVI had been superseded by the time of Kuo and before the

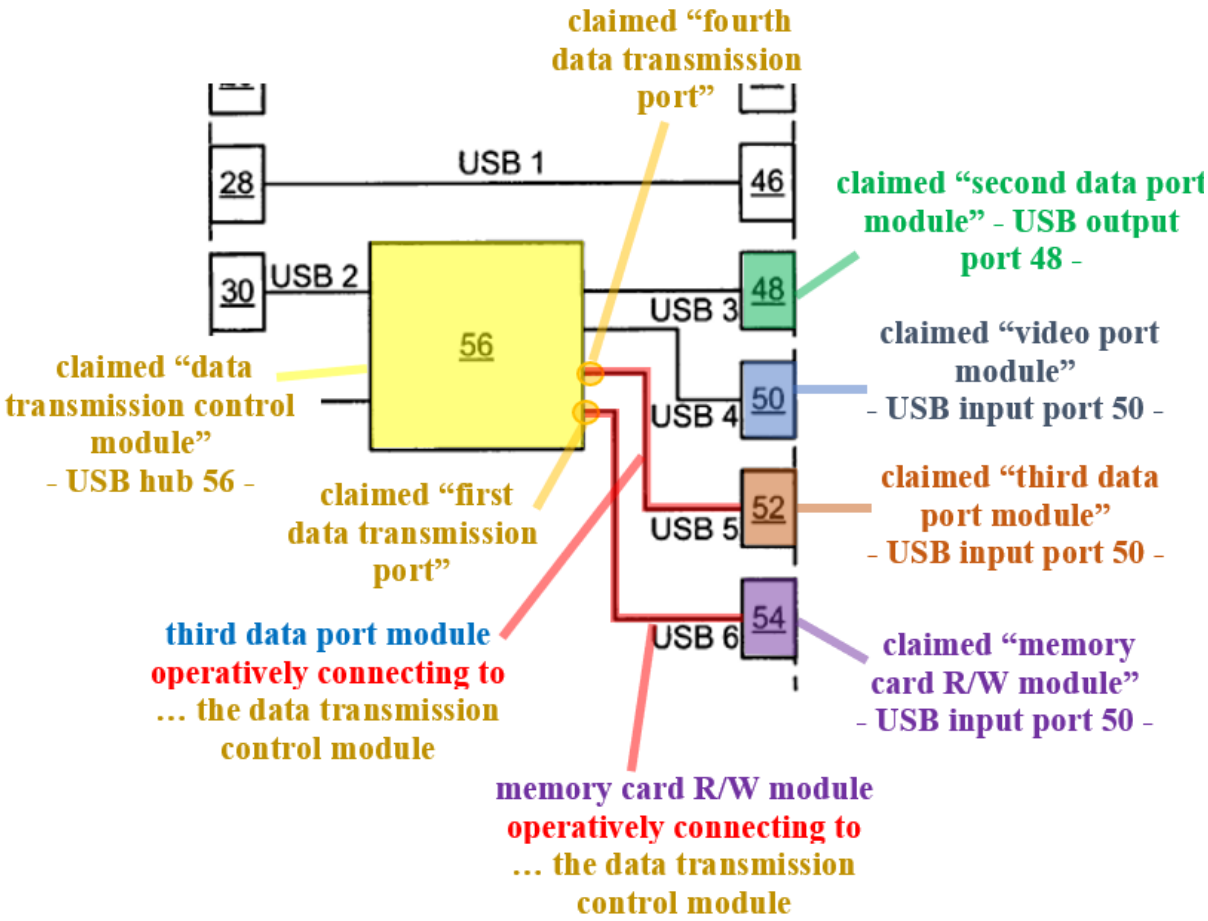
'429 patent, this entire channel of O'Shea's docking station—the connection between the DVI input port 18 and the DVI and VGA output ports 34, 36—had become largely useless for modern commercial laptops that no-longer had DVI ports. EX1003, ¶135; EX1012, 1; EX1006, ¶¶[0007], [0023]. By making the combination described above, this obsolete channel of O'Shea's docking station could be eliminated, reducing its footprint and/or cost. EX1003, ¶135.

The combination involves applying a known technique (of Kuo's image output interface 24 and control system 22) to a known device (O'Shea's USB port 50-54 and hub 56) ready for improvement to yield predictable results. *KSR*, 127 S. Ct. 1727, 1740-41. O'Shea stands ready for improvement because it already has extra USB ports 50-54, any of which could be replaced with Kuo's HDMI output port 242. EX1003, ¶136. And as explained, O'Shea's hub could be updated to include the video functionality of Kuo's control system 22. *Id.* The combination would yield predicable results because, when added to O'Shea, Kuo's HDMI output port and control system functionality would operate generally as they operate in Kuo. *Id*. Thus, the combination could be made through routine skill in the art and with a reasonable expectation of success. *Id*.

B. Claim 2

The combination of O'Shea and Kuo renders elements [2.1] and [2.2] obvious. EX1003, ¶¶137-138. As discussed, O'Shea has four USB output ports 48-54.

EX1007, 4:20-28. *Supra* Section X.A.5. Two of these ports correspond to the second data port module of element [1.5] and the video port module of element [1.7]. *Supra* Sections X.A.5, 6. This leaves two remaining USB ports for the claimed third data port module of element [2.1] and memory R/W module of element [2.2]:



O'Shea, FIG. 1*

Neither O'Shea nor Kuo discloses a memory card reader, but a POSITA would have found it obvious to implement a memory card reader as an additional port supported by O'Shea's hub 56. EX1003, ¶138. Memory card readers were

common on docking stations before the '429 patent. EX1003, ¶138; *see supra* Section VIII.B. A POSITA would have been motivated to add this functionality to the docking station of O'Shea. EX1003, ¶138. Modifying O'Shea's hub 56 to support the additional connection would require only routine skill in the art and could be done with a reasonable expectation of success. *Id*. For example, the USB hub 56 could be modified to convert data between USB format and the particular format of the memory car supported by the reader (e.g., SD memory) for read/write operations. *Id*.

C. Claim 3

The O'Shea-Kuo combination renders element [3.1] obvious. EX1003, ¶139. *See supra* Section X.B.

D. Claim 4

In Ground 1, Petitioner explains how Kuo discloses the DTCM including the units recited in element [4.1]. *Supra* Section VIII.D. Specifically, the control system 22 corresponds to the DTCM, the main control unit 221 corresponds to the USB control unit, the USB signal processing unit 223 corresponds to the USB conversion unit and the memory card conversion unit, and the image signal processing unit 222 corresponds to the mode conversion unit:

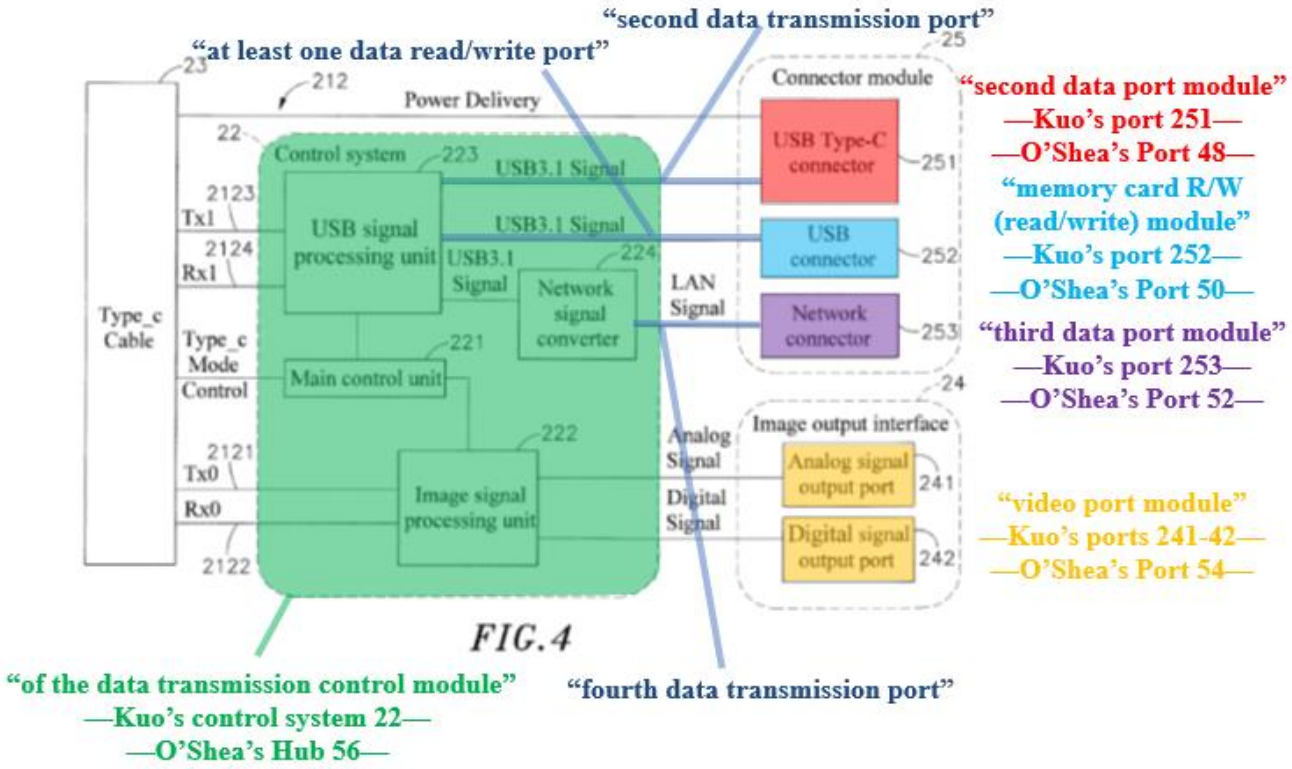


FIG. 4

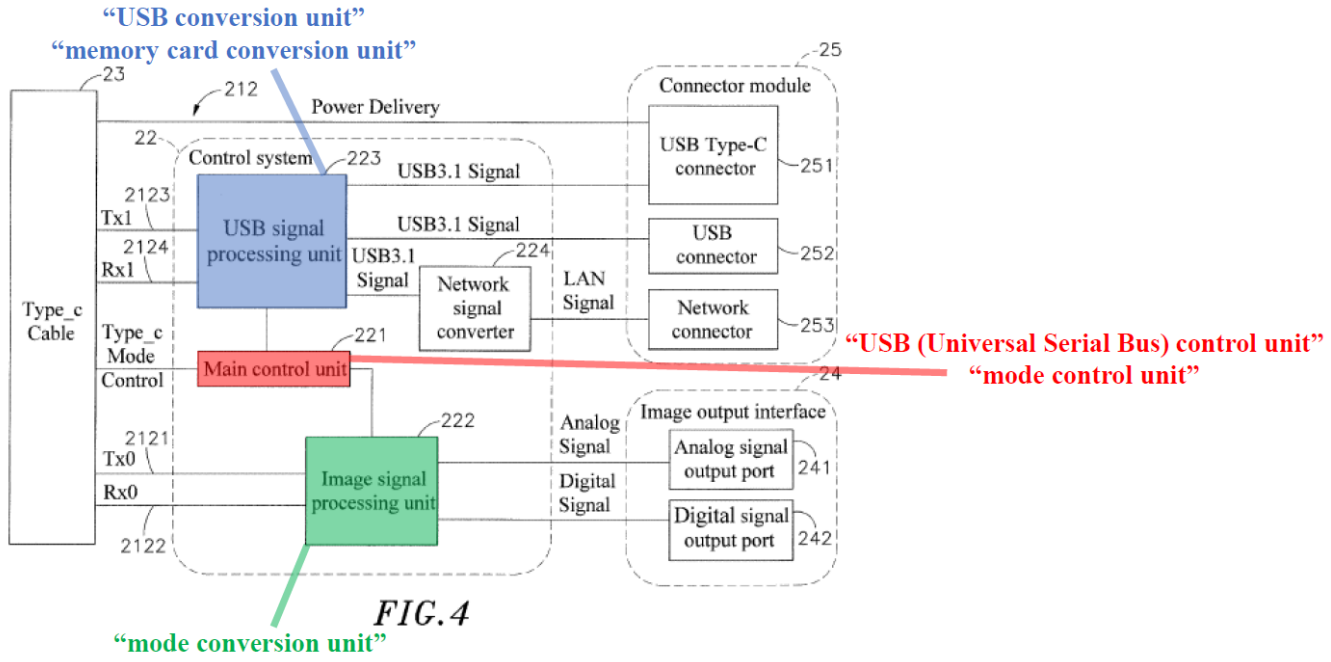


FIG. 4

O'Shea-Kuo Combination

Petitioner explains above for element [1.7] why it would have been obvious to incorporate the main control unit 221 (USB control unit) and image signal processing unit 222 (mode conversion unit) of Kuo into the hub 56 of O'Shea to modernize the video capabilities of O'Shea's docking station. *Supra* Section X.A.6. But it also would have been obvious to add Kuo's USB signal processing unit 223 (claimed USB conversion unit) to O'Shea's hub 56 because O'Shea does not describe the specific configuration of the USB hub or how it operates to route or process data between the USB input port 30 and the USB output ports 48-54. EX1003, ¶141; *see also* EX1007, 4:20-28. Kuo explains that the USB signal processing unit 223 of its control system 22 implements the many-to-one USB connections between the USB connectors 251, 251 and the cable 23 connecting to the host computer. *See* EX1006, ¶[0021] (explaining how the USB signal processing unit 223 converts one type of USB signal to another type of USB signal, such as USB 3.0 into USB 3.1), FIG. 4; EX1003, ¶142. To improve the utility of O'Shea's docking station, a POSITA would have sought to make some or all the remaining USB output ports 50-54 have different USB protocols (e.g., USB 2.0, 3.0, 3.1, etc.), so that the docking station supported peripheral devices operating according to various USB protocols. EX1003, ¶142. As part of this combination, the POSITA would have incorporated Kuo's disclosure of the USB signal processing unit 223. *Id*.

As discussed for element [1.7], the combination involves applying a known technique (Kuo's control system 22) to a known device (O'Shea's hub 56) ready for improvement to yield predictable results. *Supra* Section X.A.6; *KSR*, 127 S. Ct. 1727, 1740-41; EX1003, ¶143. The combination could have been made through routine skill in the art with a reasonable expectation of success. *Supra* Section X.A.6.

E. Claims 5 and 6

The combination of O'Shea and Kuo discussed above for claim 4 includes the elements of claims 5 and 6:

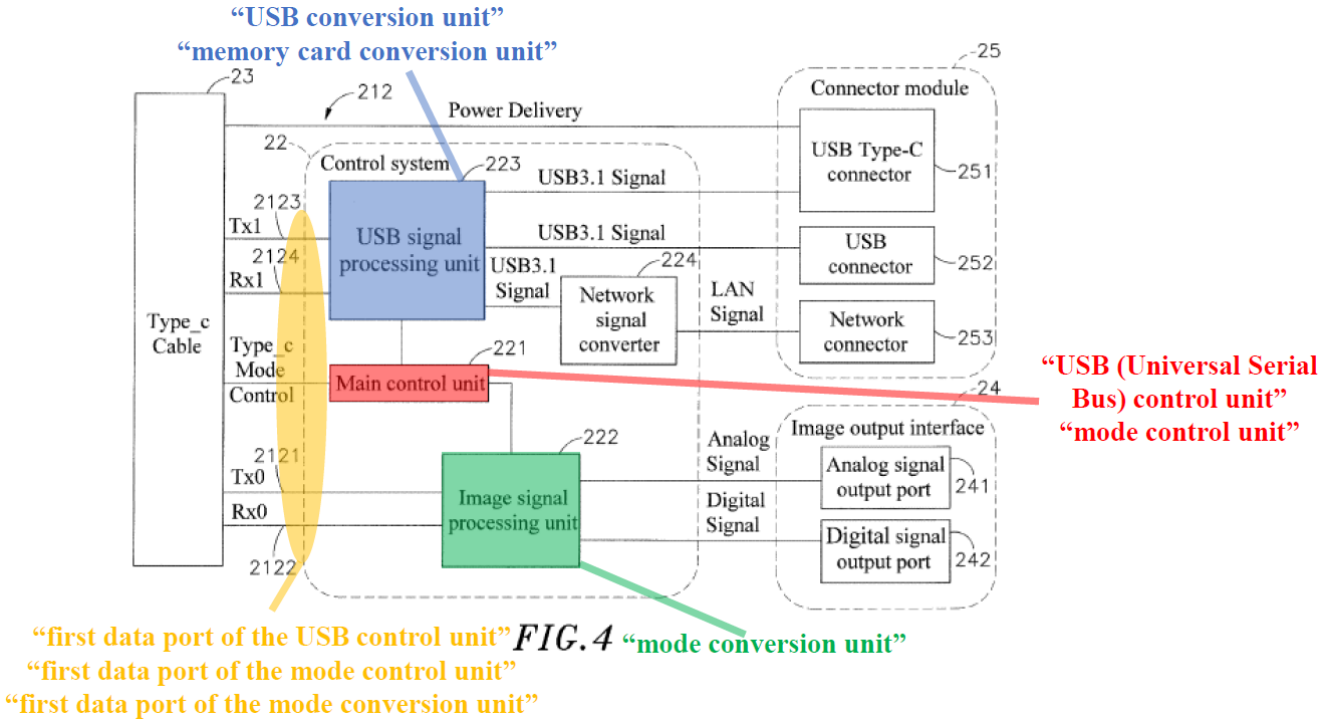


FIG. 4

O'Shea-Kuo Combination

See supra Sections VIII.E-F; EX1003, ¶144.

F. Claim 13

As explained for element [1.7], Kuo's HDMI output port 241 corresponds to the claimed video port module in the O'Shea-Kuo combination. *Supra* Section X.A.6; EX1003, ¶145.

G. Claims 14 and 16

As explained for elements [1.2] and [2.1], the USB ports 46 and 52 of O'Shea respectively disclose the claimed first data port module and the claimed third data port module. *Supra* Sections X.A.3 and X.B. O'Shea discloses these ports are "USB Type-A plug[s]," but for the reasons discussed in Ground 1 for claims 14 and 16, it would have been obvious to instead make theses ports female USB Type-C/Lightning ports as recited in claims 14 and 16. *See* EX1007, 4:15-28; EX1003, ¶146; *see also supra* Sections VIII.H and VIII.J.

H. Claim 15

O'Shea discloses that the USB port 48 (second data port module) is a female port, as claimed. EX1007, 4:20-28, FIG. 3; EX1003, ¶147.

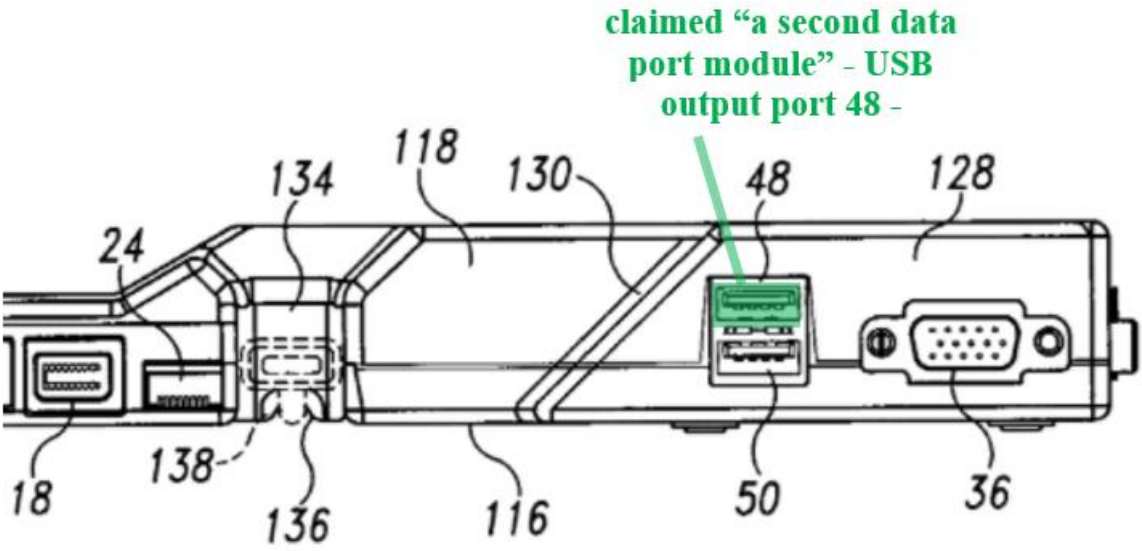
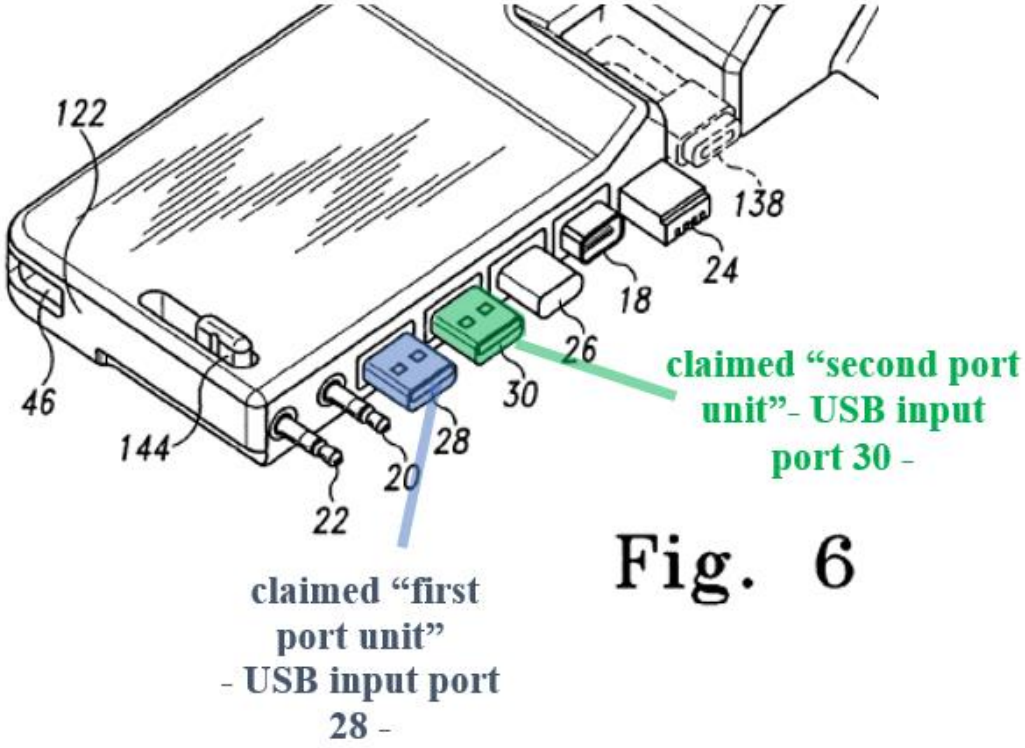


Fig. 3

O'Shea, FIG. 3*

I. Claim 17

O'Shea discloses that the USB port 28 (first port unit) and USB port 30 (second port unit) are USB male ports. EX1007, 4:15-28, FIG. 6; EX1003, ¶148. For the reasons discussed in Ground 1 for claim 17, it would have been obvious to make these ports USB Type-C ports. *Supra* Section VIII.K.



O'Shea, FIG. 6*

XI. GROUND 4: O'SHEA AND KUO, FURTHER IN VIEW OF CHANG, RENDER OBVIOUS CLAIMS 1-6 AND 13-17

Under Petitioner's construction, the main port module requires a separate component containing the first and second port units. *Supra* Section VII.A. O'Shea's USB input ports 28, 30 respectively disclose the claimed first and second port units. *Supra* Section X.A.2. For similar reasons to those discussed in Ground 2, it would have been obvious to use Chang's circuit board 2 (claimed main port module) to implement the USB ports 28, 30 of O'Shea. *Supra* Section IX.A.

O'Shea's USB input ports 28, 30 are depicted side-by-side, like the ports in Chang. *Compare* EX1007, FIGS. 2, 3, and 6 *with* EX1008, FIGS. 1-3 and 10.

O'Shea's input ports 28, 30 also must connect to the underlying circuity of the docking station device like the ports connect to the circuit board of Chang. *Compare* EX1007, 4:15-28 *with* EX1006, ¶¶[0023], [0026], FIG. 5; EX1003, ¶150. Thus, a POSITA also would have wanted to use Chang's teachings about the circuit board to address the same pin-delicacy, pin-alignment, and circuitry issues with O'Shea's input ports 28, 30. EX1003, ¶150. Thus, it would have been obvious to combine Chang with O'Shea. The combination also renders obvious the main port module under Patent Owner's construction because Chang's circuit board 2 is one physical communication access point of a circuit board having only interface connectors to which an end-user device may directly connect. EX1003, ¶151; *supra* Section IX.A.

XII. INSTITUTION IS APPROPRIATE

Institution is appropriate under 35 U.S.C. §§ 314(a) and 325(d). Regarding § 325(d), the '429 patent has not been challenged in any IPR proceeding or in reexamination. None of the prior art used in this Petition was cited during original prosecution, and these references address the reason the Examiner allowed the claims because they disclose a many-to-many port expander having a main port module that contains the first and second port units, as explained above. *Supra* Section V.

Regarding § 314(a), the *Fintiv* factors favor institution. *Apple Inc. v. Fintiv, Inc.*, IPR2020- 00019, Paper 11, 5–6 (Mar. 20, 2020) (precedential). The first factor

favors institution because no motion to stay has been filed the related litigation, and so the Board should not infer the outcome of such a motion. *Intel Corp. v. VLSI Tech. LLC*, IPR2020-00158, Paper 16 at 7 (May 20, 2020); *Apple*, Paper 15 at 12 (May 13, 2020). The district court has granted or partially granted most—31 of 37—of the motions to stay pending IPR filed with the court. EX1017.

The second factor favors institution because no trial date has been set, and potential disruptions caused by COVID-19 casts doubt as to when a trial can safely occur. The litigation schedule has been extended several times, with summary judgment motions not due until January 7, 2022. EX1030. The typical time to jury trial for a patent case in the district court is over 5.5 years from filing. EX1018. Should the Board institute, a final written decision would likely be due in late 2022—well ahead of any expected trial date for the litigation.

Factor three favors institution because the litigation is still in its early stages, with minimal investment by the parties and the court. The parties have only begun discovery and the court has not issued a ruling on claim construction.

Factor four strongly favors institution because Petitioner stipulates that, if the Board institutes this proceeding, Petitioner and the other defendants will not maintain in the related district court litigation Grounds 1-4 or other grounds that Petitioner raised or reasonably could have raised in this IPR (i.e., those based exclusively on patents or printed publications). By eliminating any potential overlap

on invalidity between the IPR and the related litigation, this factor strongly favors institution and should override other arguments for exercising discretion. *Sand Revolution II, LLC. v. Continental Intermodal Group–Trucking LLC*, IPR2019-01393, Paper 24 at 12 (informative).

The fifth factor favors institution because Petitioner is a defendant in the related litigation and the remaining defendants are identified as real parties-in-interest. Thus, this IPR is likely to help the parties resolve their dispute.

Factor six also favors institution. Petitioner was diligent, filing the present Petition before the anniversary of the related litigation. The '429 patent was not subject to particularly rigorous examination, as the Office issued just one action before allowance. *See* EX1002. And, none of the prior art here was before the Office during original prosecution.

Date: April 30, 2021

Respectfully Submitted,

/*James D. Stein*/
James D. Stein (Reg. No. 63,872)

CERTIFICATION UNDER 37 C.F.R. § 42.24(d)

This Petition complies with the requirements of 37 C.F.R. § 42.24. As calculated by the word count feature of Microsoft Word, it contains 13,910 words, excluding the words contained in: Table of Contents, Table of Authorities, List of Exhibits, Mandatory Notices, Certification Under § 42.24(d) and Certificate of Service.

Respectfully Submitted,

/*James D. Stein*/
James D. Stein (Reg. No. 63,872)

CERTIFICATE OF SERVICE

The undersigned certifies that the foregoing Petition for *Inter Partes* Review, the associated Power of Attorney, and Exhibits 1001-1032 are being served on April 30, 2021 by Express Mail at the following address of record for the subject patent.

Roger Chu
RC Patent Services - GoPod
19499 Eric Dr.
Saratoga, CA 95070

Courtesy copies of the same documents are also being served on April 30, 2021 by Express Mail at the following addresses of record for litigation counsel of the Patent Owner in the active matters.

Ali A. Aalaei
Alexander Chen
Benjamin Martin
Tuan Tiet
Ari Law, P.C.
317 University Ave., Ste. 100
Palo Alto, CA 94301

Respectfully Submitted,

/James D. Stein/
James D. Stein (Reg. No. 63,872)