

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DELL INC., DELL TECHNOLOGIES INC., HP INC., AND LENOVO (UNITED STATES) INC.,

Petitioners

v.

UNIVERSAL CONNECTIVITY TECHNOLOGIES INC.,

Patent Owner.

PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 8,680,712

Case No. IPR2024-01478

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Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

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EXHIBIT LIST

Exhibit	Description
1001	U.S. Patent No. 8,680,712 (the “’712 Patent”)
1002	Prosecution History of the ’712 Patent
1003	Declaration of Eric Welch
1004	Curriculum Vitae of Eric Welch
1005	U.S. Pat. App. Pub. No. 2006/0089230 A1 to Biederman et al. (“Biederman”)
1006	IEEE Standard for Information Technology, Part 3, Amendment: Data Terminal Equipment (DTE) Power via Media Dependent Interface (MDI) (“IEEE 802.3af”)
1007	U.S. Pat. App. Pub. No. 2006/0100799 A1 to Karam (“Karam”)
1008	U.S. Pat. App. Pub. No. 2008/0168283 A1 to Penning (“Penning”)
1009	Declaration of James L. Lansford, Ph.D. regarding IEEE 802.3af
1010	<i>Intentionally left blank</i>
1011	UCT’s Amended Infringement Contentions, Ex. H, <i>Universal Connectivity Technologies Inc. v. Dell Technologies Inc. et al.</i> , 1:23-cv-01506-RP (W.D. Tx. Apr. 3, 2024)
1012	Universal Serial Bus Type-C Cable and Connector Specification, Release 2.0
1013	Declaration of Nathaniel Frank-White Regarding WayBack Machine URLs
1014	Galit Mendelson, <i>All you Need to Know About Power over Ethernet (PoE) and the IEEE 802.3af Standard</i> (June 2004), available at https://web.archive.org/web/20050302031350/http://www.powerdsine.com/Documentation/WhitePapers/PoE_and_IEEE802_3af.pdf .

Exhibit	Description
1015	Texas Instruments, <i>An Engineer's Guide to Current Sensing</i>
1016	DigiKey, <i>Current Shunt Monitors</i> , YouTube 0:13, 0:34 (August 12, 2010), https://www.youtube.com/watch?v=PDqbIOik9tY .

LISTING OF CHALLENGED CLAIMS

Claim 1	
1[p]	A power delivery circuit configured to deliver power to one or more of a plurality of devices connected in a network, the power delivery circuit comprising:
1[a]	a voltage source configured to generate a voltage;
1[b]	a power relay switch configured to relay, when closed, the voltage generated by the voltage source to one or more of the connected devices;
1[c]	a signature resistor connected to the switch and configured to detect a power source from one or more of the connected devices; and
1[d]	a load detector connected to the switch and configured to read a load current flowing therethrough so as to detect a load in one of the connected devices, and to extract information about the connected device based on the load current;
1[e]	wherein the information extracted by the load detector comprises information regarding whether the connected device is powered on or powered off, and whether or not the connected device needs a supply of power.
Claim 2	
2	The power delivery circuit of claim 1, further comprising a controller that controls opening and closing of the power relay switch.
Claim 3	
3	The power delivery circuit of claim 1, wherein the plurality of devices are connected to each other through a daisy chain, and wherein the power delivery circuit is included within each one of the devices in the daisy chain.

Claim 5	
5	The power delivery circuit of claim 1, wherein the load detector is further configured to detect removal of one of the plurality of devices from the network.
Claim 7	
7[p]	A method of delivering power to one of a plurality of devices connected in a daisy chain, the method comprising:
7[a]	detecting a load in a first device of the plurality of devices including detecting a load current flowing through the load;
7[b]	extracting information from the first device based on the detected load current; and
7[c]	relaying power to the first device based on the extracted information;
7[d]	wherein the information extracted comprises information regarding whether the first device is powered on or powered off, and whether or not the first device needs a supply of power.
Claim 9	
9	The method of claim 7, further comprising: detecting removal of a device of the plurality of devices.

I. INTRODUCTION

Dell Inc. and Dell Technologies Inc. (collectively, “Dell”), HP Inc. (“HP”), and Lenovo (United States) Inc. (“Lenovo”; together with Dell and HP, the “Petitioners”) petition for *Inter Partes* Review (“IPR”) of claims 1, 2, 3, 5, 7, and 9 of U.S. Patent No. 8,680,712 (the “’712 Patent”), assigned to Universal Connectivity Technologies Inc. (“UCT”).

II. REQUIREMENTS FOR IPR UNDER 37 C.F.R. § 42.104

A. Grounds for Standing Under 37 C.F.R. § 42.104(a)

Pursuant to 37 C.F.R. § 42.104(a), Petitioners certify that the ’712 Patent is available for IPR and that Petitioners are not barred or estopped from requesting IPR.

B. Challenge under 37 C.F.R. § 42.104(b) and Relief Requested

Petitioners request IPR of claims 1, 2, 3, 5, 7, and 9 of the ’712 Patent on the grounds listed below. In support, this petition includes a declaration of Eric Welch (EX1003). EX1003 ¶¶ 56-57.

Ground	Claims	Basis for Rejection
1	1, 2, 3, and 5	35 U.S.C. §103 over Biederman in view of IEEE 802.3af
2	1, 2, 3, and 5	35 U.S.C. §103 over Biederman in view of Karam
3	1, 2, 3, and 5	35 U.S.C. §103 over Biederman in view of IEEE 802.3af and Penning

4	1, 2, 3, and 5	35 U.S.C. §103 over Biederman in view of Karam and Penning
5	1, 2, 3, and 5	35 U.S.C. §103 over Biederman in view of IEEE 802.3af, Karam, and Penning
6	7 and 9	35 U.S.C. §102 over Karam

III. SUMMARY OF THE '712 PATENT

A. Brief Description

The '712 Patent is directed to “[a] system for delivering power over a network of devices connected through a serial link,” where the devices support the bi-directional transfer of “user data,” including “audio data, control data, Ethernet data, and bulk data,” and may be connected in a daisy chain via Ethernet cables. EX1003 ¶¶ 35-41; EX1001 at abstract, 1:18-25, 1:36-38, 2:54-57. Independent claims 1 and 7 are specifically directed to a power delivery circuit (a “POD circuit”) for delivering power to the plurality of devices, and a method of delivering power to the plurality of devices connected in a daisy chain, respectively. *Id.* at 7:2-4, 8:7-8.

As shown in Fig. 4, below, the claimed power delivery circuit 401 includes:

a voltage source 410 configured to generate a voltage (or equivalently, electric power); a power relay switch 420 configured to relay, when closed, the voltage generated by the voltage source 410 to one or more of the connected devices; a signature resistor 430 connected to the switch 420 and configured for power source detection from one or more of the connected devices; and a load detector 450 connected to the switch 420 and configured to read a load current flowing therethrough

so as to detect a load in one of the connected devices, and to extract information about the connected device based on the load current.

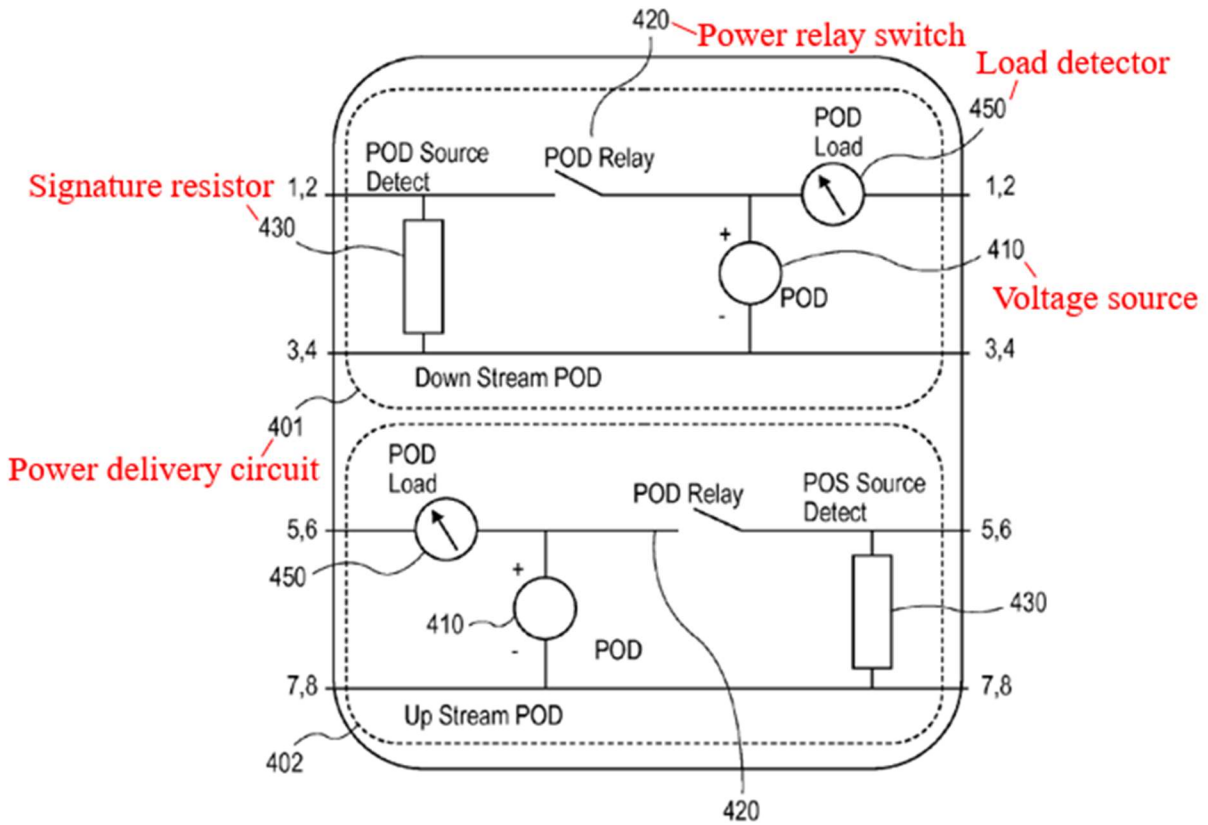


FIG. 4

Id. at 4:35-48, Fig. 4 (annotated).¹

The power delivery circuit also includes a controller (not shown in Fig. 4), which controls the power relay switch 420. *Id.* at 4:46-48. According to the '712 Patent, the circuit illustrated in Fig. 4 can perform several functions, including:

¹ All color annotations in figures have been added unless otherwise stated.

“detecting power source from a neighboring device; detecting POD load in a neighboring device; detecting removal of a device and/or connection of a new device; detecting a hot plug; detecting a POD client device; detecting power-on or power-off state of a connected device; and relaying POD power, i.e. relaying POD current from one side to the other.” *Id.* at 5:3-10, Fig. 4.

The '712 Patent further explains that the information extracted by the load detector 450 may include information regarding the identity of the connected device, whether the connected device is powered on or off, and whether the connected device needs power. *Id.* at 4:51-55. For example, the load detector may determine that “the device is self-powered, and thus does not need to be supplied with power,” or may “receive information from a connected device indicating that the device needs to be supplied with power.” *Id.* at 4:63-5:2; *see also* Fig. 7 (“All devices *that are not locally powered* receive power from TV (POD server)”) (emphasis added). The load detector may also detect removal of a device from the network and/or the connection of a new device. *Id.* at 4:55-58. More specifically, when a load (typically one or more load resistors) is connected to the circuit, the load detector 450 “detects current flow therethrough, to determine whether a device is connected, and if so, to obtain information about the connected device based on the load resistor value.” *Id.* at 4:59-63.

As illustrated in Fig. 6, the devices can be connected in a “daisy chain,” in which bi-directional data is transmitted from a source device S4 to a sink device (TV) through a daisy chain of POD devices S1-S4. *Id.* at 5:38-43. The ’712 Patent explains that the devices in the chain can operate in an “active mode,” in which the device is turned on (locally powered and fully functional) and data is processed on chip using local power. *Id.* at 5:55-58.

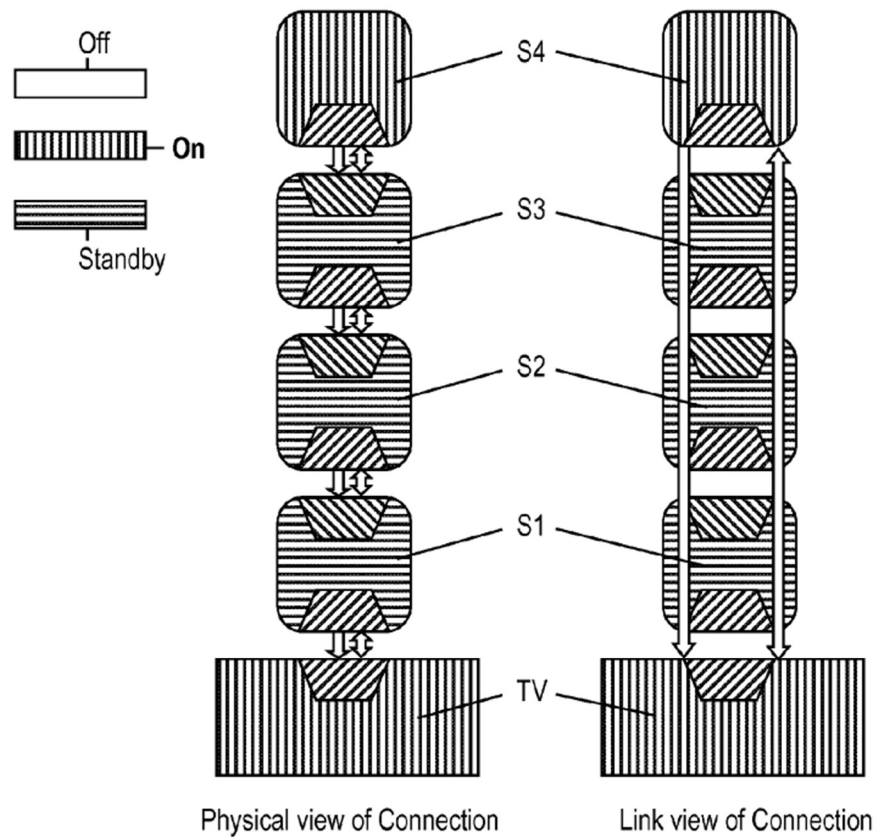


FIG. 6

Id. at Fig. 6.

The flowchart of Fig. 7 outlines an exemplary process for delivering power to devices in a daisy chain configuration comprising a source device (DVD player), a POD client (set-up box), and a sink device (TV). *Id.* at 6:28-33, Fig. 7. The TV sends power to the devices in the daisy chain, such that “[a]ll source devices not local powered (i.e. ‘turned on’) receive power from the TV.” *Id.* at 6:34-36.

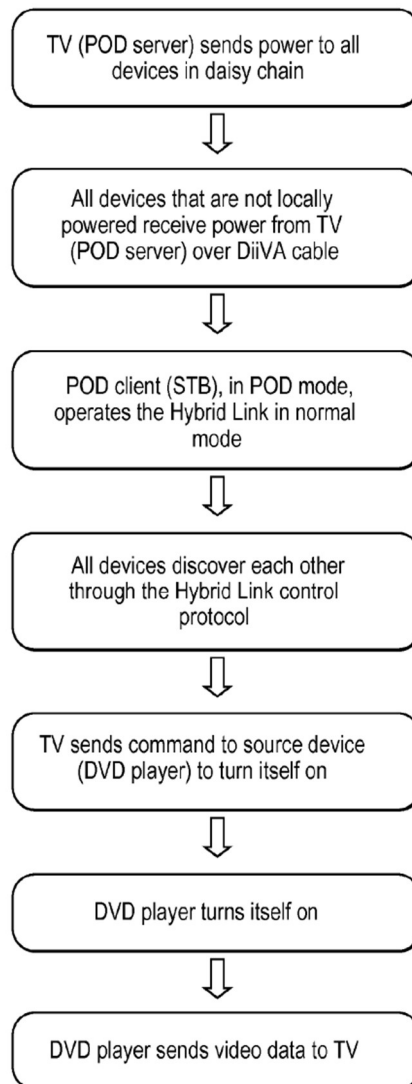


FIG. 7

Id. at Fig. 7.

B. Summary of the Prosecution of the '712 Patent

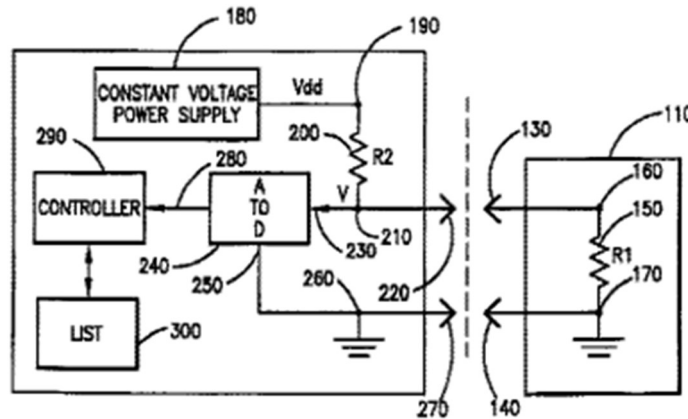
On December 11, 2009, the '712 Patent was filed as Application No. 12/636,063 (the "'063 Application") entitled "Power Delivery Over Digital Interaction Interface for Video and Audio (DiiVA)." EX1002 at 545. The '063 Application claims priority to Provisional Application No. 61/201,727, filed on December 11, 2008, and originally listed 23 claims. EX1002 at 476, 531-34.

The PTO issued a non-final rejection on February 1, 2013, in which the examiner rejected claims 13-16, 18-19, and 22-23 as obvious over U.S. Patent No. 5,783,926 ("Moon") in view of U.S. Patent App. Pub. No. 2006/0100799 ("Karam"). *Id.* at 420-26. The examiner objected to claim 17 as being dependent upon a rejected base claim, but noted without explanation that it would be allowable if rewritten in independent form. *Id.* at 425. Claim 17 recited "[t]he power delivery circuit of claim 13, wherein the information extracted by the load detector comprises information regarding whether the connected device is powered on or powered off; and whether or not the connected device needs a supply of power." *Id.* at 441.

In rejecting claims 13-16, 18-19, and 22-23, the examiner explained that Moon discloses:

a power delivery circuit comprising a voltage source 180, a signature resistor R1, and a load detector to detect a load of connected device 110

and to extract information about the connected device based on the load current. The load on resistor 150 (R1) is V which is a product of a current produced by $V_{dd}/R2$ and $R1$.



Id. at 423.

The examiner further explained that Karam discloses:

a power delivery circuit and power device discovery and identification system comprising a switch for selectively connecting applying voltage across a signature resistor to identify power devices....

a controller...to control opening and closing of the power relay switch....[and]

connecting devices in daisy chain and providing power delivery circuit for each of the daisy-chained devices.

Id. at 424-25.

In response, the applicant did not argue that the examiner's rejection was incorrect, but instead amended independent claims 13 and 22 (corresponding to issued claims 1 and 7, respectively) to "incorporate the allowable subject matter of claim 17." *Id.* at 409, 406-08. The PTO then allowed the claims. *Id.* at 394-99; EX1003 ¶¶ 42-47.

While the examiner found the subject matter of original claim 17 allowable, that limitation is disclosed by Biederman, Karam, IEEE 802.3af, and Penning.

IV. THE BOARD SHOULD NOT DISCRETIONARILY DENY INSTITUTION

A. Section 325(d)

Advanced Bionics and §325(d) do not support discretionary denial given that the Biederman reference used by Petitioners in five grounds, the IEEE 802.3af reference used by Petitioners in three grounds, and the Penning reference used by Petitioners in three grounds were not considered by the Office. *See Thorne Rsch., Inc. v. Trs. of Dartmouth Coll.*, IPR2021-00491, Paper 18 at 8-9 (PTAB Aug. 12, 2021). While Karam was cited by the examiner during prosecution of the '712 Patent as a secondary reference (EX1002 at 420-26), as shown below in Grounds 2 and 6, the examiner failed to appreciate that Karam discloses the subject matter of original claim 17 that was allegedly absent from the prior art: “wherein the information extracted by the load detector comprises information regarding whether the connected device is powered on or powered off, and whether or not the connected device needs a supply of power.” Denial under §325(d) is thus unwarranted. EX1002 at 425 (failing to explain why the subject matter of original claim 17 was allegedly absent from the prior art); *Advanced Bionics, LLC v. Med-El Elektromedizinische Gerate GmbH.*, IPR2019-01469, Paper 6 at 10-11 (PTAB Feb. 13, 2020) (“[I]f the record of the Office’s previous consideration of the art is

not well developed...Petitioners may show the Office erred by overlooking something persuasive.”).

V. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (POSITA) would have had a bachelor’s degree in electrical engineering, computer engineering, computer science, or equivalent training, and three years of experience with data communications systems or interfaces, including at least some experience with serial or display data communications systems or interfaces. Additional education can substitute for less work experience, and vice versa. EX1003 ¶¶ 30-34.

VI. CLAIM CONSTRUCTION UNDER 37 C.F.R. § 42.104(B)(3)

In an IPR, claim terms are construed according to the *Phillips* standard. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); 37 C.F.R. §42.100. Construction of any terms is unnecessary because it is not dispositive of this case—the art teaches the limitations under any construction under the *Phillips* standard. *Cf. Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999); EX1003 ¶ 55.

VII. OVERVIEW OF THE PRIOR ART

A. IEEE 802.3af (EX1006)

The IEEE Standard for Information Technology, Part 3, Amendment on Data Terminal Equipment (DTE) Power via Media Dependent Interface (MDI)

(“IEEE 802.3af”) is a well-known specification authored by the Institute of Electrical and Electronics Engineers (“IEEE”) Computer Society for providing power to devices connected in an Ethernet network—otherwise known as Power over Ethernet (“PoE”). EX1006 at 1. IEEE 802.3af qualifies as prior art under at least pre-AIA §§102(a) and 102(b) because it is a printed publication that was publicly accessible on June 18, 2003—at least one year before the earliest claimed filing date of the ’712 Patent (December 11, 2008, hereinafter the “Priority Date”). EX1001 at 1. Specifically, the IEEE 802.3af standard was publicly available for download from the standards.ieee.org download page for a fee no later than June 18, 2003, and was publicly available for download from the standards.ieee.org download page for free six months later (and by at least February 14, 2004).

EX1009 at ¶¶ 15-16;

<https://web.archive.org/web/20040214174215/http://standards.ieee.org/getieee802/802.3.html> (February 14, 2004 link to download 802.3af from the IEEE website);

[EX1013 at 1, 11-12 \(Declaration of Nathaniel Frank-White regarding WayBack Machine\)](#). As support, Petitioners rely upon the Declaration of Dr. James L.

Lansford (“the Lansford Declaration”), who has held numerous leadership positions in IEEE 802 over the last 25 years and has served as a member of the Sponsor Executive Committee (SEC), the leadership team for all of IEEE 802 (including 802.3). EX1009 ¶ 4. As a member of the IEEE SEC, Dr. Lansford

voted to approve the IEEE 802.3af specification in June 2003. *Id.* ¶¶ 7, 13. Dr.

Lansford states that the IEEE 802.3af specification, a copy of which is attached to the declaration as Attachment F, was made publicly available as of the date on the cover of the specification, June 18, 2003. *Id.* ¶¶ 15-16. Additionally, Dr. Lansford states that, pursuant to the Get IEEE 802 pilot program, IEEE 802 standards were made available to the public at no charge after they had been published in PDF for six months. *Id.* ¶¶ 15-18;

<https://web.archive.org/web/20030624044640/http://www.standards.ieee.org/getieee802/> (June 24, 2003 description of the Get IEEE 802 program); EX1013 at 1, 15-16. Accordingly, Dr. Lansford states that the IEEE 802.3af standard would have been made publicly available at no charge on the IEEE website six months after it was initially published on June 18, 2003, on December 18, 2003. EX1009 at ¶¶ 14-17; *see also*

<https://web.archive.org/web/20051125014531/http://standards.ieee.org/getieee802/download/802.3af-2003.pdf> (Get IEEE 802 download page archived on November 25, 2005); EX1013 at 1, 41-42.

PoE is governed by the IEEE 802.3af standard, which “defines the functional and electrical characteristics of...a Powered Device (PD) and Power Sourcing Equipment (PSE),” which “allow devices to supply/draw power using the same generic cabling as is used for data transmission.” EX1006 at 27; EX1003 ¶¶

58-61; *see also* EX1003 ¶¶ 48-54 (describing the state of the art of PoE). The standard provides “[a] protocol allowing the detection of a device that requires power,” “a method to classify devices based on their power needs,” and “[a] method for scaling supplied power back to the detect level when power is no longer requested or required.” EX1006 at 27. The PSE’s “main functions are to search the link section for a PD, optionally classify the PD, supply power to the link section (only if a PD is detected), monitor the power on the link section, and scale power back to the detect level when power is no longer requested or required.” *Id.* at 29. One example of when power is no longer required is “[a]n unplugged link section.” *Id.* A PSE may also detect a PD but opt not to power it. *Id.* at 37. A PD “is a device that is either drawing power or requesting power by participating in the PD detection algorithm.” *Id.* at 49. A PD may be able to draw power from an alternate source, in which case the PD may not require power from the PSE. *Id.*

During the detection process, the PSE checks for a valid signature resistance in the PD. *Id.* at 38-39. The PD “shall present a valid detection signature...while it is in a state where it will accept power” from the PSE. *Id.* at 51. The PD will present a non-valid signature “while it is in a state where it will not accept power” from the PSE. *Id.* A valid PD detection signature is between 23.75K Ω and 26.25 K Ω . *Id.* at 52, Table 33-8. The PSE may detect the signature via “voltage or

current measurement.” *Id.* at 39. The IEEE 802.3af standard explains that this detection process is vital and “should not be overlooked” because, [g]iven the large number of legacy devices (both IEEE 802.3 and other types of devices) that could be connected...and the possible consequences of powering such devices, the protocol to distinguish compatible devices and noncompatible devices is important to prevent damage to non-compatible devices.” *Id.* at 27.

After detection, the PSE may classify the maximum power required by the PD during operation. *Id.* at 53. The PSE performs classification of a PD by “applying voltage and measuring current.” *Id.* at 40. “The PSE shall measure IClass and classify the PD based on the observed current according to Table 33–4,” which defines classes 0 through 4 based on current ranges. *Id.* at 40, 53. IEEE 802.3af further defines the power requirements for each class in Table 33-10; as one example, default class O requires 0.44 to 12.95 Watts. *Id.* at 53, Table 33-10.

B. Biederman (EX1005)

U.S. Pat. App. Pub. No. 2006/0089230 A1 to Biederman et al. was filed as Application No. 10/961,864 on October 7, 2004, and published on April 27, 2006. EX1005 at 1. Biederman is prior art under pre-AIA §§102 (a) and 102(b) because it was published over one year before the Priority Date of the ’712 Patent. EX1001 at 1.

Biederman is generally directed to “[a] method and apparatus for bidirectional provision of inline power,” “also known as Power over Ethernet and PoE.” EX1005 at [0013]-[0014], [0018]; EX1003 ¶¶ 62-65. Specifically, Biederman teaches a networked device that “may operate as a powered device (PD) under certain circumstances, may be off for power purposes under other circumstances and may operate as a power Sourcing equipment (PSE) under yet other circumstances.” EX1005 at [0032]. In Fig. 2, Biederman illustrates media dependent interfaces (“MDI”) 14a and 14b, each with a PD functional block and a PSE functional block. *Id.* at [0034]. The MDI connected to the PSE has the PD block activated, while the MDI connected to the PD has the PSE block activated. *Id.* Biederman teaches that the PSE portion of the device includes a 48-volt power supply 70 to power a connected PD, and that the device includes a controller for selectively activating the PD block, the PSE block, neither, or both via switching circuitry which may include “diodes, transistors, relays, and the like.” *Id.* at fig. 5, [0038].

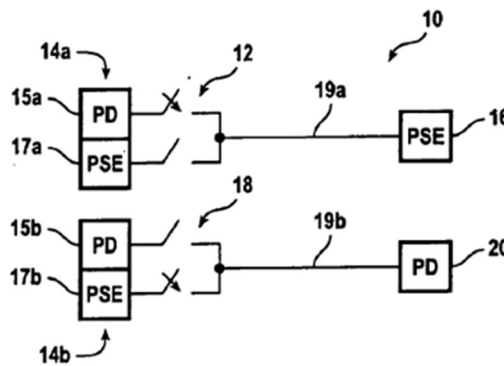
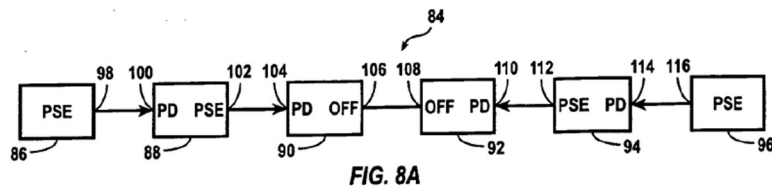


FIG. 2

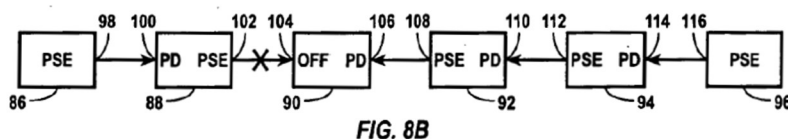
EX1005 at Fig. 2.

Biederman also teaches that “the power requirements of a PD may change from time to time depending upon how it is used,” so “it would be desirable to adjust the power delivered to the PD from time to time to meet these new requirements,.” *Id.* at [0042]. Biederman explains that “[a] number of mechanisms are provided by the present invention to accomplish this,” and that “[t]hose of ordinary skill in the art will [] realize that other equivalent mechanisms are available to periodically revise the amount of power made available by the PSE to the PD.” *Id.* at [0042]. As one example, Biederman notes that “[t]here are mechanisms within the IEEE 802.3af standard to allocate a requested amount of power.” *Id.* at [0014].

Finally, Biederman teaches that the networked devices may be arranged in a daisy chain configuration to provide redundant data and inline power so that data or power interruption does not occur if the cabling is cut. *Id.* at [0043]-[0045]. In the below example, port 100 of device 88 is configured as a PD to receive power from PSE 826, and port 102 of device 88 is configured as a PSE to send power to device 90. *Id.* at [0044]. When a cable in the chain is cut, the adjacent devices reconfigure themselves—as illustrated below in Fig. 8B, when devices 88 and 90 are disconnected, port 104 of device 90 is turned off and port 108 of device 92 is turned on and configured to operate as a PSE. *Id.* at [0045].



EX1005 at Fig. 8A.



EX1005 at Fig. 8B.

C. Karam (EX1007)

U.S. Pat. App. Pub. No. 2006/0100799 A1 to Karam was filed as U.S. Application No. 10/982,383 on November 5, 2004, and published on May 11, 2006. EX1007 at 1. Karam is prior art under pre-AIA §§ 102(a) and 102(b) because it was published over one year before the Priority Date of the '712 Patent (December 11, 2008). EX1001 at 1.

Karam also relates to PoE and teaches “a method and apparatus for managing an Inline Power relationship between a network device and a Powered Device (PD) where the network device is acting as power sourcing equipment (PSE) to provide Inline Power to a first PD (PD1) which is, in turn, powering another PD (PD2).” EX1007 at [0039], Fig. 2A; EX1003 ¶¶ 66-73.

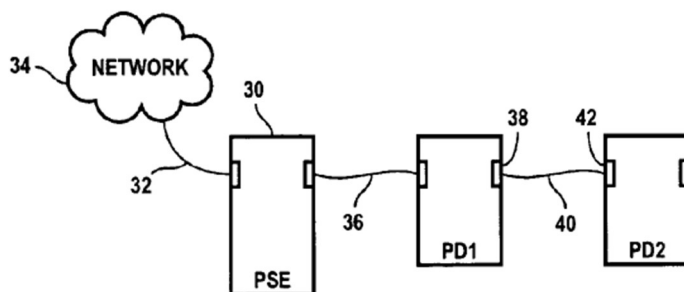


FIG. 2A

EX1007 at Fig. 2A.

The PSE may also provide power to a longer daisy chain of PD devices. *Id.* at [0046] and Fig. 2D (“In FIG. 2D an arrangement is shown where a PSE provides power and data to three PDs: PD1, PD2 and PD3. This is again accomplished over a series of single 8 conductor (4 pair) cables daisy-chained between the various devices.”). The first PD, PD1, receives power from a voltage source in the PSE. *Id.* at [0044].

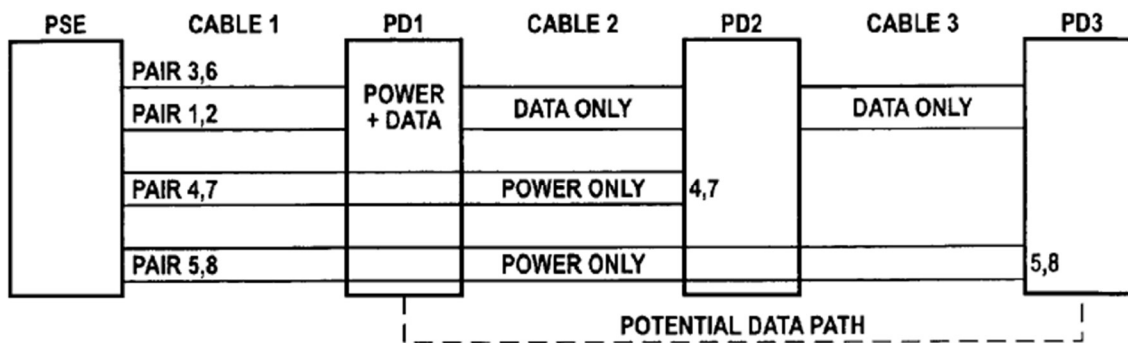


FIG. 2D

EX1007 at Fig. 2D.

Karam explains:

In order to provide regular Inline Power to a PD from a PSE it is a general requirement that two processes first be accomplished. First, a “discovery” process must be accomplished to verify that the candidate PD is, in fact, adapted to receive Inline Power. Second, a “classification” process must be accomplished to determine an amount of Inline Power to allocate to the PD, the PSE having a finite amount of Inline Power resources available for allocation to coupled PDs.

Id. at [0018].

Referencing the IEEE 802.3af standard, Karam explains that the discovery process looks for an “identity network” in the PD, which is a 25,000 Ω resistor. *Id.* at [0019]. To detect the identity network, the PSE applies voltage discovery signals, measures the “return currents responsive to application of the discovery signals,” and calculates the resistance. *Id.* at [0020]. If the resistance is the proper value, an optional classification process may begin to determine whether the maximum inline power level should be 15.4 Watts, 7.0 Watts, or 4.0 Watts. *Id.* at [0020], [0065]. Again referencing the IEEE 802.3af standard, Karam explains that the classification process involves applying a voltage to the PD, which responds by sending a classification current back to the PSE. *Id.* at [0021]. This current corresponds to a “class,” which represents a device’s specific power requirements. *Id.* at [0021], Table I.

Karam teaches that the first PD 50 in the chain includes a connector 52 to connect to the PSE, a second connector 54 which may be coupled to another

device, and a third connector 56 for providing power to another device, such as a cell phone. *Id.* at [0051], Fig. 4A.

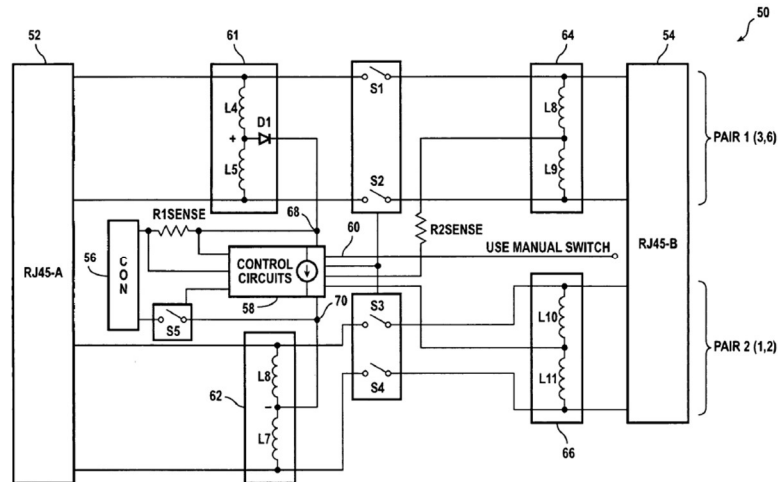


FIG. 4A

EX1007 at Fig. 4A.

Karam explains that, in order to supply power to device 50, “the PSE port must see the proper identity network characteristics,” which, “in accordance with the IEEE 802.3af standard,” is a $25,000\Omega$ resistance in response to “certain discovery voltage signals.” *Id.* Accordingly, the controller 58 of the device 50 provides the identity network signal back to the PSE so that inline power may be provided. *Id.* at [0052].

The device 50 is also adapted to “act as a PSE device to determine if an attached device at a second connector 54 has an appropriate identity network so that inline power may be provided to it.” *Id.* The device 50 senses the identity network via current sensor R2SENSE. *Id.* at Fig. 4A, [0058] (explaining that a

similar current sensor 81 coupled to the control circuitry 78 and a port 76 measures the current at the port). If the device 50 does not verify that the attached device can receive power, it may leave switches S1-S4 open, cutting off data and power to second connector 54. *Id.* Karam further explains that the controller 58 may keep switch S5 to third connector 56 closed “only when current [is] being drawn from third connector 56 so that if the device were unplugged from third connector 56 the power would turn off.” *Id.* at [0051].

D. Penning (EX1008)

U.S. Pat. App. Pub. No. 2008/0168283 A1 to Penning was filed as U.S. Application No. 11/649,913 on January 5, 2007, and published on July 10, 2008. EX1008 at 1. Penning is prior art under pre-AIA §§ 102(a) and 102(e) because it was filed and published before the Priority Date of the '712 Patent (December 11, 2008). EX1001 at 1.

Penning teaches a system for powering multiple devices in a PoE network. EX1008 at [0028]-[0030]; EX1003 ¶¶ 74-78. The system includes a data distribution device 105, an independent power supply 115, a remote data distribution device 110, network devices 125-1 to 125-N, and externally powered network devices 120-1 to 120-N. EX1008 at [0029], Fig. 1.

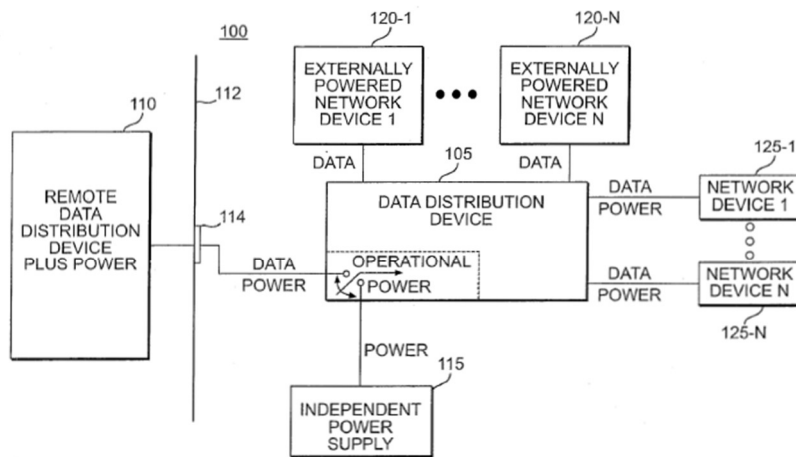


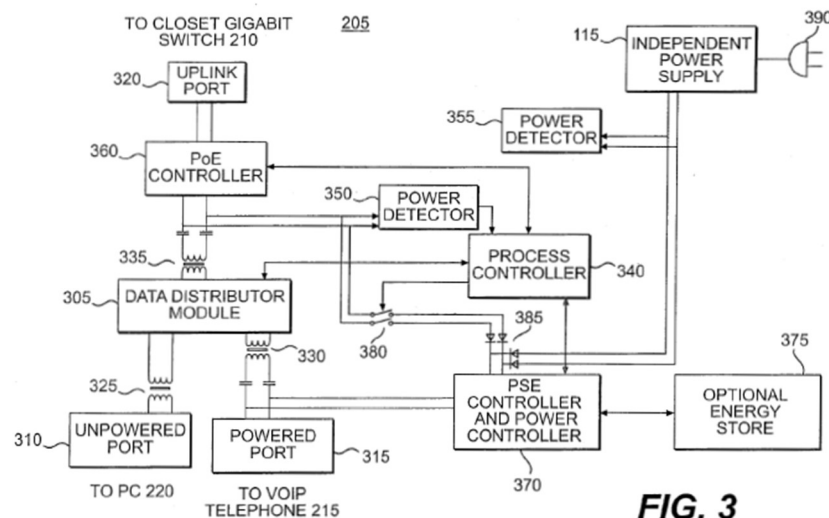
FIG. 1

Id. at Fig. 1.

Remote data distribution device 110 acts as a PSE providing data and power to data distribution device 105, which can then provide data and power to network devices 125-1 through 125-N. *Id.* at [0029]. Data distribution device 105 may power itself and network devices 125-1 through 125-N from one of several power sources, including remote data distribution device 110 and independent power supply 115. *Id.* at [0032]. The device 105 switches between power supplies using “relays, transistors, or any other known switching device.” *Id.*

Power detectors 350 and 355 of the exemplary data distribution device 205, which may be “voltage or current detectors...of any appropriate type known to one of ordinary skill in the art,” indicate whether power is available from independent power supply 115 or uplink port 320, respectively, by sending a signal to process controller 340. *Id.* at [0049], [0056], Fig. 3. The process controller 340 determines

which power supply to use based on these signals and sends a command signal to switch 380, “which may be a relay,” to select the power source. *Id.* at [0051], [0047], [0049]. If the data distribution device is powered locally by the independent power supply, process controller 340 signals PoE controller 360 to set a signature resistance on uplink port 320 in accordance with IEEE 802.3af to inform closet gigabit switch 210 that device 205 does not require power. *Id.* at [0056].



EX1008 at Fig. 3.

VIII. THERE IS A REASONABLE LIKELIHOOD THAT THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1: Claims 1, 2, 3, and 5 are obvious over Biederman in view of IEEE 802.3af

1. Motivation to Combine Biederman with IEEE 802.3af

As explained above in Section VII.B, Biederman is generally directed to “[a] method and apparatus for bidirectional provision of inline power,” “also known as Power over Ethernet and PoE,” which is defined in the IEEE 802.3af standard.

EX1005 at [0013]-[0014], [0018]. In its background section, Biederman explains:

PoE is defined in the IEEE (The Institute of Electrical and Electronics Engineers, Inc.) Standard Std 802.3af-2003 published 18 Jun. 2003.... The IEEE 802.3af standard is a globally applicable standard for combining the transmission and reception (collectively: “transceiving”) of Ethernet packets with the transmission and reception of DC-based power over the same set of wires in a single Ethernet cable.... There are mechanisms within the IEEE 802.3af standard to allocate a requested amount of power. Other proprietary schemes also exist to provide a finer and more sophisticated allocation of power than that provided by the IEEE 802.3af standard while still providing basic compliance with the standard.

EX1005 at [0014].

Biederman’s background section further explains that PoE “is a technology for providing electrical power over a wired data telecommunications network (such as, for example, the well-known Ethernet) from power source equipment (PSE) to a powered device (PD) over a link section.” *Id.* at [0013]. Biederman provides electrical schematic diagrams of three different configurations of PoE as

contemplated by the IEEE 802.3af standard, each illustrating a PSE connected with a PD.

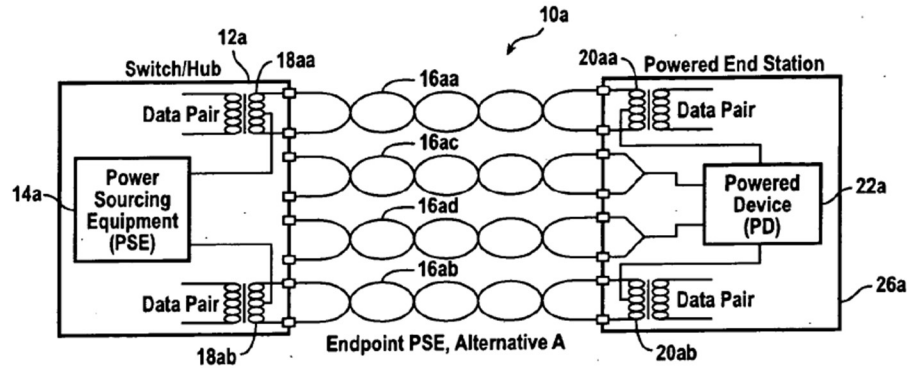


FIG. 1A

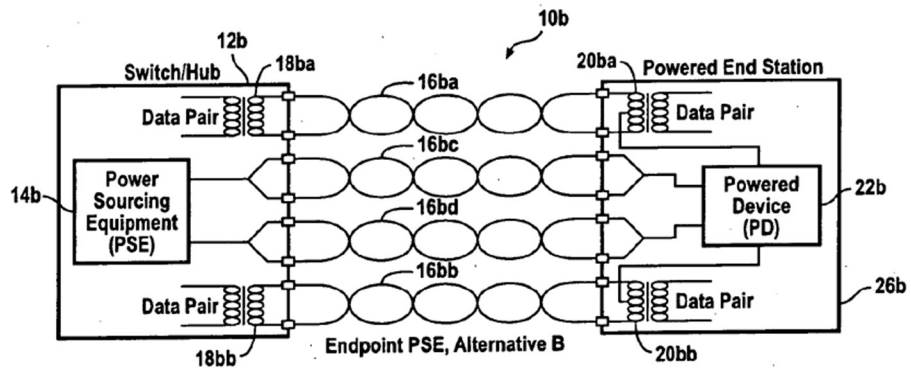


FIG. 1B

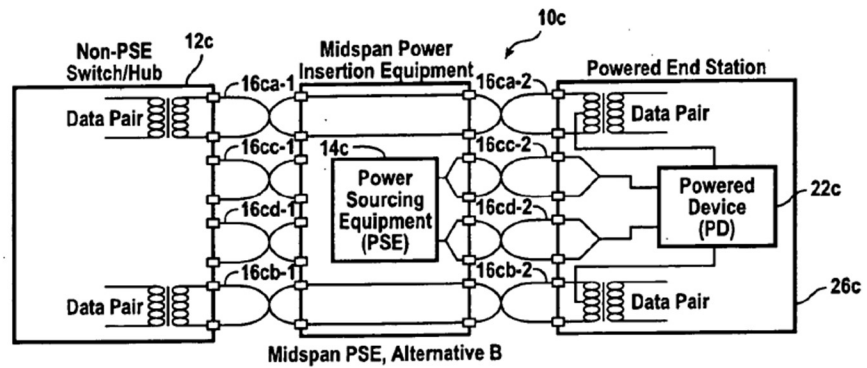


FIG. 1C

Id. at Figs. 1A-1C.

Biederman notes that, “[i]n the interest of clarity, not all of the routine features of the implementations described herein are shown and described. It will, of course, be appreciated that in the development of any such actual implementation, numerous implementation-specific decisions must be made in order to achieve the developer’s specific goals, such as compliance with application- and business-related constraints.” *Id.* at [0031]. Biederman explains that such development “would...be a routine undertaking of engineering for those of ordinary skill in the art having the benefit of this disclosure.” *Id.*

In view of the above, Biederman’s disclosure omits certain routine details of PoE devices that are governed by the IEEE 802.3af standard. In Fig. 2, Biederman illustrates media dependent interfaces (“MDI”) 14a and 14b, each with a PD functional block and a PSE functional block. *Id.* at [0034]. Biederman teaches that the device includes a controller for selectively activating the PD block, the PSE block, neither, or both via switching circuitry which may include “diodes, transistors, relays, and the like.” *Id.* at Fig. 5, [0038].

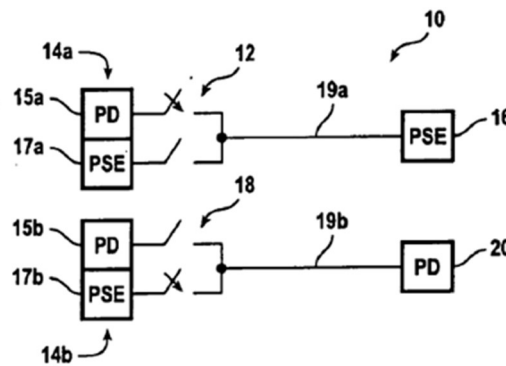


FIG. 2

EX1005 at Fig. 2.

Biederman also teaches that “the power requirements of a PD may change from time to time depending upon how it is used,” so “it would be desirable to adjust the power delivered to the PD from time to time to meet these new requirements.” *Id.* at [0042]. Biederman explains that “[a] number of mechanisms are provided by the present invention to accomplish this,” and that “[t]hose of ordinary skill in the art will [] realize that other equivalent mechanisms are available to periodically revise the amount of power made available by the PSE to the PD.” *Id.* at [0042]. As one example, Biederman notes that “[t]here are mechanisms within the IEEE 802.3af standard to allocate a requested amount of power.” *Id.* at [0014].

As described above in Section VII.A, the IEEE 802.3af standard describes “[a] protocol allowing the detection of a [PD] device that requires power,” “a method to classify [PD] devices based on their power needs,” and “[a] method for scaling supplied power back to the detect level when power is no longer requested or required.” EX1006 at 27. During the detection process, the PSE checks for a valid signature resistance in the PD. *Id.* at 38-39. The PD “shall present a valid detection signature...while it is in a state where it will accept power” from the PSE. *Id.* at 51. The PD will present a non-valid signature “while it is in a state where it will not accept power” from the PSE. *Id.* A valid PD detection signature is

between 23.75K Ω and 26.25 K Ω . *Id.* at 52, Table 33-8. The PSE may detect the signature via “voltage or current measurement.” *Id.* at 39. The IEEE 802.3af standard explains that this detection process is vital and “should not be overlooked” because, [g]iven the large number of legacy devices (both IEEE 802.3 and other types of devices) that could be connected...and the possible consequences of powering such devices, the protocol to distinguish compatible devices and noncompatible devices is important to prevent damage to non-compatible devices.” *Id.* at 27.

A PD presenting a valid detection signature has a default power class of 0 and requires 0.44 to 12.95 Watts. *Id.* at 53, Table 33-10. The PSE may also optionally classify the PD in one of the power classes 0-3 after the detection process. *Id.* at 53 (while Table 33-10 also includes class 4, this is reserved for future use). The PSE performs classification of a PD by “applying voltage and measuring current.” *Id.* at 40. “The PSE shall measure IClass and classify the PD based on the observed current according to Table 33-4,” which defines classes 0 through 4 based on current ranges. *Id.* at 40, 53. IEEE 802.3af further defines the power requirements for each class in Table 33-10. *Id.* at 53, Table 33-10.

It would have been obvious to a POSITA to implement the standardized detection and classification features of IEEE 802.3af—including the signature resistor, load detector, and classification current elements—in the PoE system of

Biederman, such that the PD portion of each device includes a signature resistor, and the PSE portion of each device includes a load detector for detecting a PD signature resistor and a PD classification current. EX1003 ¶¶ 80-89. A POSITA would have been motivated by Biederman's own disclosure to make this combination, because Biederman explains that (a) PoE is governed by IEEE 802.3af; (b) "[t]hose of ordinary skill in the art will [] realize that other equivalent mechanisms are available to periodically revise the amount of power made available by the PSE to the PD;" and (c) "[t]here are mechanisms within the IEEE 802.3af standard to allocate a requested amount of power." EX1005 at [0014], [0042]; *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1329 (Fed. Cir. 2009) ("We previously noted that '[t]he reason, suggestion, or motivation to combine may be found explicitly or implicitly: 1) in the prior art references themselves; 2) in the knowledge of those of ordinary skill in the art... or 3) from the nature of the problem to be solved'...KSR expanded the sources of information...to include market forces; design incentives; the 'interrelated teachings of multiple patents'; 'any need or problem known in the field of endeavor at the time of invention and addressed by the patent'; and the background knowledge, creativity, and common sense of the person of ordinary skill.")). A POSITA also would have been motivated by the disclosure of IEEE 802.3af to make this combination, because IEEE 802.3af emphasizes the importance of its

detection process to prevent damage to non-compatible devices. EX1006 at 27; EX1003 ¶¶ 87-88.

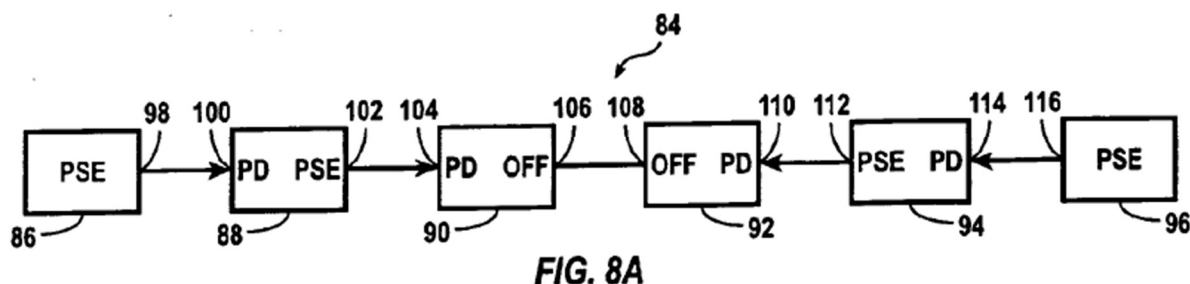
Such an improvement is no “more than the predictable use of prior art [IEEE 802.3af detection and classification] elements according to their established functions,” or the “combination of familiar [IEEE 802.3af detection and classification] elements according to known methods” disclosed by IEEE 802.3af to yield predictable results. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 401 (2007). Furthermore, a POSITA would have had a reasonable expectation of success in making this combination because, as Biederman explains, the elements added from IEEE 802.3af are merely “routine features,” the implementation of which would be a “routine undertaking of engineering for those of ordinary skill in the art.” EX1005 at [0031]; EX1003 ¶ 89.

2. Claim 1

a. “A power delivery circuit configured to deliver power to one or more of a plurality of devices connected in a network, the power delivery circuit comprising:” 1[P]

To the extent the preamble is limiting, Biederman teaches this limitation. EX1003 ¶¶ 90-92. Biederman explains that a plurality of PoE network devices 86, 88, 90, 92, and 94 can be connected in a daisy chain network. EX1005 at Figs. 8A-8B, [0043]-[0044]. Each device has at least one port for carrying out data telecommunications and inline power transmission. *Id.* at [0043]. For example, a

network device 88 in the chain has two ports 100 and 102 for connecting to devices 86 and 90, where each port can be configured as a PD, a PSE, off, or both PSE and PD. *Id.* at [0043]-[0045], [0041], [0039].

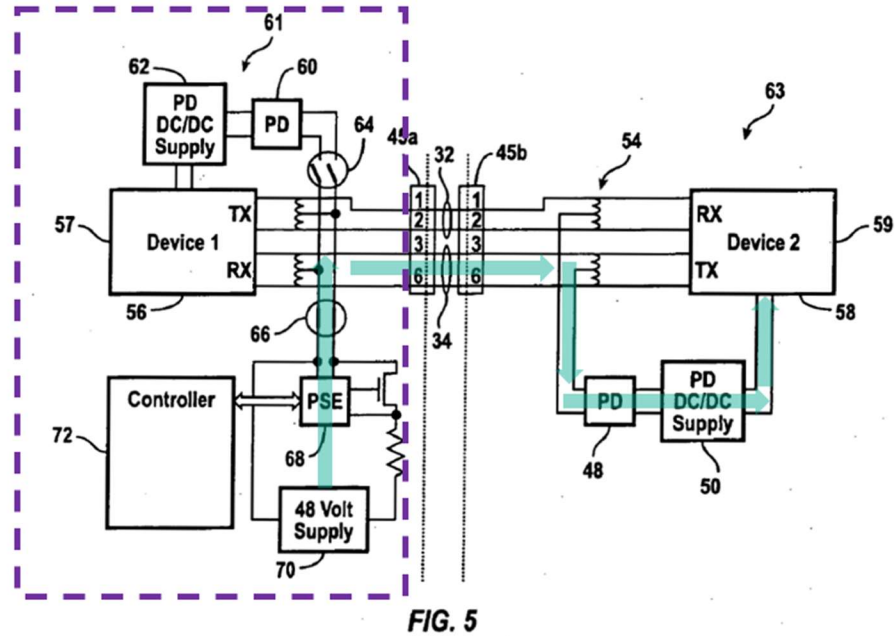


Id. at Fig. 8A.

An embodiment of a port of a network device is shown in greater detail in Fig. 5. While Biederman does not explicitly teach that the port depicted in Fig. 5 is the same as the ports of the network devices in Fig. 8A, it would have at least been obvious to a POSITA to combine embodiments and use the port circuitry depicted in Fig. 5 to implement the ports of the network devices in Fig. 8A. *Bos. Sci.*

Scimed, Inc. v. Cordis Corp., 554 F.3d 982, 991 (Fed. Cir. 2009) (“Combining two embodiments disclosed adjacent to each other in a prior art patent does not require a leap of inventiveness.”). Moreover, Biederman explains that “not all of the routine features of the implementations...are shown and described” for the sake of clarity, but notes that implementing the invention “would...be a routine

undertaking of engineering for those of ordinary skill in the art having the benefit of this disclosure.” EX1005 at [0031].



Id. at Fig. 5.

Fig. 5 illustrates a first networked device 57 with a port 61 (the claimed “power delivery circuit,” annotated above in purple) coupled to a port 63 of a second network device 59 via two pairs of wires 32 and 34. *Id.* at Fig. 5, [0038] (“[A] first functional block 56 representing the data portion of a port 61 of a first network device 57 is coupled to first MDI 45a, and from first MDI 45a...to a second MDI 45b, and from there to a second functional block 58 representing the data portion of a port 63 of a second network device 59.”). The port 61 includes a PSE functional block 68 and a 48 Volt power supply 70. *Id.* In operation, controller 72 may cause switching circuitry 66 to selectively couple PSE block 68 and power

supply block 70 to MDI 45a. *Id.* When the power supply 70 is connected to MDI 45a, it can supply power to second networked device 59 via wire pair 34. *Id.* at [0038], [0037] (explaining that in a conventional inline PoE system, the PD DC/DC power supply of the second networked device receives power from the first networked device's PSE power supply and transmits that power to a power input of the second networked device). The provision of power from PSE to PD through wire pair 34 is annotated in green, above. *Id.* at Fig. 5.

**b. “a voltage source configured to generate a voltage;”
1[a]**

Biederman teaches this limitation. EX1003 ¶ 93. As explained above, the power delivery circuit includes a PSE functional block 68 and a power supply block 70 (highlighted below in red), which may be a conventional grid-powered or battery-powered power supply. EX1005 at Fig. 5, [0038]-[0039]. In operation, the power supply can generate a voltage to power a second networked device 59. *Id.* at [0038], [0037] (explaining that in a conventional inline PoE system, the PD DC/DC power supply of the second networked device receives power from the first networked device's PSE power supply and transmits that power to a power input of the second networked device). The provision of power from PSE to PD through wire pairs 32 and 34 is illustrated in green, below.

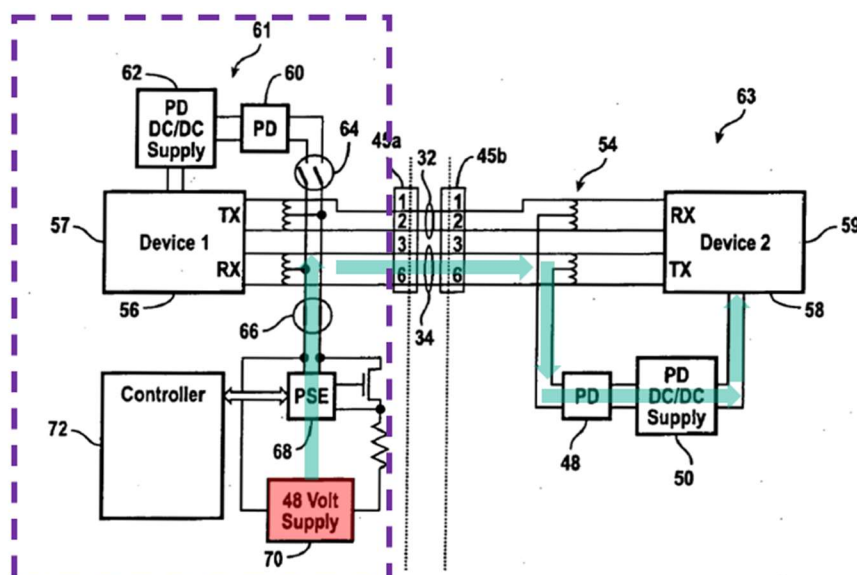


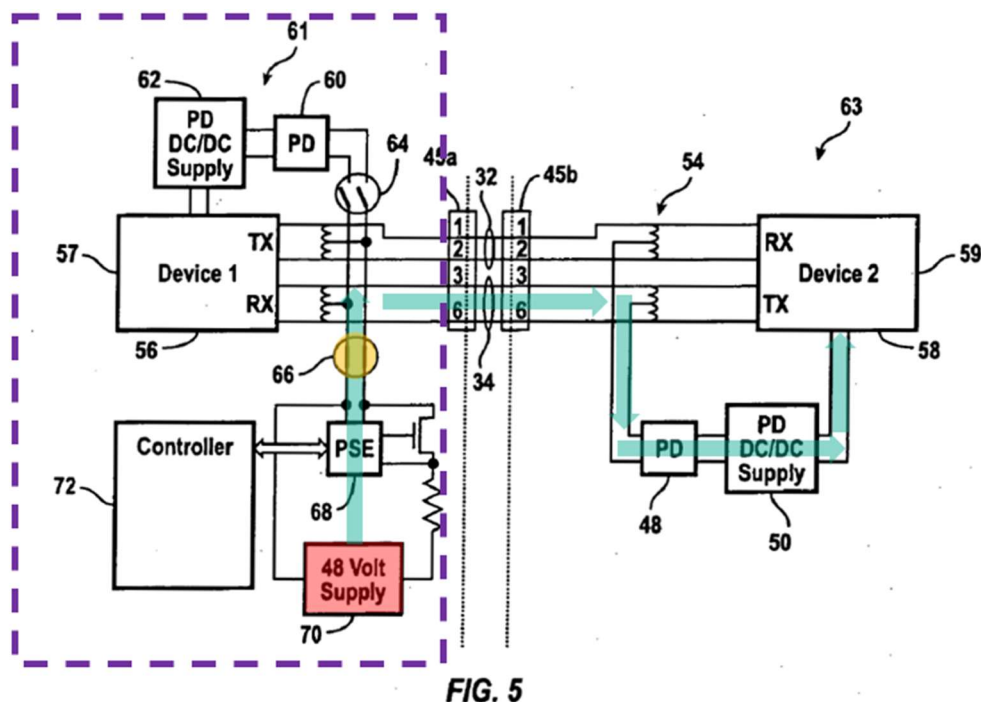
FIG. 5

Id. at Fig. 5.

c. “a power relay switch configured to relay, when closed, the voltage generated by the voltage source to one or more of the connected devices;” 1[b]

Biederman also discloses this limitation. EX1003 ¶ 94. Specifically, Biederman teaches that the power delivery circuit (port 61) includes a power relay switch 66 (annotated below in orange). EX1005 at Fig. 5, [0038]. In operation, the controller 72 causes switch 66 to selectively couple PSE block 68 and power supply block 70 to first MDI 45a in order to power the second connected device 59. *Id.* at [0037]-[0038], Fig. 5. Biederman explains that the switching mechanisms 66 and 64 for enabling either the PD or PSE modes may be “switches...or other equivalent switching equipment such as diodes, transistors, **relays** and the like as

will now be apparent to those of ordinary skill in the art.” *Id.* at [0038] (emphasis added).

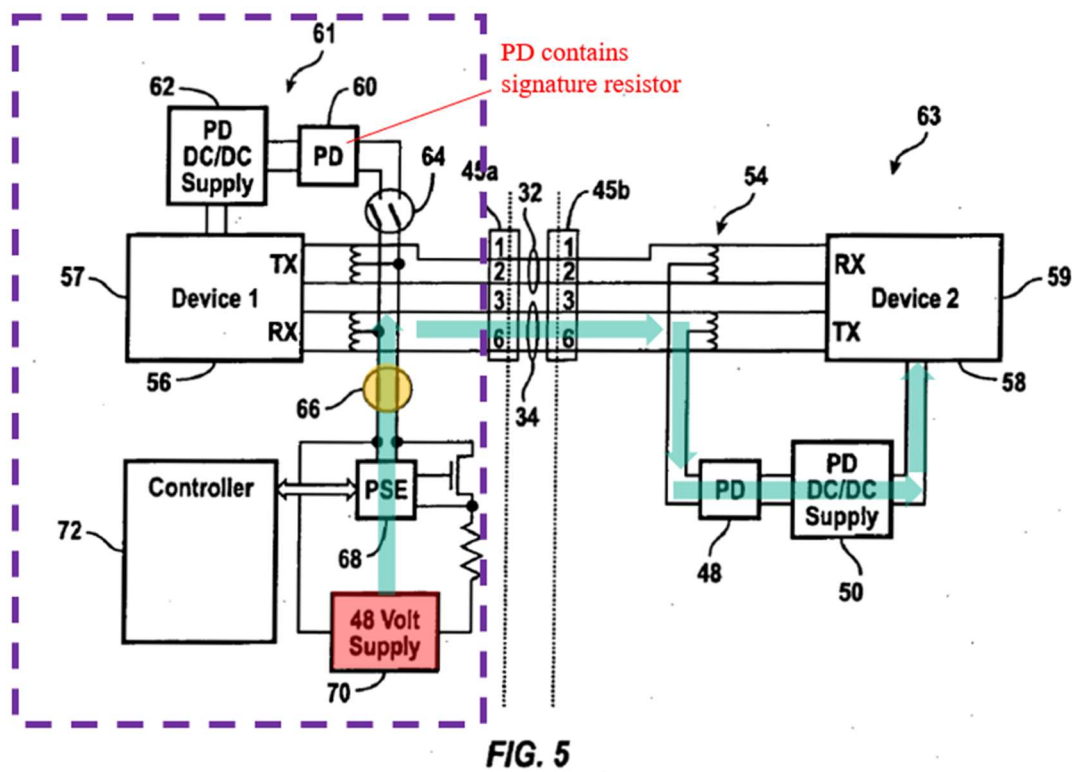


Id. at Fig. 5.

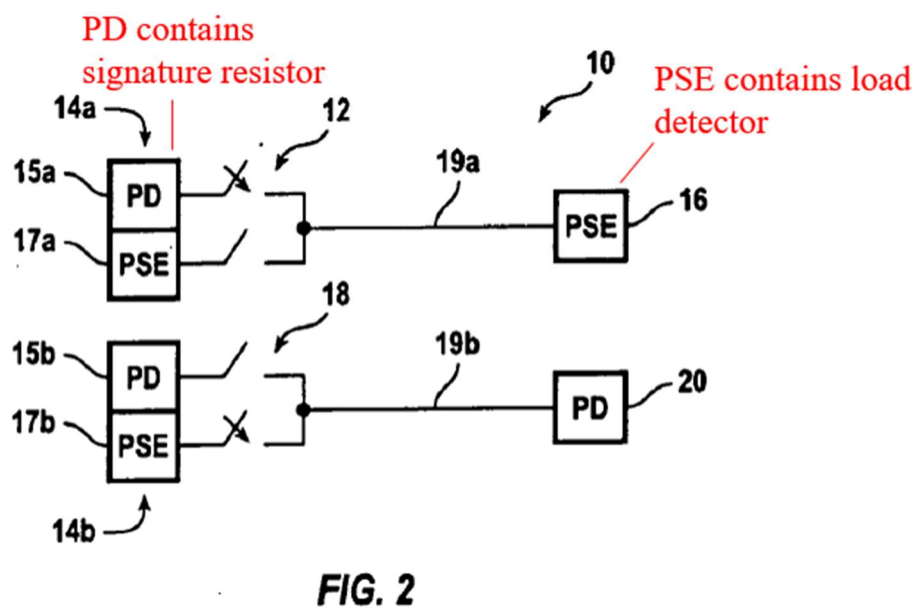
d. “a signature resistor connected to the switch and configured to detect a power source from one or more of the connected devices; and” 1[c]

This limitation is taught by Biederman in view of IEEE 802.3af. EX1003 ¶ 95. As explained above (*supra* Section VIII.A.1), the PD (60) and PSE (68) functional blocks of Biederman’s device 57 as informed by the requirements of IEEE 802.3af would include the detection and classification features of IEEE 802.3af compliant PSE and PD devices. More particularly, IEEE 802.3af teaches that the PSE’s “main functions are to search the link section for a PD, optionally

classify the PD, supply power to the link section (only if a PD is detected), monitor the power on the link section, and scale power back to the detect level when power is no longer requested or required.” EX1006 at 29. During the PD detection process, the PSE checks for a valid signature resistance in the PD. *Id.* at 38-39. The PD “shall present a valid detection signature...while it is in a state where it will accept power” from the PSE. *Id.* at 51. The PD will present a non-valid signature “while it is in a state where it will not accept power” from the PSE. *Id.* A valid PD detection signature is between 23.75K Ω and 26.25 K Ω . *Id.* at 52, Table 33-8. Accordingly, in light of Biederman’s teachings as informed and modified by those of IEEE 802.3af, a POSITA would have understood that PD unit 60 of the power delivery circuit (port 61) includes a signature resistor (annotated in Fig. 5 below). Furthermore, the PD unit 60 and its signature resistor are connected to the switch 66 and are capable of being detected by a PSE connected to the device 57 (as in the top configuration of Fig. 2); EX1005 at Fig. 5, Fig. 2.



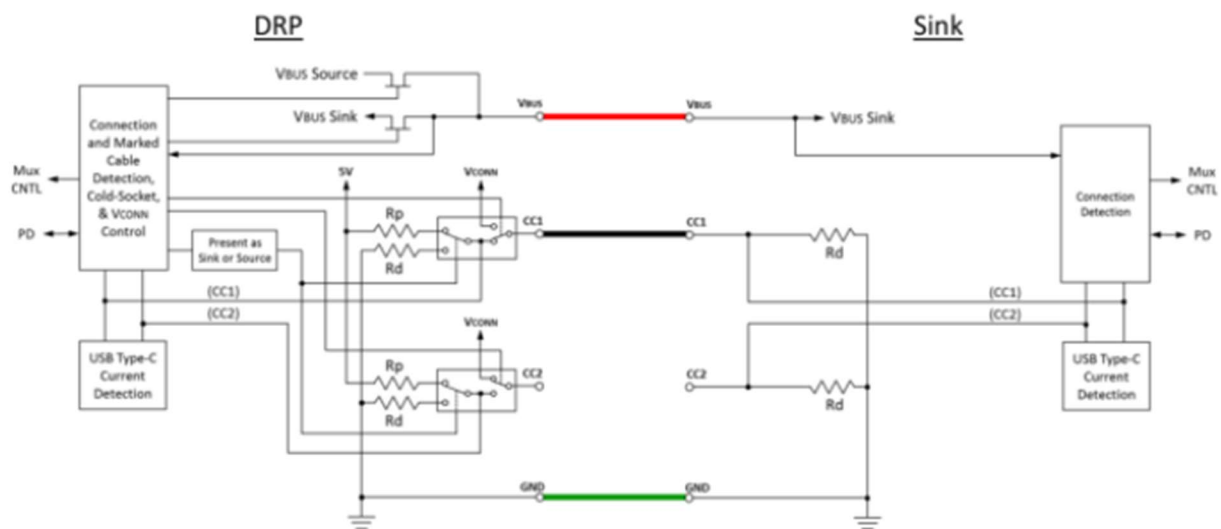
Id. at Fig. 5.



Id. at Fig. 2.

While the signature resistor in the PD block 60 is configured *to be detected* by a connected PSE with a power source so that the PSE can identify the connected device as a PD to which the PSE should send power, Patent Owner has pointed to a similar configuration as reading on this limitation in *Universal Connectivity Technologies Inc. v. Dell Technologies Inc. et al.*, 1:23-cv-01506-RP (W.D. Tx.). In that case, Patent Owner has argued that claim 1 of the '712 Patent is infringed by a laptop with a USB-C dual role port ("USB-C DRP"). EX1011 at 1, 4. Patent Owner explains that "[t]he USB-C DRP port conducts a discovery process to determine whether it needs to operate as a power source or power sink in a connection formed by the USB-C DRP port, a USB-C port of another USB-C device, and a USB-C eMarker cable connecting the two ports." *Id.* at 4.

Figure 4-23 DRP to Sink Functional Model



Id. at 5.

With respect to the signature resistor limitation, Patent Owner’s claim chart explains that “when determining whether the USB-C DRP port is to operate as a power sink, the port controller configures the switching networks in both signal paths to present **Rd pull down resistors to detect whether the USB-C port of the other USB-C device is attached as a power source** and whether the USB-C eMarker cable is attached as a power sink.” *Id.* at 13 (emphasis added). Patent Owner alleges that when the other USB-C device connected to the USB-C DRP port is a power source, “Rd pull down resistors at the USB-C DRP port and a Rp pull up resistor at the other USB-C port combine in one of the CC1 and CC2 signal paths to provide a source to-DRP pull up signature on that signal path.” *Id.* Patent Owner’s infringement contentions make clear that the USB-C DRP port’s Rd pull down resistors do not by themselves *detect* a connected power source. *Id.* at 17 (“[A] port controller [purportedly] detects these pull downs by monitoring the currents in the CC1 and CC2 signal paths”).

While Petitioners do not agree with Patent Owner’s infringement contentions, a PoE PSE, like a USB-C source, also detects a resistance in a connected device to determine whether a PD (i.e., a sink) is connected. Just as a USB-C Source monitors the voltage on the CC1 and CC2 lines to detect the “presence of an Rd pull-down resistor” and thus determine that “a Sink is being attached” (EX1012 at 154), a PoE PSE has a voltage or current measuring load

detector to detect the presence of a valid signature resistor, which indicates that a valid PD is attached (EX1006 at 38-39). Thus, at least under Patent Owner’s understanding of limitation 1[c], Biederman in view of IEEE 802.3af also teaches this limitation.

e. “a load detector connected to the switch and configured to read a load current flowing therethrough so as to detect a load in one of the connected devices, and to extract information about the connected device based on the load current;” 1[d]

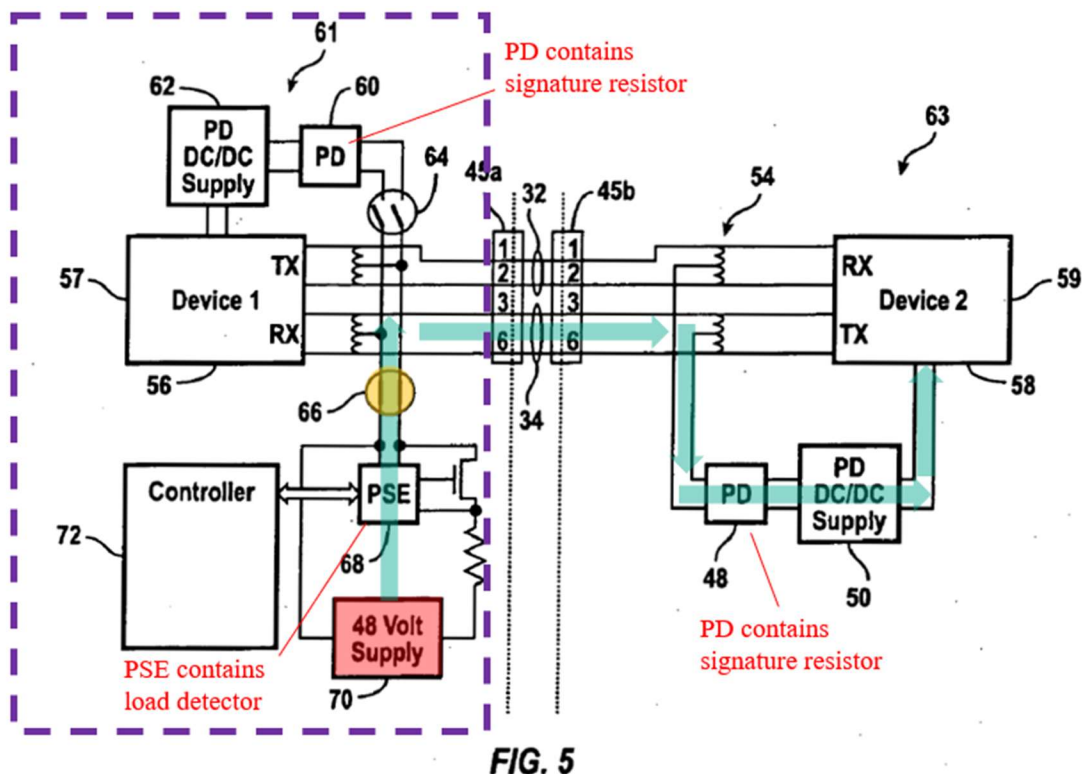
Biederman in view of IEEE 802.3af also teaches this limitation. EX1003 ¶¶ 96-98. As explained above (*supra* Section VIII.A.1), the PD (60) and PSE (68) functional blocks of Biederman’s device 57 as informed and modified by the requirements of IEEE 802.3af would include the detection and classification features of IEEE 802.3af-compliant PSE and PD devices. More particularly, IEEE 802.3af teaches that the PSE’s “main functions are to search the link section for a PD, optionally classify the PD, supply power to the link section (only if a PD is detected), monitor the power on the link section, and scale power back to the detect level when power is no longer requested or required.” EX1006 at 29. During the PD detection process, the PSE checks for a valid signature resistance in the PD (the signature resistor discussed with respect to limitation 1[c]—i.e., the load in the connected device). *Id.* at 38-39. The PD “shall present a valid detection signature...while it is in a state where it will accept power” from the PSE. *Id.* at 51.

The PD will present a non-valid signature “while it is in a state where it will not accept power” from the PSE. *Id.* The PSE may detect the signature via “voltage or current measurement.” *Id.* at 39.

A PD presenting a valid detection signature has a default power class of 0 and requires 0.44 to 12.95 Watts. *Id.* at 53, Table 33-10. The PSE may also optionally classify the PD in one of the power classes 0-3 after the detection process. *Id.* at 53 (while Table 33-10 also includes class 4, this is reserved for future use). The PSE performs classification of a PD by “applying voltage and measuring current” from the PD. *Id.* at 40. “The PSE shall measure IClass and classify the PD based on the observed current according to Table 33–4,” which defines classes 0 through 4 based on current ranges. *Id.* at 40, 41, 53. IEEE 802.3af further defines the power requirements for each class in Table 33-10; classes 1-3 correspond to narrower bands of power within the default range of 0.44 to 12.95 Watts, and class 4 is reserved for future use. *Id.* at 53, Table 33-10.

Accordingly, in light of Biederman’s teachings as informed and modified by IEEE 802.3af, a POSITA would have understood that the PSE unit 68 includes a load detector (annotated in Fig. 5 below). Furthermore, that PSE unit 68 and its load detector are connected to the switch 66 and configured to read a current flowing through the signature resistor of PD 48 of the connected device 59 and flowing back through the switch 66 to PSE unit 68, and to extract information

about the connected device based on that value. EX1005 at Fig. 5. This information includes whether the PD is a compatible device, whether it will accept power, and whether it requires some amount of power from the PSE in the range of 0.44-12.95 Watts (where the required power can be further limited to a smaller band within that range via the optional classification process). EX1006 at 27, 51, 53.



f. “wherein the information extracted by the load detector comprises information regarding whether the connected device is powered on or powered off, and whether or not the connected device needs a supply of power.” 1[e]

Biederman in view of IEEE 802.3af also discloses this limitation. EX1003

¶¶ 99-102. First, with respect to “information regarding...whether or not the

connected device needs a supply of power,” IEEE 802.3af explains that if the PD does not require power, it can present a non-valid signature, which will be detected by the PSE’s load detector. EX1006 at 51. If the PD requires power, it presents a valid signature for detection by the PSE. *Id.* The valid signature indicates that the PD requires some amount of power in the range of 0.44-12.95 Watts, but the PD can also communicate more specific power requirements within that range to the PSE via the optional classification process, during which the PSE’s load detector will measure the classification current of the PD. *Id.* at 40-41, 53.

Second, with respect to “information regarding whether the connected device is powered on or off,” the ’712 Patent explains that a device is powered on when it is “locally powered and fully functional.” EX1001 at 5:56-58. The ’712 Patent further explains that a connected device does not need a supply of power when it is locally powered. *Id.* at 4:63-5:2 (The load detector may determine that “the device is self-powered, and thus does not need to be supplied with power.”); *see also* Fig. 7. IEEE 802.3af similarly explains that a PD may not require power from the PSE if the PD can draw power from an alternate source or is locally powered. EX1006 at 49, 54 (“The PD may be capable of drawing power from a local power source. When a local power source is provided, the PD may draw some, none, or all of its power from the [PSE].”). In this scenario, the device will

indicate to the PSE that it is locally powered, and thus, “powered on,” by presenting a non-valid signature for detection by the PSE. *Id.* at 51.

IEEE 802.3af also teaches that the PSE can detect whether the PD is currently being powered by the PSE. Specifically, when power is present on the link between the PSE and PD, there is an “indication from the circuitry that power is present on the link” and the PD asserts the maintain power signature (“MPS”) for detection by the PSE. *Id.* at 49-51. The MPS is a 27 k Ω resistance signature. *Id.* at 47.

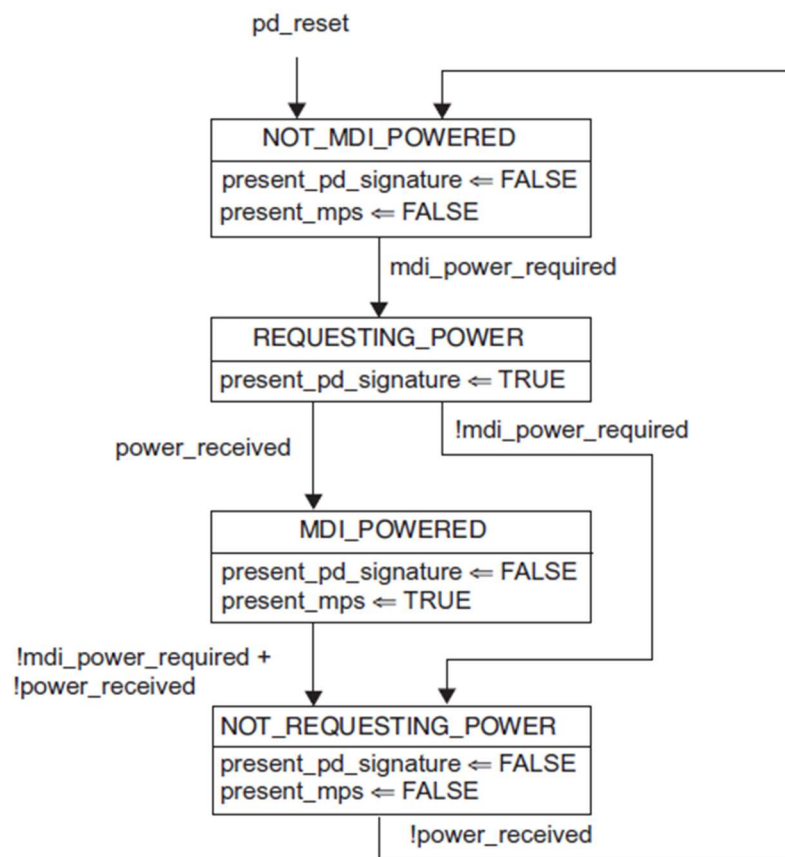


Figure 33–12—PD state diagram

When the PD does not maintain a minimum input current of 10mA and an input impedance with the below resistive and capacitive components (i.e., when the PD is disconnected and powered off), it stops asserting the MPS and the PSE will stop providing power. *Id.* at 56-57.

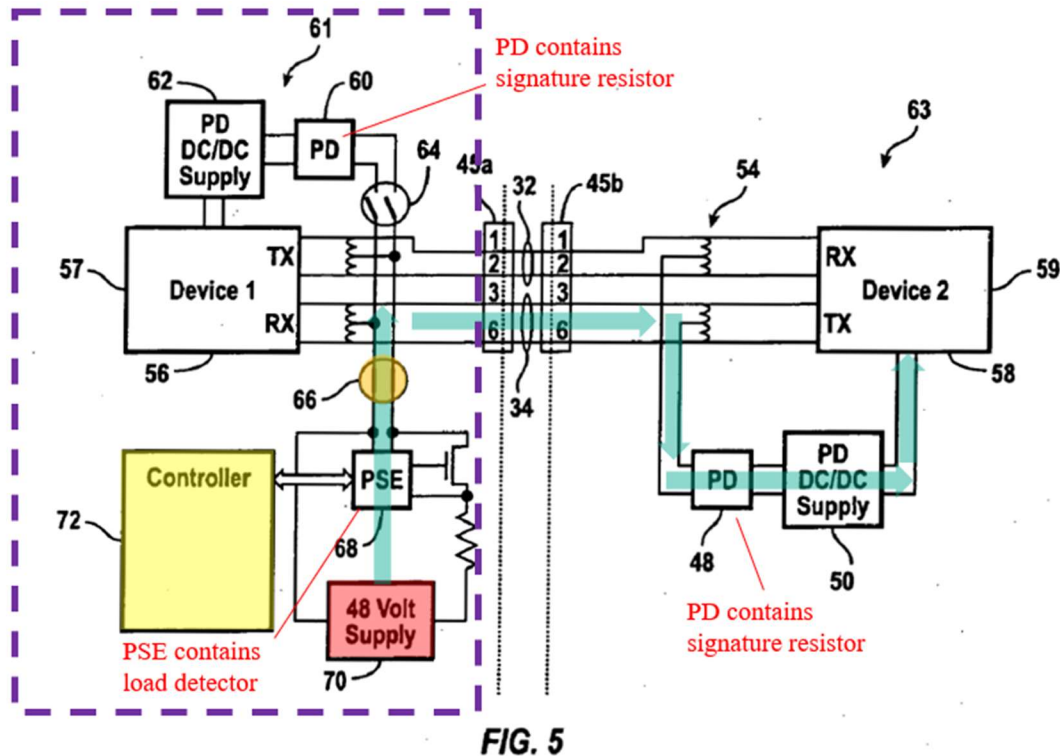
Table 33–13—PD Maintain Power Signature

Item	Parameter	Symbol	Unit	Min	Max	Additional information
1	Input current	I_{port}	mA	10		See 33.3.6.1
2	Input resistance	$R_{\text{pd_d}}$	K Ω		26.25	
3	Input capacitance	$C_{\text{pd_d}}$	μF	0.05		With 0V to 57V DC bias applied

3. Claim 2: “The power delivery circuit of claim 1, further comprising a controller that controls opening and closing of the power relay switch.”

Biederman in view of IEEE 802.3af discloses the limitations of Claim 2.

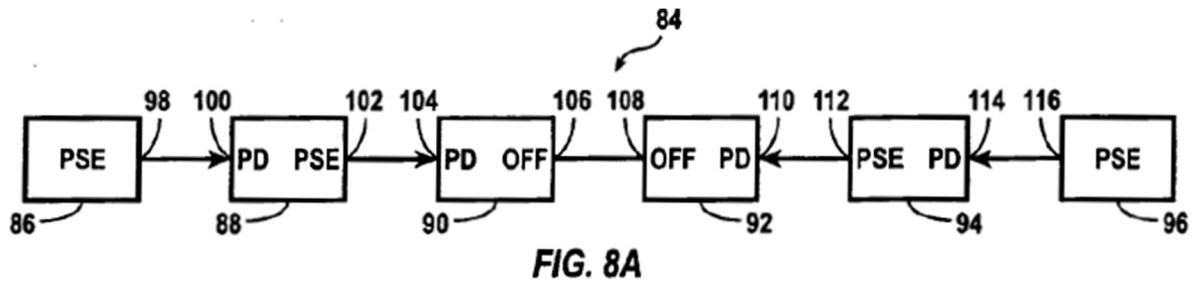
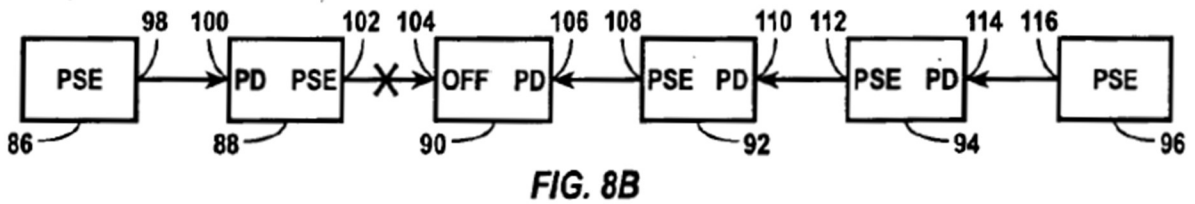
EX1003 ¶ 103. Specifically, Biederman teaches that the power delivery circuit 61 includes a controller 72 (annotated below in yellow) for causing switching circuitry 66 (annotated below in orange) to “selectively couple[] PSE block 68 (and power supply block 70)...to first MDI 45a.” EX1005 at [0038], Fig. 5.



EX1005 at Fig. 5.

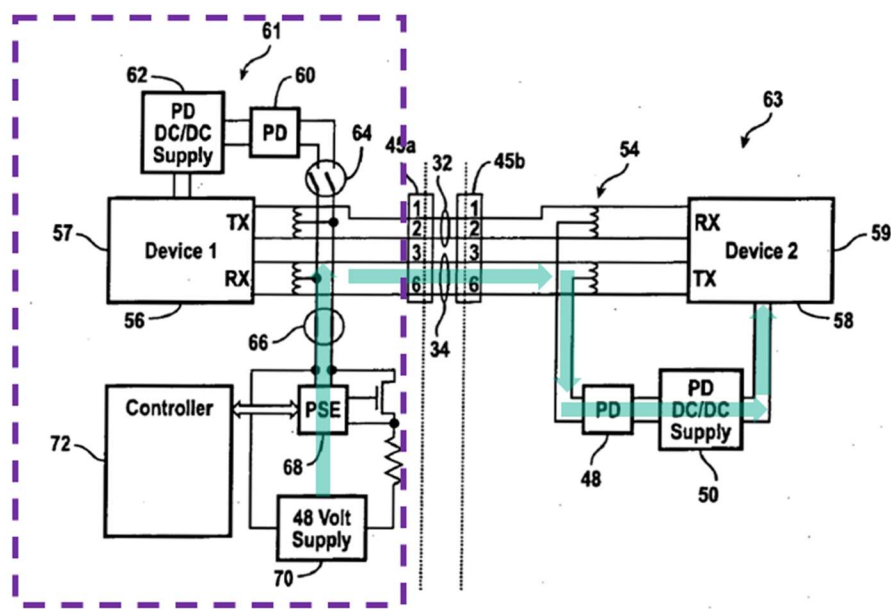
4. Claim 3: “The power delivery circuit of claim 1, wherein the plurality of devices are connected to each other through a daisy chain, and wherein the power delivery circuit is included within each one of the devices in the daisy chain.”

Biederman in view of IEEE 802.3af also teaches Claim 3. EX1003 ¶¶ 104-05. Biederman teaches that several network devices can be arranged in a daisy chain network configuration, where each network device includes at least one port (i.e., the claimed power delivery circuit). EX1005 at [0043]-[0044], Figs. 8A-8B.



EX1005 at Figs. 8A-8B.

As explained above with reference to limitation 1[p], it would have been obvious to a POSITA to implement each port in the devices of Fig. 8A as the port 61 illustrated in the embodiment of Fig. 5. *Supra* Section VIII.A.2.a, Fig. 5 (showing the port 61, which is the claimed power delivery circuit, annotated in purple below).



EX1005 at Fig. 5.

5. Claim 5: “The power delivery circuit of claim 1, wherein the load detector is further configured to detect removal of one of the plurality of devices from the network.”

Biederman in view of IEEE 802.3af also teaches claim 5. EX1003 ¶¶ 106-107. IEEE 802.3af explains that “[t]he PSE’s “main functions are to search the link section for a PD, optionally classify the PD, supply power to the link section (only if a PD is detected), monitor the power on the link section, and scale power back to the detect level when power is no longer requested or required.” EX1006 at 29. IEEE 802.3af further explains that one example of when power is no longer required is “[a]n unplugged link section.” *Id.* When a PD is disconnected, the PSE is configured to detect the change in the Disconnect Detection time, T_{MPDO} , and turn off power. *Id.* at 99-100, 104-06.

Biederman similarly teaches that, when the network devices are arranged in a daisy chain, the devices can detect when the cabling has been “cut or disrupted” and adjust their functions accordingly. EX1005 at [0044]. In the example of Fig. 8B, the “cabling has been cut or disrupted in some fashion between port 102 and port 104.” *Id.* at [0045], Fig. 8A-8B. “[S]ince port 104 can no longer receive inline power from port 102, it has been reconfigured [by the controller] so that inline power is off.” *Id.* Similarly, “[p]ort 106 which had been off in FIG. 8A is...reconfigured to receive power in PD mode,” and “[p]ort 108 which had been off is...reconfigured in response to the demand from port 106 in PD mode so that it is now in PSE mode.” *Id.* This reconfiguration necessarily requires the network device of Biederman to be capable of detecting the removal of a device from the network.

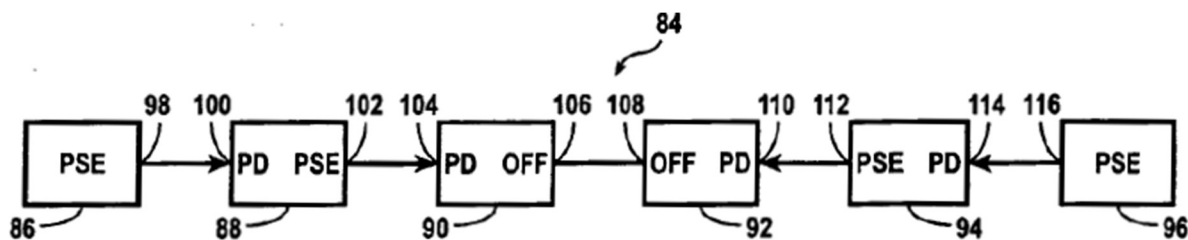


FIG. 8A

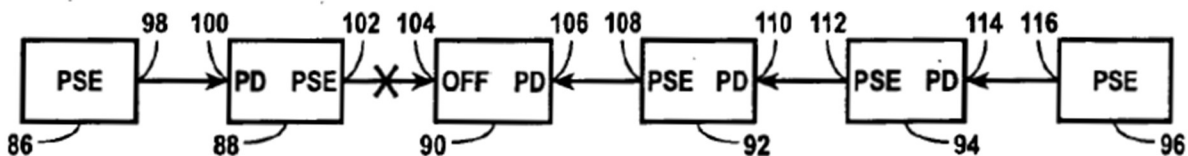


FIG. 8B

EX1005 at Figs. 8A-8B.

B. Ground 2: Claims 1, 2, 3, and 5 are obvious over Biederman in view of Karam

1. Motivation to Combine Biederman and Karam

As explained above in Section VII.B and VIII.A.1, Biederman is generally directed to “[a] method and apparatus for bidirectional provision of inline power,” “also known as Power over Ethernet and PoE.” EX1005 at [0013]-[0014], [0018]. Biederman notes that, “[i]n the interest of clarity, not all of the routine features of the implementations described herein are shown and described,” but implementing the invention “would...be a routine undertaking of engineering for those of ordinary skill in the art having the benefit of this disclosure.” *Id.* at [0031]. As a result, Biederman’s disclosure omits certain routine details of PoE devices that are governed by the IEEE 802.3af standard, in the interest of brevity. As explained in Section VIII.A.1, some of these omitted details relate to the detection and classification features of IEEE 802.3af, including the signature resistor, load detector, and classification current elements.

As described above in Section VII.C, Karam discloses an “apparatus for managing an Inline Power relationship between a network device and a Powered Device (PD) where the network device is acting as power sourcing equipment (PSE) to provide Inline Power to a first PD (PD1) which is, in turn, powering another PD (PD2).” EX1007 at [0039], Fig. 2A.

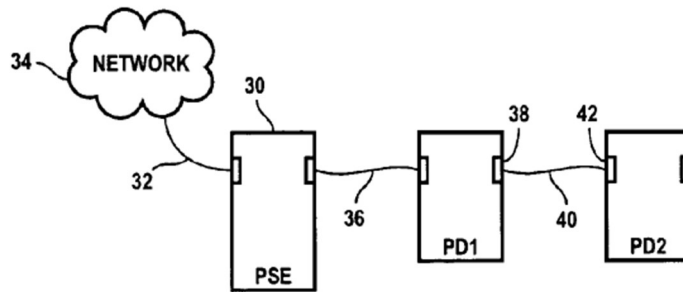


FIG. 2A

EX1007 at Fig. 2A.

Like Biederman, Karam also refers to the IEEE 802.3af standard. *Id.* at [0014]. Unlike Biederman, Karam discloses the details of the PoE classification and detection components governed by the IEE 802.3af standard. For example, Karam explains:

In order to provide regular Inline Power to a PD from a PSE it is a general requirement that two processes first be accomplished. First, a “discovery” process must be accomplished to verify that the candidate PD is, in fact, adapted to receive Inline Power. Second, a “classification” process must be accomplished to determine an amount of Inline Power to allocate to the PD, the PSE having a finite amount of Inline Power resources available for allocation to coupled PDs.

Id. at [0018].

Referencing the IEEE 802.3af standard, Karam explains that the discovery process looks for an “identity network” in the PD, which is a 25,000 Ω resistor. *Id.* at [0019]. To detect the identity network, the PSE applies voltage discovery signals, measures the “return currents responsive to application of the discovery signals,” and calculates the resistance. *Id.* at [0020]. If the resistance is the proper

value, classification may begin. *Id.* Again referencing the IEEE 802.3af standard, Karam explains that the classification process involves applying a voltage to the PD, which responds by sending a classification current back to the PSE. *Id.* at [0021]. This current corresponds to a “class,” which represents a device’s power requirements. *Id.* at [0021], Table I. Karam indicates that the classification process is optional. *Id.* at [0065].

It would have been obvious to a POSITA to implement the detection and classification features of IEEE 802.3af as carried out in Karam—including the signature resistor, load detector, and classification current elements—in the PoE system of Biederman, such that the PD portion of each device of Biederman includes a signature resistor, and the PSE portion of each device of Biederman includes a load detector for detecting a PD signature resistor and a PD classification current. EX1003 ¶¶ 108-114. A POSITA would have been motivated by Biederman’s own disclosure to make this combination, because Biederman explains that (a) PoE is governed by IEEE 802.3af; (b) “[t]hose of ordinary skill in the art will [] realize that other equivalent mechanisms are available to periodically revise the amount of power made available by the PSE to the PD;” (c) “[t]here are mechanisms within the IEEE 802.3af standard to allocate a requested amount of power;” and (d) Karam illustrates one implementation of the classification and detection features of the IEEE 802.3af specification. EX1005 at

[0014], [0042]. A POSITA also would have been motivated by IEEE 802.3af to make this combination, because IEEE 802.3af emphasizes the importance of its detection process to prevent damage to non-compatible devices. EX1006 at 27. *Perfect Web Techs.*, 587 F.3d at 1329 (explaining that the motivation to combine may be found explicitly or implicitly in the prior art); EX1003 ¶ 113.

Such an improvement is no “more than the predictable use of prior art [IEEE 802.3af detection and classification] elements according to their established functions,” the “combination of familiar [IEEE 802.3af detection and classification] elements according to known methods” disclosed by Karam to yield predictable results, or the use of a known technique (PoE detection and classification) to improve a similar PoE device in the same way. *KSR*, 550 U.S. at 401. Furthermore, a POSITA would have had a reasonable expectation of success in making this combination because the elements added from Karam, as Biederman explains with regard to such elements, are merely “routine features” of IEEE 802.3af devices, the implementation of which would be a “routine undertaking of engineering for those of ordinary skill in the art.” EX1005 at [0031]; EX1003 ¶ 114.

2. Claim 1

a. “A power delivery circuit configured to deliver power to one or more of a plurality of devices connected in a network, the power delivery circuit comprising:” 1[P]

To the extent the preamble is limiting, Biederman teaches the limitation for the same reasons explained above with respect to limitation 1[p] in Ground 1.

Supra Section VIII.A.2.a; *see* EX1005 at [0031], [0037]-[0038], [0043]-[0044], [0041], [0039], and Figs. 8A-8B, 5; EX1003 ¶ 115.

b. “a voltage source configured to generate a voltage;” 1[a]

For the same reasons explained above with respect to limitation 1[a] in Ground 1, Biederman teaches this limitation. *Supra* Section VIII.A.2.b; EX1005 at [0037]-[0039], Fig. 5; EX1003 ¶ 116.

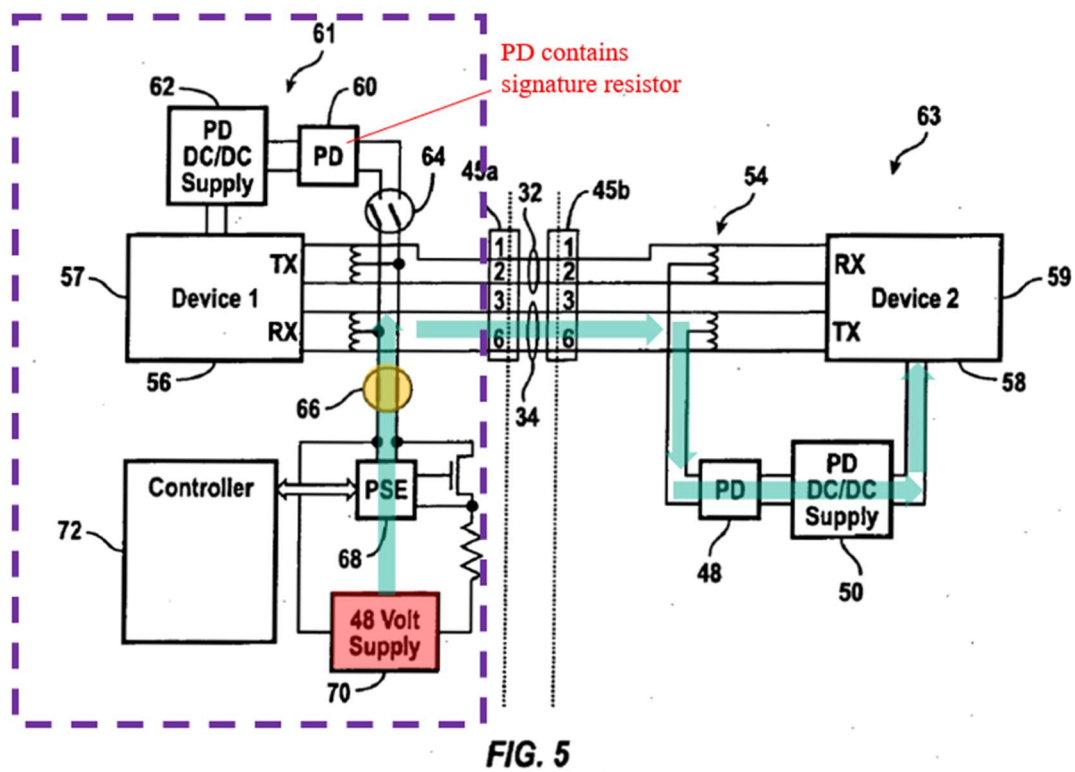
c. “a power relay switch configured to relay, when closed, the voltage generated by the voltage source to one or more of the connected devices;” 1[b]

For the same reasons explained above with respect to limitation 1[b] in Ground 1, Biederman teaches this limitation. *Supra* Section VIII.A.2.c; EX1005 at [0037]-[0038], Fig. 5; EX1003 ¶ 117.

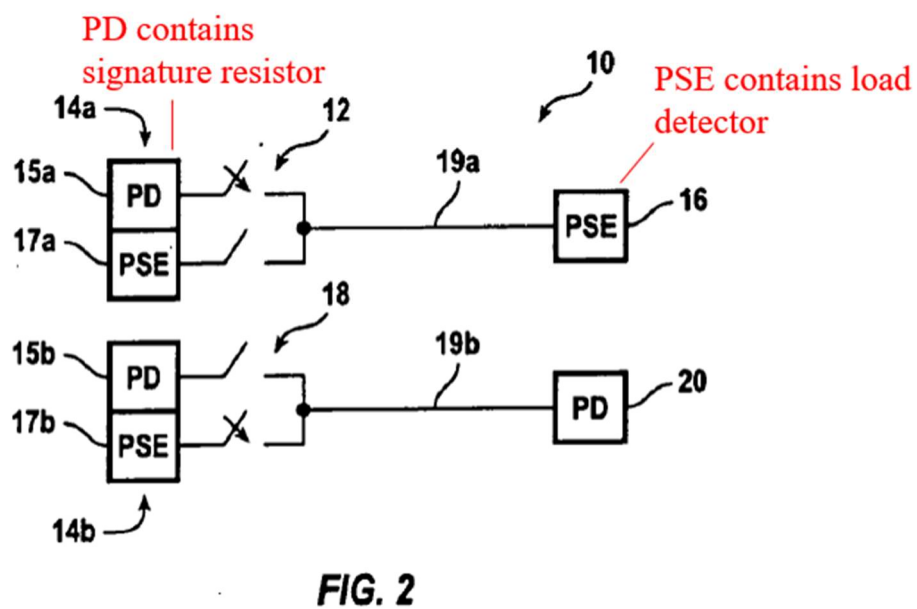
d. “a signature resistor connected to the switch and configured to detect a power source from one or more of the connected devices; and” 1[c]

This limitation is taught by Biederman in view of Karam. EX1003 ¶ 118. As explained above (*supra* Section VIII.B.1), the PD (60) and PSE (68) functional

blocks of port 61 of Biederman's device 57 as modified by Karam include the detection and classification features of IEEE 802.3af compliant PSE and PD devices. Referencing the IEEE 802.3af standard, Karam explains that the discovery process looks for an "identity network" in the PD, which is a 25,000 Ω resistor. EX1007 at [0019]. To detect the identity network, the PSE applies voltage discovery signals, measures the "return currents responsive to application of the discovery signals," and calculates the resistance. *Id.* at [0020]. If the resistance is the proper value, classification may begin. *Id.* Again referencing the IEEE 802.3af standard, Karam explains that the classification process involves applying a voltage to the PD, which responds by sending a classification current back to the PSE. *Id.* at [0021]. This current corresponds to a "class," which represents a device's power requirements. *Id.* at [0021], Table I. Accordingly, Biederman's device as modified by Karam includes a signature resistor (annotated in Fig. 5 below) in the functional PD unit 60, which is connected to the switch 66 and which is capable of being detected by a PSE connected to the device 57 (as in the top configuration of Fig. 2). EX1005 at Fig. 5, Fig. 2.



EX1005 at Fig. 5.



Id. at Fig. 2.

e. “a load detector connected to the switch and configured to read a load current flowing therethrough so as to detect a load in one of the connected devices, and to extract information about the connected device based on the load current;” 1[d]

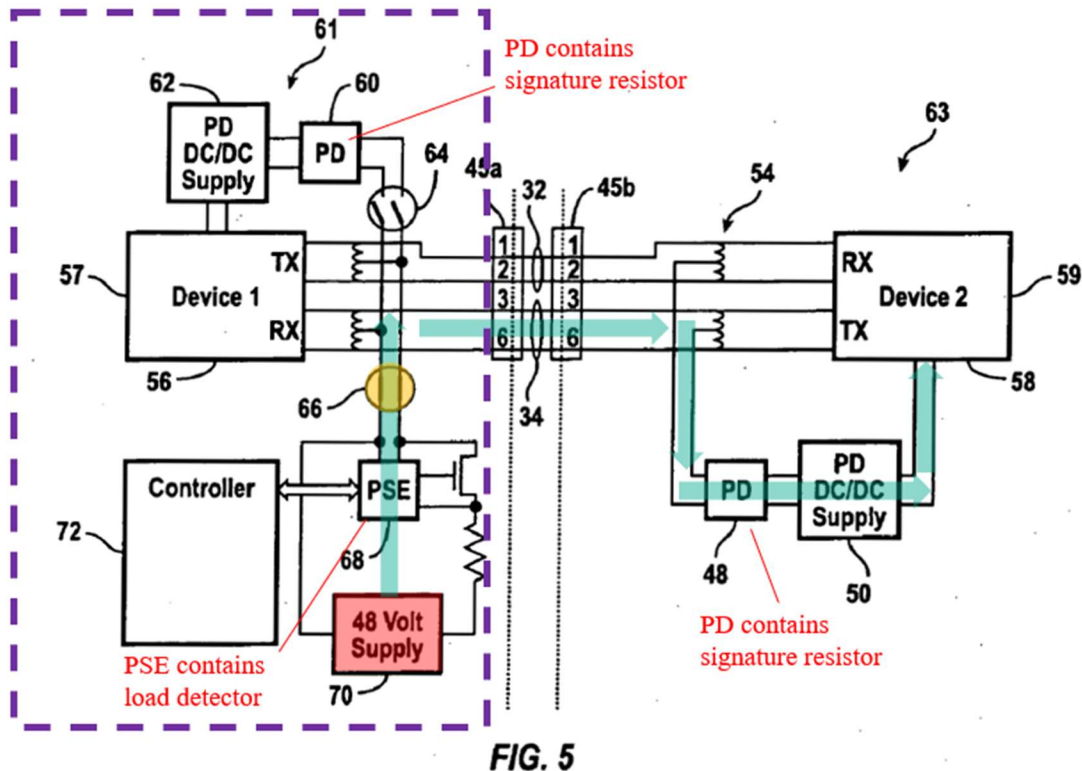
Biederman in view of Karam also teaches this limitation. EX1003 ¶ 119.

Karam explains that, to detect the PD identity network, the PSE applies voltage discovery signals, measures the “return currents responsive to application of the discovery signals,” and calculates the resistance on the connection with the PD.

EX1007 at [0020]. If the resistance is the proper value (i.e., the 25,000 Ω signature resistance), classification may begin to determine whether the device should receive a maximum of 15.4 Watts, 7.0 Watts, or 4.0 Watts. *Id.* The classification process involves applying a voltage to the PD, which responds by sending a classification current back to the PSE. *Id.* at [0021]. This current corresponds to a “class,” which represents a device’s power requirements. *Id.* at [0021], Table I.

Accordingly, Biederman’s device as modified by Karam includes a load detector (annotated in Fig. 5 below) in the functional PSE unit 68, which is connected to the switch 66 and which is configured to read a current flowing through the signature resistor of PD 48 of the connected device 59, and to extract information about the connected device based on that value. EX1005 at Fig. 5. As taught by Karam, this information includes whether a connected PD is “off or disconnected” (EX1007 at [0058]); whether a connected device is a “legacy” device that cannot receive inline

power (*id.* at [0022]); and whether the PD requires *some* amount of power, the specific amount to be determined via the classification process (*id.* at [0018], [0021], [0065].).



EX1005 at Fig. 5.

f. “wherein the information extracted by the load detector comprises information regarding whether the connected device is powered on or powered off, and whether or not the connected device needs a supply of power.” 1[e]

Biederman in view of Karam also discloses this limitation. EX1003 ¶ 120.

As explained above with respect to limitation 1[d], Karam teaches that the PSE’s current sensor extracts information concerning whether a connected PD is “off or

disconnected” (EX1007 at [0058]); whether a connected device is a “legacy” device that cannot receive inline power (*id.* at [0022]); and whether the PD requires *some* amount of power, the specific amount to be optionally determined by the load detector via the classification process (*id.* at [0018], [0021], [0065]).
Supra Section VIII.B.2.e.

3. Claim 2: “The power delivery circuit of claim 1, further comprising a controller that controls opening and closing of the power relay switch.”

For the same reasons explained above with respect to claim 2 in Ground 1, Biederman teaches this claim. *Supra* Section VIII.A.3; EX1005 at [0038], Fig. 5; EX1003 ¶ 121.

4. Claim 3: “The power delivery circuit of claim 1, wherein the plurality of devices are connected to each other through a daisy chain, and wherein the power delivery circuit is included within each one of the devices in the daisy chain.”

For the same reasons explained above with respect to claim 3 in Ground 1, Biederman teaches this claim. *Supra* Section VIII.A.4; EX1005 at [0043]-[0044], Figs. 8A-8B, 5; EX1003 ¶ 122.

5. Claim 5: “The power delivery circuit of claim 1, wherein the load detector is further configured to detect removal of one of the plurality of devices from the network.”

Biederman in view of Karam also teaches claim 5. EX1003 ¶¶ 123-124.
For the same reasons explained above with respect to claim 5 in Ground 1, Biederman teaches this claim. *Supra* Section VIII.A.5; EX1005 at [0044]-[0045],

Figs. 8A-8B. Karam also teaches the limitations of this claim. With reference to the embodiment of Fig. 5, Karam explains:

Inline power is provided to the third port 76 by closing switch 88...If the control circuitry 78 sees that power is applied and then **the current in current sensor 92 goes to zero (device at second port 74 is off or disconnected)** while current is still being used by third port 76 then it **forces normally closed switch 90 to open making sure that a 'hot cable' situation is not created at second port 74 by removing the inline power to second port 74. To provide inline power again to second port 74 the control circuitry 78 must identify the presence of an appropriate identity network across the 1-2 pair and the 3-6 pair.** This may be achieved, for example, by control circuitry 78 reducing the applied voltage and closing switch 90 to carry out a conventional inline power discovery process which may also be followed up by a classification process, if desired in the particular application.

EX1007 at [0058].

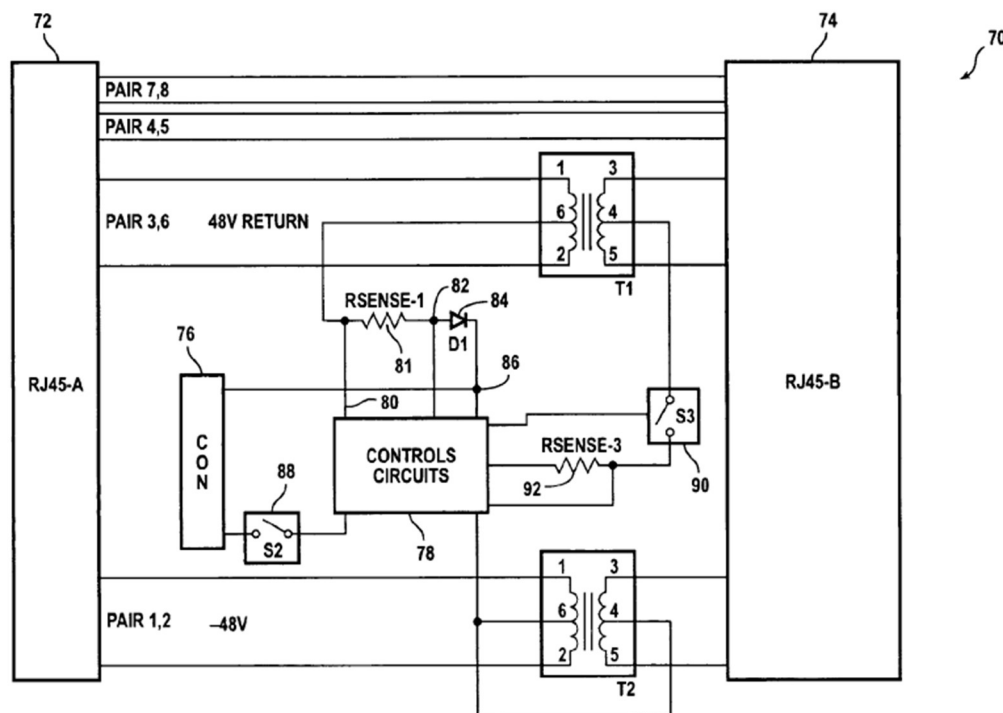


FIG. 5

EX1007 at Fig. 5.

Thus, Karam teaches that the load detector 92 can sense when the current drops to zero when the device is disconnected from port 74.

C. Grounds 3-5: Claims 1, 2, 3, and 5 are obvious over Biederman in view of IEEE 802.3af and Penning (Ground 3); Biederman in view of Karam and Penning (Ground 4); and Biederman in view of IEEE 802.3af, Karam, and Penning (Ground 5)

1. Motivation to Combine Penning with Biederman and Karam or with Biederman and IEEE 802.3af

Claims 1, 2, 3, and 5 are obvious over Biederman in view of IEEE 802.3af (Ground 1) or in view of Karam (Ground 2). *Supra* Sections VIII.A, VIII.B. To the extent that Patent Owner were to incorrectly argue that neither Biederman, IEEE 802.3af, nor Karam discloses a “signature resistor connected to the switch and configured to detect a power source from one of the connected devices,” as recited in limitation 1[c], or “wherein the information extracted by the load detector comprises information regarding whether the connected device is powered on or powered off, and whether or not the connected device needs a supply of power,” as recited in limitation 1[e], those limitations are obvious over Biederman-Karam, Biederman-IEEE 802.3af, and Biederman-IEEE802.3af-Karam in further view of Penning. EX1003 ¶¶ 125-140. The mapping for all other claim limitations in claims 1, 2, 3, and 5 is as set forth in Grounds 1 and/or 2. *Supra* Sections VIII.A, VIII.B.

Biederman teaches that it may be “useful to provide backup sources of power to a network at locations where power happens to be available....[s]uch as generator-supplied power or emergency power.” EX1005 at [0046]. Biederman is silent as to how a device in the daisy chain PoE network of Figs. 8A-8B would detect and select between sources of power, such as a PSE and a local power supply. However, Penning discloses a similar PoE device with a “power detector” for detecting connected power sources and a controller for switching between them.

As explained in Section VII.D, Penning teaches a system for powering multiple devices in a PoE network. EX1008 at [0028]-[0030]. The system includes a data distribution device 105, an independent power supply 115, a remote data distribution device 110, network devices 125-1 to 125-N, and externally powered network devices 120-1 to 120-N. *Id.* at [0029], Fig. 1.

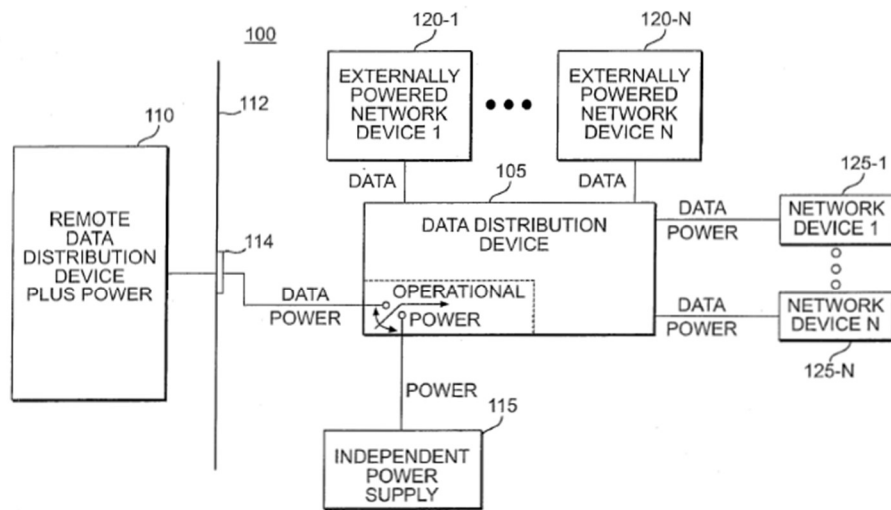


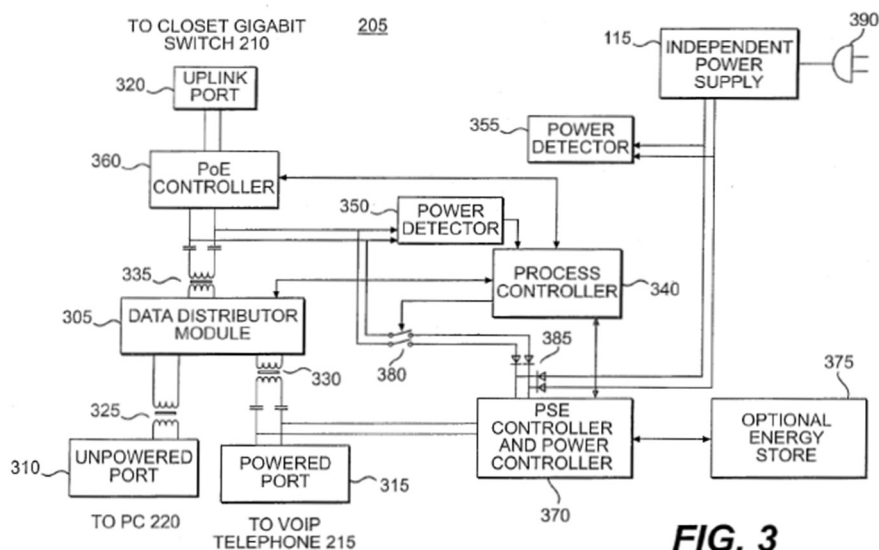
FIG. 1

Id. at Fig. 1.

Remote data distribution device 110 acts as a PSE providing data and power to data distribution device 105, which can then provide data and power to network devices 125-1 through 125-N. *Id.* at [0029]. Data distribution device 105 may power itself and network devices 125-1 through 125-N from one of several power sources, including remote data distribution device 110 and independent power supply 115. *Id.* at [0032]. The device 105 switches between power supplies using “relays, transistors, or any other known switching device.” *Id.*

As illustrated in Fig. 3, power detectors 350 and 355 of the exemplary data distribution device 205 indicate whether power is available from independent power supply 115 or uplink port 320, respectively, by sending a signal to process controller 340. *Id.* at [0049], [0056], Fig. 3. The process controller 340 determines

which power supply to use based on these signals and sends a command signal to switch 380, “which may be a relay,” to select the power source. *Id.* at [0051], [0047], [0049]. If the data distribution device is powered locally by the independent power supply, process controller 340 signals PoE controller 360 to set a signature resistance on uplink port 320 in accordance with IEEE 802.3af to inform closet gigabit switch 210 that device 205 does not require power. *Id.* at [0056].



EX1008 at Fig. 3.

Penning teaches that the power detectors may be “voltage or current detectors...of any appropriate type known to one of ordinary skill in the art.” *Id.* at [0049]. A POSITA would have understood based on common general knowledge or Karam (EX1007 at [0058]) that one common type of current detector is a

current sense resistor, which includes a resistor and a sensor for measuring the voltage drop across the resistor and calculating current. Thus, in the combination PSE/PD device of Biederman as modified by Penning, the device includes current sense resistors, each one comprising a resistor and a sensor for measuring the voltage drop across the resistor (the resistor and sensor together comprising the claimed “signature resistor”), connected to the switch to detect connected power sources and facilitate switching between them; EX1003 ¶¶ 131-134; EX1015 at 6, 11, 8 Fig.1; EX1016 at 2-3.

A POSITA would have been motivated by Biederman’s disclosure concerning backup sources of power to modify Biederman with Penning to provide a means for the network devices to detect connected power sources and switch between them. A POSITA also would have been motivated by Penning’s disclosure to make such a combination to boost data transfer rates, as Penning explains that a “user may require faster data transfer rates...which may necessitate operating off of an independent power supply, e.g., so that all of the twisted pairs of the Ethernet connection are being utilized for data transfer and not data and PoE.” EX1008 at [0062]; *Perfect Web*, 587 F.3d at 1329.

Such an improvement is no “more than the predictable use of prior art [PoE power detection] elements according to their established functions,” or the “combination of familiar [PoE power detection] elements according to known

methods” to yield predictable results. *KSR*, 550 U.S. at 401. This straightforward modification also reflects the application of a known technique (Penning’s technique for detecting connected power sources and switching between them) to improve a similar PoE device (Biederman’s combination PD/PSE device) in the same way (to enable the device to detect and switch between power sources) to yield predictable results. *Id.* A POSITA would have had a reasonable expectation of success in making the above modifications because each reference teaches a PoE device that can be connected in a network to multiple power sources, including local backup power supplies.

2. Claim 1

a. “a signature resistor connected to the switch and configured to detect a power source from one or more of the connected devices; and,” 1[c]

Patent Owner has suggested in the co-pending litigation against Dell that this “signature resistor” limitation is met by the combination of (a) pull-up and pull-down resistors that combine in a signal path to form a signal that is detected by (b) a voltage monitoring detection circuit of a USB-C device. EX1011 at 13-16. Under Patent Owner’s position that this “signature resistor” limitation is met by the combination of at least one resistor and a voltage monitoring detection circuit for detecting the resistor, which Petitioners adopt for purposes of this proceeding only, this limitation is taught by Biederman in view of IEEE 802.3af and Penning

(Ground 3); Biederman in view of Karam and Penning (Ground 4); and Biederman in view of IEEE 802.3af, Karam, and Penning (Ground 5). *See* VIII.C.1; EX1003 ¶ 137. Specifically, Penning teaches the use of current or voltage detectors in a PoE device to detect connected power sources and send signals to a controller to switch between them. EX1008 at [0028]-[0030], [0032], [0049], [0056], [0051], [0047], [0049], Figs. 1, 3. A POSITA would have understood based on common general knowledge or Karam (EX1007 at [0058]) that the current detectors could be current sense resistors, each of which comprise a resistor and a voltage measuring element for calculating the voltage drop across the resistor. This combination of resistor and voltage measuring element constitutes the claimed “signature resistor.”

b. “wherein the information extracted by the load detector comprises information regarding whether the connected device is powered on or powered off, and whether or not the connected device needs a supply of power.” 1[e]

Biederman in view of IEEE 802.3af and Penning (Ground 3); Biederman in view of Karam and Penning (Ground 4); and Biederman in view of IEEE 802.3af, Karam, and Penning (Ground 5) also disclose this limitation. EX1003 ¶¶ 138-140. IEEE 802.3af explains that if the PD does not require power, it can present a non-valid signature, which will be detected by the PSE’s load detector. EX1006 at 51. If the PD requires power, it presents a valid signature for detection by the PSE. *Id.*

The valid signature indicates that the PD requires power in the range of 0.44-12.95 Watts. *Id.* at 40-41, 53.

IEEE 802.3af also explains that a PD may not require power from the PSE if the PD can draw power from an alternate source or is locally powered. EX1006 at 49, 54 (“The PD may be capable of drawing power from a local power source...[in which case] the PD may draw some, none, or all of its power from the [PSE].”). In this scenario, the device will indicate to the PSE that it is locally powered, and thus, “powered on,” by presenting a non-valid signature for detection by the PSE. *Id.* at 51.

Penning similarly teaches that, when a PD receives power from a local power supply and is thus already “powered on,” the PD sets an invalid signature resistance on the port connected to the PSE to inform the PSE that it does not require power from the PSE. EX1008 at [0056].

D. Ground 6: Claims 7 and 9 are anticipated by Karam

1. Claim 7:

**a. “A method of delivering power to one of a plurality of devices connected in a daisy chain, the method comprising:”
7[p]**

To the extent the preamble is limiting, Karam teaches this limitation. EX1003 ¶¶ 141-43. Karam teaches “a method and apparatus for managing an Inline Power relationship between a network device and a Powered Device (PD)

where the network device is acting as power sourcing equipment (PSE) to provide Inline Power to a first PD (PD1) which is, in turn, powering another PD (PD2).” EX1007 at [0039], Fig. 2A. As shown in Fig. 2A below, the PSE, PD1, and PD2 are connected in a daisy chain configuration. The PSE may also provide power to a longer daisy chain of PD devices. *Id.* at [0046] and Fig. 2D. The first PD, PD1, receives power from a voltage source in the PSE. *Id.* at [0044].

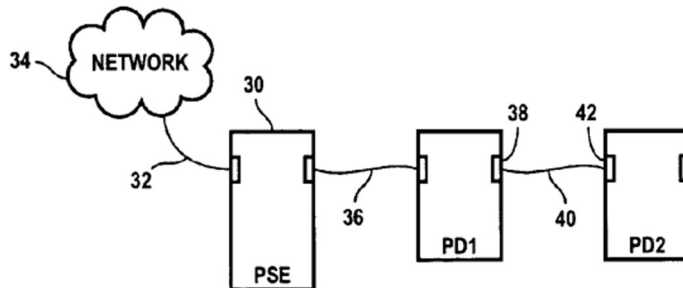
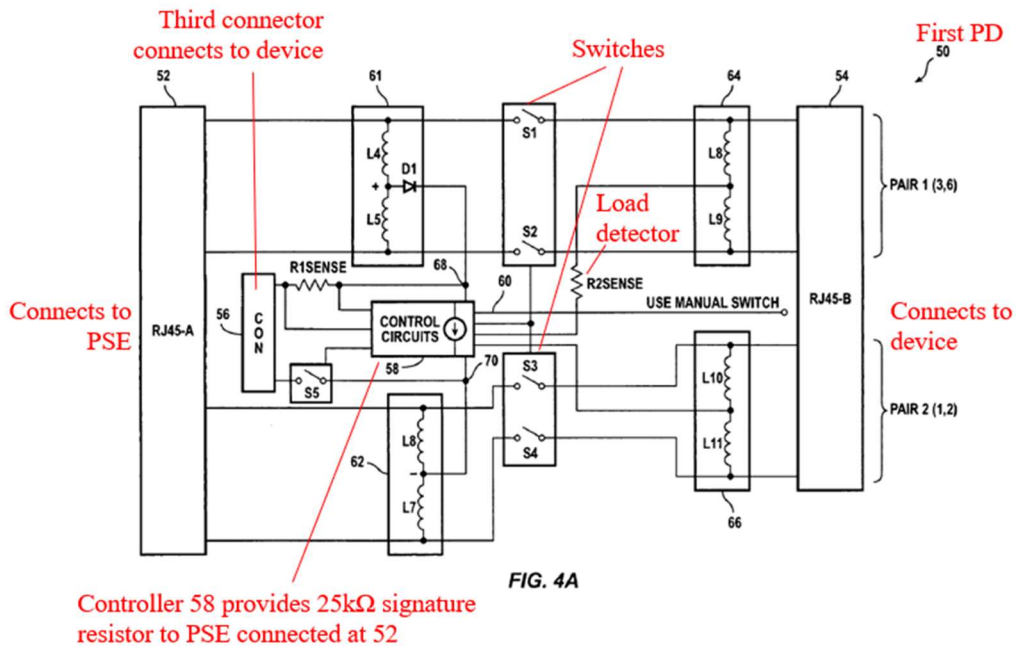


FIG. 2A

EX1007 at Fig. 2A.

In the more detailed embodiment shown in Fig. 4A, a PSE may be coupled to connector 52 of device 50 (corresponding to PD1 of Fig. 2A), which in turn may be coupled to downstream devices (such as PD2 of Fig. 2A) at connectors 54 and/or 56. *Id.* at [0051]-[0052], Fig. 4A (annotated below). The PSE may provide power to device 50 as it would a PD, and device 50 may also act as a PSE to provide a portion of the power from the PSE to devices coupled to connectors 54 and 56. *Id.*



EX1007 at Fig. 4A.

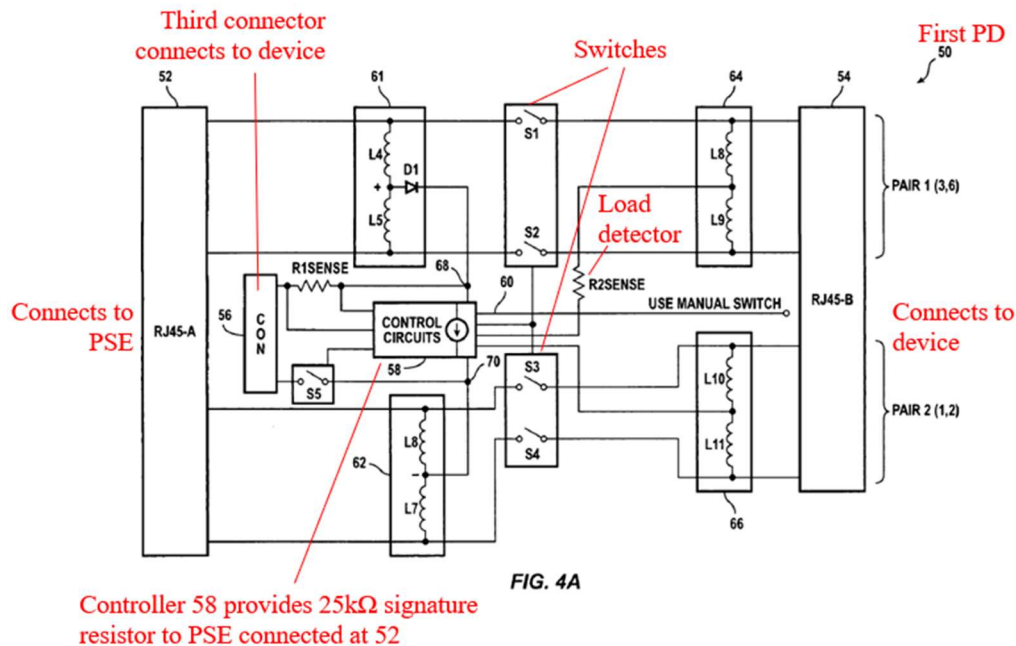
b. “detecting a load in a first device of the plurality of devices including detecting a load current flowing through the load;” 7[a]

Karam teaches this limitation. EX1003 ¶¶ 144-46. Karam explains that “[i]n order to provide regular Inline Power to a PD from a PSE....a ‘discovery’ process must be accomplished to verify that the candidate PD is, in fact, adapted to receive Inline Power.” EX1007 at [0018]. Then, a classification process may be used “to determine an amount of Inline Power to allocate to the PD, the PSE having a finite amount of Inline Power resources available for allocation to coupled PDs.” *Id.* Referencing the IEEE 802.3af standard, Karam explains that the

discovery process looks for an “identity network” in the PD, which is a $25,000\Omega$ resistor. *Id.* at [0019]. To detect the identity network, the PSE applies voltage discovery signals, measures the “return currents responsive to application of the discovery signals,” and calculates the resistance (the load in the PD). *Id.* at [0020]. If the resistance is the proper value, classification may begin. *Id.* Again referencing the IEEE 802.3af standard, Karam explains that the classification process involves applying a voltage to the PD, which causes a classification current to flow on the circuit connecting the PD and the PSE. *Id.* at [0021]. This current corresponds to a “class,” which represents a device’s power requirements. *Id.* at [0021], Table I.

With respect to the system illustrated in Fig. 4A, Karam teaches that the device 50 in the chain, which corresponds to PD1 of Fig. 2A, includes a connector 52 to connect to the PSE, a second connector 54 which may be coupled to another PD device, and a third connector 56 for providing power to another PD device, such as a cell phone. *Id.* at [0051], Fig. 4A. To supply power to device 50, “the PSE port must see the proper identity network characteristics,” which, “in accordance with the IEEE 802.3af standard,” is a $25,000\Omega$ resistance in response to “certain discovery voltage signals.” *Id.* Accordingly, the controller 58 of the device 50 provides the identity network signal back to the PSE so that inline power may be provided. *Id.* at [0052]. Thus, Karam teaches limitation 7[a] through its

disclosure of the PSE measuring current to determine the signature resistance (load) in the connected PD (device 50).



EX1007 at Fig. 4A.

The device 50 is also adapted to “act as a PSE device to determine if an attached device at a second connector 54 has an appropriate identity network so that inline power may be provided to it.” *Id.* at [0052]. The device 50 senses the identity network via current sensor R2SENSE. *Id.* at Fig. 4A, [0058]. If the device 50 does not verify that the attached device can receive power, it may leave switches S1-S4 open, cutting off data and power to second connector 54. *Id.* Karam further explains that the controller 58 may keep switch S5 to third

connector 56 closed “only when current [is] being drawn from third connector 56 so that if the device were unplugged from third connector 56 the power would turn off.” *Id.* at [0051]. Thus, Karam teaches limitation 7[a] through its disclosure of the device 50 acting as a PSE and measuring current to determine the signature resistance (load) in the PD(s) connected to connectors 54 and/or 56.

c. “extracting information from the first device based on the detected load current; and;” 7[b]

Karam also teaches this limitation. EX1003 ¶ 147. As explained above with respect to limitation 7[a] in this ground, the PSE extracts information from first device 50 via the detection and classification processes, and the device 50 similarly extracts information from PD devices coupled to connectors 54 and 56 via the detection and classification processes. *Supra* Section VIII.D.1.b. This information concerns whether the devices are “off or disconnected” (EX1007 at [0058]); whether a connected device is a “legacy” device that cannot receive inline power (*id.* at [0022]); and whether the PD requires *some* amount of power, the specific amount to be determined via the classification process (*id.* at [0018], [0021], [0065]).

d. “relaying power to the first device based on the extracted information;” 7[c]

Karam also teaches this limitation. EX1003 ¶¶ 148-50. Specifically, the discovery and classification procedures are used to determine whether a connected

PD is adapted to receive inline power and whether the PD requires *some* amount of power, the specific amount to be optionally determined via the classification process, EX1007 at [0018], [0021], [0065]. For example, a class 1 device requires a maximum amount of 4.0 W of power. *Id.* at [0021]. The classification process is used to determine the “amount of Inline Power to allocate to the PD,” where “the PSE...[has a] finite amount of Inline Power resources available for allocation to coupled PDs.” *Id.* at [0018].

In operation, device 50 acts as a PSE with respect to a first device coupled to connector 54 “to determine if an attached device at a second connector 54 has an appropriate identity network so that inline power may be provided to it.” *Id.* at [0052]. The device 50 senses the identity network via current sensor R2SENSE. *Id.* at Fig. 4A, [0058]. If the device 50 does not verify that the attached device can receive power, it may leave switches S1-S4 open, cutting off data and power to second connector 54. *Id.*

Device 50 may also act as a PSE with respect to a first device connected to third connector 56. Karam explains that the controller 58 may keep switch S5 to third connector 56 closed “only when current [is] being drawn from third connector 56 so that if the device were unplugged from third connector 56 the power would turn off.” *Id.* at [0051].

e. “wherein the information extracted comprises information regarding whether the first device is powered on or powered off, and whether or not the first device needs a supply of power.” 7[d]

Karam teaches this limitation. EX1003 ¶ 151. As explained above, the PSE extracts information from first device 50 via the detection and classification processes, and the device 50 similarly extracts information from devices coupled to connectors 54 and 56 via the detection and classification processes. This information concerns whether the devices are “off or disconnected” (EX1007 at [0058]); whether a connected device is a “legacy” device that cannot receive inline power (*id.* at [0022]); and whether the PD requires *some* amount of power, the specific amount to be optionally determined via the classification process (*id.* at [0018], [0021], [0065].).

2. Claim 9: “The method of claim 7, further comprising: detecting removal of a device of the plurality of devices.”

Karam also teaches the limitations of claim 9. EX1003 ¶¶ 152-53. With respect to the system of Fig. 4A, Karam discloses that the PSE extracts information from first device 50 via the detection and classification processes, and the device 50 similarly extracts information from devices coupled to connectors 54 and 56 via the detection and classification processes. This information concerns whether the devices are “off or disconnected.” EX1007 at [0058]. Karam further explains that “[r]emoval of the device coupled at third connector 56 removes the current drain

which may...cause controller 58 to stop requesting inline power from the PSE coupled to first connector 52.” *Id.* at [0057]. Karam explains that the system removes power shortly after a device is disconnected to avoid a “hot cable” situation. *Id.* at [0058].

IX. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Parties-In-Interest Under 37 C.F.R. § 42.8(b)(1)

Petitioners hereby name Dell Inc., Dell Technologies Inc., HP Inc., and Lenovo (United States) Inc. as real parties-in-interest and, solely because it is named as a defendant in a co-pending district court case listed below, further identify Lenovo Group Ltd. as a real party-in-interest.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

UCT asserted eight patents, including the ’712 Patent, against Dell in *Universal Connectivity Technologies Inc. v. Dell Technologies Inc. et al.*, CA 1:23-cv-01506 (W.D. Tex.), against HP in *Universal Connectivity Technologies Inc. v. HP Inc.*, CA 1:23-cv-01177 (W.D. Tex.) (terminated and transferred) and *Universal Connectivity Technologies Inc. v. HP Inc.*, CA 4:24-cv-04097 (N.D. Cal.), and against Lenovo Group Limited in *Universal Connectivity Technologies Inc. v. Lenovo Group Limited*, Civ. 2:23-00449 (E.D. Tex.).

Petitioners are concurrently filing this Petition and IPR petitions for other asserted patents: IPR2024-01428, IPR2024-01429, IPR2024-01479, IPR2024-01480, IPR2024-01481, and IPR2024-01482.

C. Lead and Back-Up Counsel under 37 C.F.R. § 42.8(b)(3)

Petitioners provide the following designation of counsel.

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D. Service Information

Please address all correspondence to the addresses above. Petitioners consent to electronic service by email at DL-DELL-UCT-MWE@mwe.com, HP-UCT-IPR@shb.com, and Lenovo-UCT-IPR@cov.com.

X. PAYMENT OF FEES UNDER 37 C.F.R. § 42.103

Petitioners authorize the Office to charge Deposit Account No. 50-0417 for the petition fee set in 37 C.F.R. §42.15(a) and for any other required fees.

XI. CONCLUSION

Accordingly, Petitioners request *inter partes* review of claims 1, 2, 3, 5, 7, and 9 pursuant to Grounds 1-6 set forth above.

Date: October 1, 2024

Respectfully submitted,

/s/ Brian W. Oaks

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CERTIFICATE OF COMPLIANCE WITH WORD COUNT

Under the provisions of 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13,848 words, which is less than the 14,000 allowed under 37 C.F.R. § 42.24(a)(1)(i).

/s/ Brian W. Oaks

Brian W. Oaks

CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) *et seq.* and 42.105(a), the undersigned certifies that on October 1, 2024, a complete and entire copy of this Petition for *Inter Partes* Review and all supporting exhibits were provided by Federal Express, cost prepaid, to the Patent Owner by serving the correspondence address of record:

Lattice Semiconductor/FENWICK
801 California Street
Mountain View, CA
UNITED STATES
*Patent Center Correspondence Address
of Record for U.S. Patent No. 8,680,712*

Additionally, a courtesy copy was also sent to patent owner's litigation counsel:

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Petitioners know these to be additional addresses likely to affect service.

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