UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TCT MOBILE (US), INC.; TCT MOBILE (US) HOLDINGS, INC.; HUIZHOU TCL MOBILE COMMUNICATION CO. LTD.; AND TCL COMMUNICATION, INC.,
Petitioners

v.

FUNDAMENTAL INNOVATION SYSTEMS INTERNATIONAL LLC,
Patent Owner

U.S. Patent No. 7,834,586
Issue Date: November 16, 2010
Title: MULTIFUNCTIONAL CHARGER SYSTEM AND METHOD

Case No. IPR2021-_____

PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT 7,834,586
CHALLENGING CLAIMS 1-2 AND 8-9 UNDER 35 U.S.C. §312 AND 37 C.F.R. §42.104

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Exhibit	***Description***
1001	U.S. Patent No. 7,834,586 to Fischer et al., "Multifunctional Charger System and Method," filed Feb. 26, 2010 (the "'586 Patent")
1002	U.S. Patent File History of the '586 Patent (the "'586 File History")
1003	Declaration of Dr. Jacob Baker regarding U.S. Patent No. 7,834,586 ("Baker")
1004	*Curriculum Vitae* of Dr. Jacob Baker
1005	U.S. Patent No. 7,239,111 ("Fischer")
1006	U.S. Provisional Application No. 60/273,021 (the "'021 provisional")
1007	U.S. Provisional Application No. 60/330,486 (the "'486 provisional")
1008	Universal Serial Bus Specification, Revision 1.1, September 23, 1998 ("USB 1.1")
1009	Universal Serial Bus Specification, Revision 2.0, April 27, 2000 ("USB 2.0")
1010	U.S. Patent No. 6,531,845 ("Kerai")
1011	U.S. Patent No. 6,625,738 ("Shiga")
1012	U.S. Patent Application Publication No. 2003/0135766 ("Zyskowski")
1013	U.S. Patent No. 6,625,790 ("Casebolt")
1014	Cypress CY7C63722/23 CY7C63742/43 enCoRe™ USB Combination Low-Speed USB & PS/2 Peripheral Controller, by Cypress Semiconductor Corporation, published May 25, 2000 ("Cypress enCoRe" or "Cypress Datasheet")
1015	Japanese Patent Application No. 2000-165513A ("Morita")
1016	Amended Complaint, *Fundamental Innovation Systems Int'l LLC v. TCT Mobile (US) Inc. et al.*, No. 1-20-cv-00552-CFC (D. Del. Sep. 11, 2020) ("Complaint")
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1018	U.S. Patent No. 5,923,146 ("Martensson")

I. INTRODUCTION

TCT Mobile (US), Inc., TCT Mobile (US) Holdings, Inc., Huizhou TCL Mobile Communication Co. Ltd., and TCL Communication, Inc. ("Petitioners") file this Petition for *inter partes* review of claims 1-2 and 8-9 (the "Challenged Claims") of U.S. Patent No. 7,834,586 (the "'586 Patent") on the grounds that they are unpatentable under 35 U.S.C. §103.

The Challenged Claims relate to a mobile device (and method for using the same) that uses industry standard Universal Serial Bus ("USB") ports and connectors to receive power and charge a battery. Receiving power through USB ports and connectors was well understood and routine by the earliest possible priority date of the '586 Patent, but the Challenged Claims purport to "invent" a mobile device that detects "an identification signal" that is "different than USB enumeration" (USB enumeration is a handshaking protocol). For example, the mobile device detects an "identification signal" that comprises a logic high value on the two data lines of an USB connection (a logic high value on the two data lines was known as a SE1 signal). The Challenged Claims essentially do nothing more than allow a mobile device to conventionally receive power through a USB interface without appropriately following the USB Specification (i.e., the enumeration protocol).

Notably, the Applicant did not tell the Examiner that (nor disclose the art in this Petition that establishes that) this "identification signal" was a well-known signal—known as a SE1 signal. Indeed, because the SE1 signal is "not a standard USB state," it was also known to use the SE1 signal in various contexts, including to identify a wake-up condition, identify a full power state, and identify the presence of a PS/2 adapter. What's more, the Examiner was not made aware that this SE1 signal was known to "be easily distinguished from USB standard data signals," making it an ideal identification signal because the ease in which a device, such as a mobile device, can ***detect*** it. Again, the Examiner was not made aware of this prior art. This Petition establishes that a mobile device that detects an identification signal, such as a SE1 signal, was painfully obvious.

Because there is a reasonable likelihood that Petitioners will prevail with respect to these claims, Petitioners respectfully request that the Board institute *inter partes* review.

II. SUMMARY OF CHALLENGE 37 C.F.R. §42.104(B)

Petitioners requests that the Board review and cancel claims 1-2 and 8-9 of the '586 Patent based on the following ground.

Ground	Claims	Basis	References
1	1-2 and 8-9	pre-AIA 35 U.S.C. § 103(a)	Morita and the knowledge of a POSITA

III. INSTITUTION SHOULD BE GRANTED; DISCRETIONARY DENIAL IS NOT APPROPRIATE

As the below explains, the Board should not exercise its discretion to deny institution under 35 U.S.C. §§ 314(a), 325(d). If the Board considers exercising its discretion to deny institution, however, Petitioner respectfully requests leave to file a reply to address any discretionary denial arguments made by Patent Owner in its preliminary response.

A. The *Apple/Fintiv* Factors Support Institution

The *Apple/Fintiv* factors support institution despite existence of a parallel district court litigation.

There is a parallel district court proceeding involving the ’586 Patent (Ex. 1005) before Judge Connolly in the District of Delaware. Amended Complaint (Ex. 1016). The complaint was filed in April 23, 2020. However, the *Apple/Fintiv* factors support institution despite the existence of the Delaware litigation. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020).

First, potential for a district court stay is neutral or weighs in favor of institution. Neither party has requested a stay,[1] so at worst this factor is neutral because the Board "will not attempt to predict" how the district court will proceed. *Sand Revolution II, LLC v. Continental Intermodal Group5 Trucking LLC,* IPR2019-01393, Paper 24 at 7 (PTAB June 16, 2020) (informative). Congress, however, intended for district courts to be liberal in granting stays pending PTAB proceedings, especially in cases where petitioners moved quickly after service of a complaint. 157 Cong. Rec. S1363 (Mar. 8, 2011) (Sen. Schumer) (Congress placed "a very heavy thumb on the scale in favor of a stay being granted"). Given that Petitioners have moved expeditiously (*see* factor 2 discussion below), this factor favors institution. Furthermore, Judge Connolly has consistently granted stays in similar patent litigation cases, especially those where the petitions are instituted. *See, e.g., Allergen USA, Inc. v. Prollenium US Inc.*, No. 1:20-cv-00104, Dkt. No. 34 (D. Del. July 16, 2020); *Uniloc 2017 LLC v. Vudu, Inc.*, No. 1:19-cv-00183, Dkt. No. 72 (D. Del. Mar. 26, 2020).

Second, the proximity of the trial date to the final written decision weighs in favor of institution. In the unlikely case that Judge Connolly does not grant a stay, the trial date is scheduled for October 17, 2022. This is after the PTAB's expected final written decision based on this Petition's filing in February 2021, which would

[1] Petitioner does intend to move for a stay of the Delaware case.

tentatively calendar an institution date in August, 2021 and final written decision date of approximately August, 2022 (depending on the accorded filing date).

Third, investment in the parallel proceeding, weighs in favor of institution. Discovery will still be in the early stages, with the deadline not until December 17, 2021. It is unlikely that any fact depositions will have taken place before the institution decision. Further, it is unlikely that the district court will have issued a *Markman* ruling by the time of the institution decision, and little to no Court resources will have been devoted to analyzing prior art invalidity issues. Again, the parallel district court litigation is likely to be stayed once the present Petition is instituted.

Furthermore, as part of a holistic analysis, the Board considers the speed with which the petitioner acted. *Apple Inc. v. Seven Networks, LLC,* IPR2020-00156, Paper 10, 11–12 (PTAB June 15, 2020). In cases where the petitioner acted diligently and without meaningful delay, as here, any investment of the parties in the parallel district court litigation is mitigated. *HP Inc. v. Neodron LTD,* IPR2020-00459, Paper 17, 40 (PTAB Sept. 14, 2020). Here, Petitioners filed this Petition within about five months of the Answer date, and roughly three months after Patent Owner served preliminary infringement contentions. Such diligence favors institution.

Fourth, overlap of issues, weighs in favor of institution. The Petition challenges claims that are not asserted in the district court action. And while the petition also challenges the same claims as the parallel district court proceeding, there is a high likelihood that Judge Connolly grants a stay upon institution. In the unlikely instance where a stay is not granted, a final written decision will still issue before the beginning of trial. The final written decision, once issued, will trigger estoppel for in the district court litigation for grounds that were raised or reasonably could have been raised. *See* 35 U.S.C. §315(e)(2).

Fifth, whether the parties are the same, weighs in favor of institution. The parties with respect to this Petition are the same as those engaged in the parallel district court case.

Finally, other circumstances strongly favor institution. Petitioners advance a targeted Petition with one ground centered on a prior art reference that has never been submitted to the Board previously. The strength of the present Petition strongly weighs in favor of institution. The ’586 Patent has been asserted against several large electronics companies such as Coolpad, Lenovo, and Petitioners. Patent Owners assert that USB adapters, which are ubiquitous, and the mobile devices they charge infringe the ’586 Patent and related patents. Given the substantial impact that the ’586 Patent and related patents could have on the mobile device industry, it is in the public interest to address invalidity, especially under new prior art never before submitted to the Board. And as the Supreme Court recently explained, there is a significant public interest against "leaving bad patents enforceable." *Thryv, Inc. v. Click-To-Call Techs., LP*, 140 S. Ct. 1367, 1374 (2020).

B. The General Plastics Factors Support Institution

The *General Plastics* factors support institution despite earlier IPRs being filed by other, unrelated entities. Section X.B (Related Matters). First, the current Petitioner (and the real parties-in-interest) are different from the prior petitioners; nor is there any relation between the current and prior petitioners. *Id.* Second, because when the earlier petitions were filed the current Petitioner had not been sued or provided notice of alleged infringement, the current Petitioner did not know of the prior art in this Petition when the earlier petitions were filed (nor did it have any reason to search for the prior art). *Id.* Third, while the preliminary responses decisions from the earlier IPRs did issue before the filing of the current Petition, this timing is the result of Patent Owner not suing the current Petitioner until after said issuance and is thus not the result of current Petitioner's delay. *Id.*; *Microsoft Corp. v. Uniloc* 2017, LLC, IPR 2019-01252, Paper 7, 8-9 (PTAB Dec. 20, 2019). Fourth, Petitioner was diligent in filing the current petition, promptly moving to file this Petition after receiving Patent Owner's selection of claims. Section X.B; *LG Electronics, Inc. v. Bell Northern Research, LLC*, IPR 2020-00319, Paper 15, 13 (PTAB June 23, 2020).

C. The Factors Under 35 U.S.C. §325(d) Support Institution

The factors under 35 U.S.C. §325(d) also support institution. The primary reference, Morita, was not before the Examiner during prosecution and was not asserted in any of the previous IPRs involving the '586 Patent. And the prior art establishing that using a logic high value on the USB data lines was a known identification signal, *see* Sections VI.A-B, was also not before the Examiner.

The previous IPRs do not present the same or substantially the same arguments as this Petition.

In IPR2018-00485, petitioner relied on Theobald as a primary reference, arguing that it would be obvious to change Theobald's 8-pin J3 connection to an USB connection. IPR2018-00485, Paper 8 (ID), 9, 11-14. Because Morita already employs an USB connection, these arguments are irrelevant to this Petition. *See* Section VI.C. In that proceeding, petitioner also relied on Dougherty as a primary reference. Its arguments were found unpersuasive because petitioner did not explain how using SE1 was compatible with Dougherty's operation, i.e., Dougherty allegedly requires the data lines to communicate to various devices. *Id.*, 18-19. Because Morita employs a charger (known as an adapter) and one of its express purposes is to merely charge a mobile phone by placing the phone on the convenient docking station, it discloses a scenario in which communication is irrelevant over the USB lines, and thus the Dougherty arguments are irrelevant to this Petition. *See* Sections VI.C, VIII.A.1.f.

In IPR2018-00493, petitioner relied on Dougherty as its primary reference. PR2018-00493, Paper 10 (ID), 8-9. That petitioner's arguments were found unpersuasive because it did not articulate persuasive reasons to replace Dougherty's USB enumeration with a SE1 signal and abandon Dougherty's USB communication with the devices. *Id.*, 19-21. These shortcomings are similar to the above and are irrelevant to this Petition. Because Morita employs a charger (known as an adapter) and one of its express purposes is to merely charge a mobile phone, it discloses a scenario in which standard USB communication is irrelevant (and not possible) over the USB data lines, and thus these Dougherty arguments are irrelevant to this Petition. *See* Sections VI.C, VIII.A.1.f. Further, this Petition explains that the SE1 signal identifies, and enables charging from, a High-power port. *See* Section VIII.A.1.f.

In IPR2018-00274, petitioner relied on Theobald as its primary reference. PR2018-00493, Paper 10 (ID), 8-9. The petitioner's arguments were found unpersuasive for similar reasons as in IPR2018-00485 (see above). Because Morita already employs an USB connection, these arguments are irrelevant to this Petition. *See* Section VI.C.

IV. OVERVIEW OF THE ’586 PATENT

A. Disclosure of the ’586 Patent (Ex. 1001)

The ’586 Patent has 13 claims that focus on the mobile device in the context of an “[a]n adapter for providing a source of power to a mobile device through an industry standard port.” ’586 Patent, 2:7-11. An “adapter” simply refers to a device that receives a power source (e.g., from a wall socket) and delivers the power to another device (e.g., a mobile device). *E.g.*, Abstract, 1:34-35.

At its heart, the ’586 Patent relates to a standard USB adapter and mobile device that simply ignores certain initiation protocols (i.e., enumeration) or limits that are required and defined in the USB Specification. *E.g., id.*, 1:48-63, 8:1-6, 8:60-9:4. To ignore these USB protocols or limits, the adapter sends an identification signal to inform the mobile device that the adapter is not a typical USB host or hub (which further indicates that it is not acting in compliance with the USB Specification). *Id.*, 8:60-9:4, 9:15-32. The ’586 Patent discloses several variations of the identification signal, such as “a logic high signal” on the USB data lines (known as a SE1 condition, *see* Section VI.A). *Id.*, 8:21-23; 9:21-25. The adapter is made of conventional components like a plug unit that attaches to a power socket, a power converter (e.g., that down-converts a standard AC wall voltage), and standard USB components. *See id.*, 7:3-56.

The ’586 Patent discloses that a mobile device detects the identification signal (e.g., “detects the presence of a voltage on the Vbus line of the USB connector”), determines that the adapter is not a typical USB host or hub (e.g., “determines that the device connected to the USB connector 54 is not a typical USB host or hub and that a USB adapter”), and proceeds to immediately charge without undergoing the enumeration process. *Id.*, 9:18-34. The ’586 Patent discloses that the mobile device includes a “charging subsystem” and “power distribution subsystem” that distributes power, e.g., from the adapter connection, to the battery to charge the battery. *Id.*, 6:17-33.

The Challenged Claims are directed to the mobile device that ***detects*** the identification signal.

Figure 2, reproduced below, is a schematic diagram of the disclosed mobile device (10) coupled to an exemplary adapter (100). *Id.*, 3:23-24.

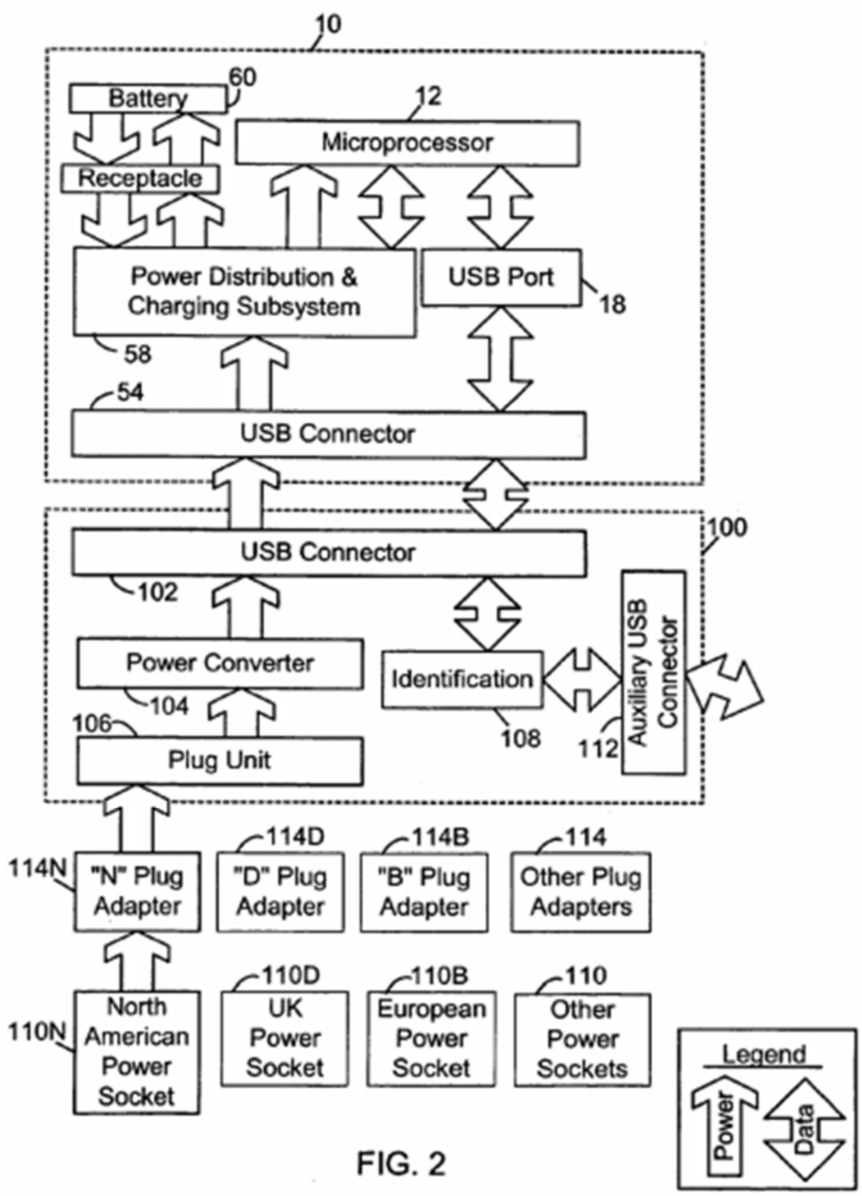

FIG. 2

B. Prosecution History of the ’586 Patent (Ex. 1002)

There was not substantive prosecution on the merits in the file history of the ’586 patent. There was only a terminal disclaimer rejection, a filed terminal disclaimer, and allowance with no statement as to the reason or allowance. Ex. 1002, 119, 124, 135, 138-139, 177, 183, 184.

The ’586 Patent claims priority through a series of continuations to two provisional applications: (1) the ’021 provisional (Ex. 1006), filed March 1, 2001; and (2) the ’486 provisional (Ex. 1007), filed October 23, 2001. Thus, the earliest potential priority date is March 1, 2001. The prior art in this Petition is prior art even assuming the priority date of the ’586 Patent is March 1, 2001.[2]

V. PERSON OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (“POSITA”) of the subject matter of the ’586 Patent would have either a bachelor's degree in electrical engineering, computer science, or a related field, plus 3-5 years of experience in design of systems with Universal Serial Bus (“USB”) or equivalent buses that follow the USB 2.0 and earlier specifications, or a master’s degree in electrical engineering, computer science, or a related field, plus 1-2 years of experience in design of systems with USB or equivalent buses that follow the USB 2.0 and earlier specifications at the time of the ’586 patent’s priority date. Along with this petition, Petitioner submits the declaration of Dr. Jacob Baker, who has been a POSITA since at least the ’586 Patent’s claimed priority date. Baker (Ex. 1003) (“Baker”), ¶ 68.

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[2] The Patent Owner in the district court case has asserted that the claims are entitled to the October 23, 2001 priority date. Regardless, the prior art cited herein is prior art to either date.

VI. SUMMARY OF THE PRIOR ART

All elements of the challenged claims were well-known in the prior art before the priority date. As this Petition explains, it would have been obvious, and a POSITA would have been motivated with a high expectation of success, to combine these well-known elements to arrive at the Challenged Claims. The below first provides background on the USB specification and then details that using the signal, known as SE1 in the USB specification, to provide various indications—and to ***detect*** the SE1 signal—was well known. The below then summarizes the Morita reference that discloses a mobile phone in which it would be obvious, and a POSITA would have been motivated with a high expectation of success, to detect the SE1 signal sent by the Morita USB adapter, with the SE1 signal identifying that the Morita adapter is not a typical USB host or hub (instead, it is an adapter that a has a high current source available for charging) so that the mobile device may draw a high current source to charge its battery.

A. Background of USB Technology and USB Specification Prior Art

The Universal Serial Bus Specification, Revision 1.1 was published by the USB Implementers Forum, Inc. on September 23, 1998 and therefore is prior art to the ’586 Patent under at least 35 U.S.C. §102(b). Ex. 1008, (“USB 1.1”), Cover Page, 2 (copyright and revision history); Baker ¶ 69.

Figure 4-1, below, shows the bus topology for a USB system. "There is only one host in any USB system. The USB interface to the host computer system is referred to as the Host Controller. The Host Controller may be implemented in a combination of hardware, firmware, or software. A root hub is integrated within the host system to provide one or more attachment points." USB 1.1, 16. In other words, a host, with a root hub, is required in a functioning USB system (i.e., one in which communication occurs). Baker, ¶ 70. Connecting, for example as seen below, Hub 1 to a node (a node is a connected device, also called a "function") or Hub 2 without connecting Hub 1 to the Host via the Root Hub will not result in a function, and communicating, USB system. *Id.*

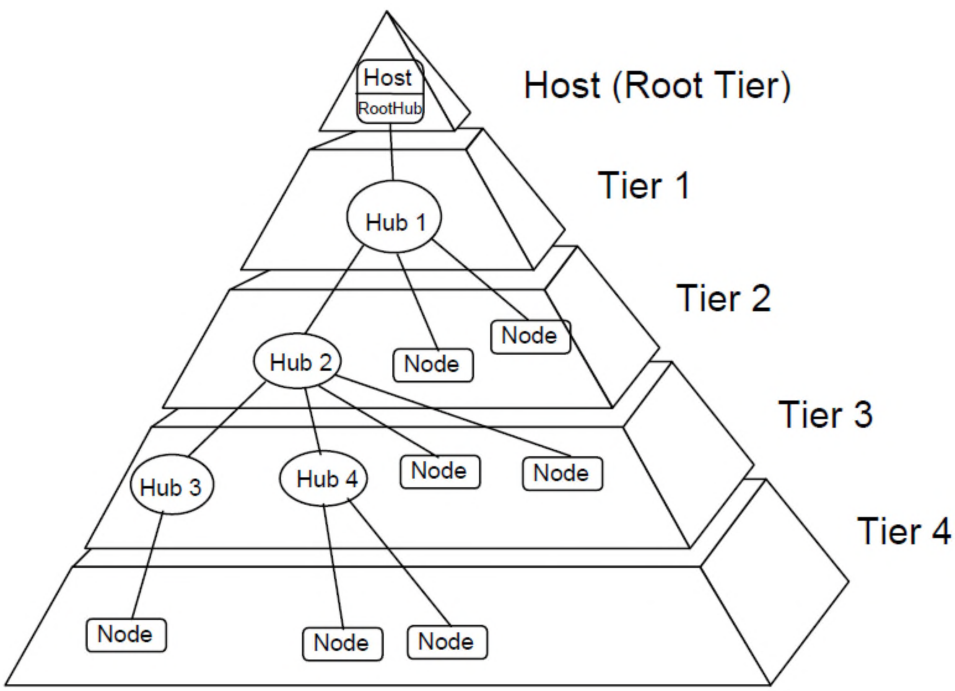


Figure 4-1. Bus Topology

USB 1.1, 16 (annotated).

USB 1.1 instructs that a USB device (i.e., node or function) is plugged into a port on a hub using a cable. “A function is a USB device that is able to transmit or receive data or control information over the bus. A function is typically implemented as a separate peripheral device with a cable that plugs into a port on a hub.” USB 1.1, 23. The cable is connected between a USB connector on a USB device and a USB connector on a host or hub.

Figure 4-4 illustrates how hubs provide connectivity in a typical computer environment.

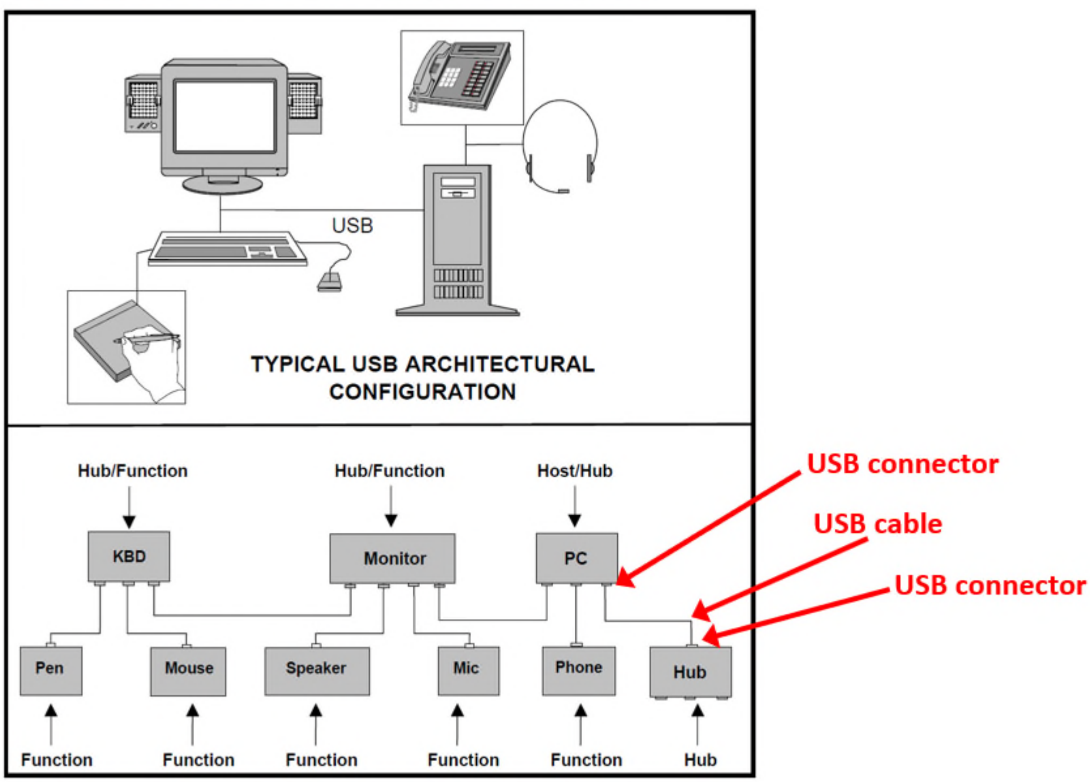


Figure 4-4. Hubs in a Desktop Computer Environment

USB 1.1, 23 (annotated).

USB 1.1 teaches a POSITA how to implement a USB plug and that a USB connector includes four contacts: VBUS, D+, D-, and GND:

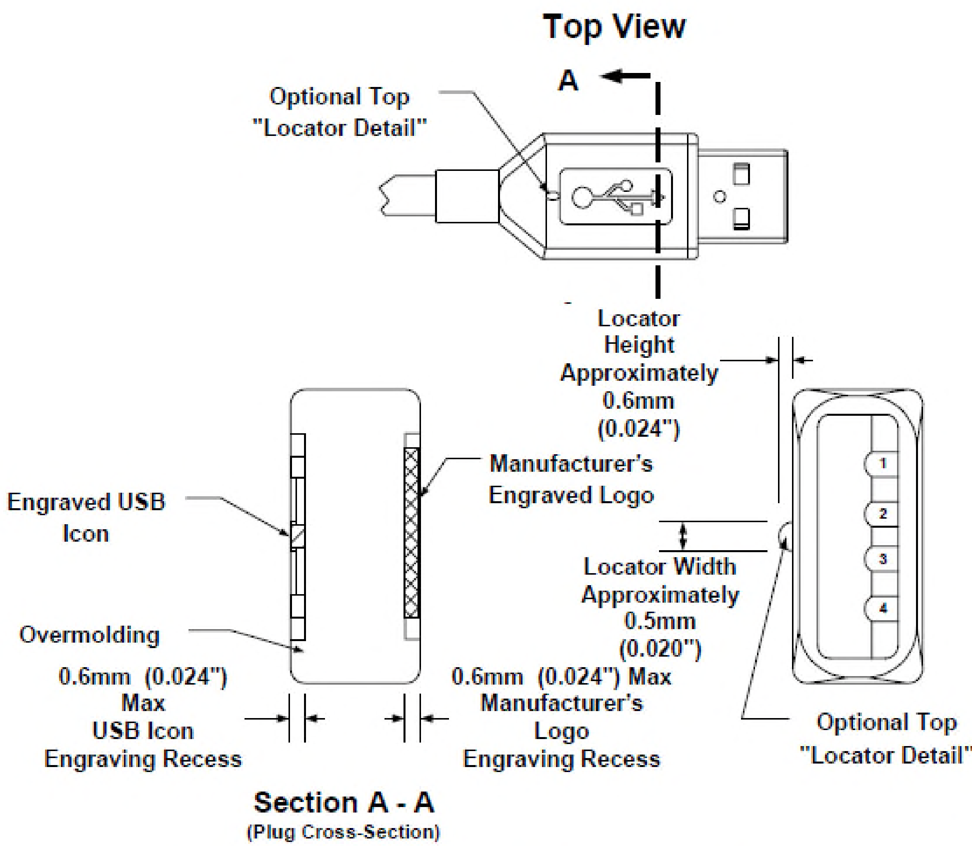


Figure 6-6. Typical USB Plug Orientation

Table 6-1. USB Connector Termination Assignment

Contact Number	Signal Name	Typical Wiring Assignment
1	VBUS	Red
2	D-	White
3	D+	Green
4	GND	Black
Shell	Shield	Drain Wire

USB 1.1, 81-82.

USB 1.1 "describes the bus attributes, the protocol definition, types of transactions, bus management, and the programming interface required to design and build systems and peripherals that are compliant with this standard." USB 1.1, 1. The standard also describes that power is supplied on the VBUS line and the associated current limits and minimums:

Table 7-5. DC Electrical Characteristics

Parameter	Symbol	Conditions	Min.	Max.	Units
Supply Voltage:					
High-power Port	VBUS	Note 2, Section 7.2.1	4.75	5.25	V
Low-power Port	VBUS	Note 2, Section 7.2.1	4.40	5.25	V
Supply Current:					
High-power Hub Port (out)	ICCPRT	Section 7.2.1	500		mA
Low-power Hub Port (out)	ICCUPT	Section 7.2.1	100		mA
High-power Function (in)	ICCHPF	Section 7.2.1		500	mA
Low-power Function (in)	ICCLPF	Section 7.2.1		100	mA
Unconfigured Function/Hub (in)	ICCINIT	Section 7.2.1.4		100	mA
Suspended High-power Device	ICCSH	Section 7.2.3 ; Note 15		2.5	mA
Suspended Low-power Device	ICCSL	Section 7.2.3		500	μA

USB 1.1, 142.

To determine if a connected device is either a "High-power Function (in)" that may draw up to 500 mA or a "Low-power Function (in)" that may draw up to 100 mA a process called "bus enumeration" or simply "enumeration" is performed on the connected function (i.e., device). USB 1.1, 3 ("Bus Enumeration - Detecting and identifying USB devices"). "At bus enumeration time, its (the attached functions) total power requirements are obtained and compared against the available power budget. If sufficient power exists, the remainder of the function may be powered on." USB 1.1, 137. As Table 7-5 illustrates, while the input USB port of a function (device) may draw up to either 100 mA [Low-power Function (in)] or 500 mA [High-power Function(in)], the same limits do not apply for the output ports on a USB hub. Rather, a "High-power Hub Port (out)" may supply in excess of 500 mA while a "Low-power Hub Port (out)" may supply in excess of 100 mA. Baker, ¶ 74.

USB 1.1 also indicates that the host is responsible for providing power to an attached USB device:

4.9 USB Host: Hardware and Software

The USB host interacts with USB devices through the Host Controller. The host is responsible for the following:

- Detecting the attachment and removal of USB devices
- Managing control flow between the host and USB devices
- Managing data flow between the host and USB devices
- Collecting status and activity statistics
- Providing power to attached USB devices.

The USB System Software on the host manages interactions between USB devices and host-based device software. There are five areas of interactions between the USB System Software and device software:

- Device enumeration and configuration
- Isochronous data transfers
- Asynchronous data transfers
- Power management
- Device and bus management information.

Whenever possible, the USB System Software uses existing host system interfaces to manage the above interactions.

USB 1.1, 24 (annotated).

Newer USB specifications, such as the USB 2.0 Specification (USB 2.0) published on April 27, 2000[3], are fully backward compatible with devices built with previous versions of the specification, such as USB 1.1.

Chapter 3
Background

This chapter presents a brief description of the background of the Universal Serial Bus (USB), including design goals, features of the bus, and existing technologies.

3.1 Goals for the Universal Serial Bus

The USB is specified to be an industry-standard extension to the PC architecture with a focus on PC peripherals that enable consumer and business applications. The following criteria were applied in defining the architecture for the USB:

- Ease-of-use for PC peripheral expansion
- Low-cost solution that supports transfer rates up to 480 Mb/s
- Full support for real-time data for voice, audio, and video
- Protocol flexibility for mixed-mode isochronous data transfers and asynchronous messaging
- Integration in commodity device technology
- Comprehension of various PC configurations and form factors
- Provision of a standard interface capable of quick diffusion into product
- Enabling new classes of devices that augment the PC's capability
- Full backward compatibility of USB 2.0 for devices built to previous versions of the specification

USB 2.0, 11.

USB 1.1 discloses that an attached device can operate at "full-speed" or "low-speed." USB 1.1 discloses "The speed of an attached device is determined by the

[3] USB 2.0 is prior art to the '586 Patent under at least 35 U.S.C. §102(a). Ex. 1009, ("USB 2.0"), Cover Page, 2 (copyright and revision history). USB specifications were well-known and accessible standards. Baker, ¶ 69.

placement of a pull-up resistor on the device (see Section 7.1.5).” USB 1.1, 251. The specific nature of how D+ and D- are connected is discussed in detail below and in USB 1.1 “Hubs, and the devices to which they connect, use a combination of pull-up and pull-down resistors to control D+ and D- in the absence of their being actively driven. These resistors establish voltage levels used to signal connect and disconnect and maintain the data lines at their idle values when not being actively driven.” USB 1.1, 256.

USB 1.1 discloses “Full-speed devices are terminated as shown in Figure 7-10 with the pull-up resistor on the D+ line” and “Low-speed devices are terminated as shown in Figure 7-11 with the pull-up resistor on the D- line.” USB 1.1, 113. These figures are annotated below to show that a pull-up resistor, labeled R_{pu}, on the D+ line indicates a “full-speed device” while a pull-up resistor, also labeled R_{pu}, on the D- line indicates a “low-speed device.”

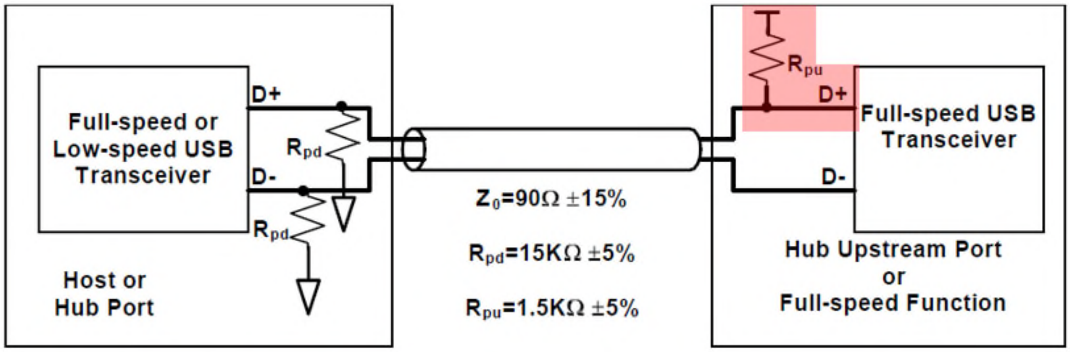


Figure 7-10. Full-speed Device Cable and Resistor Connections

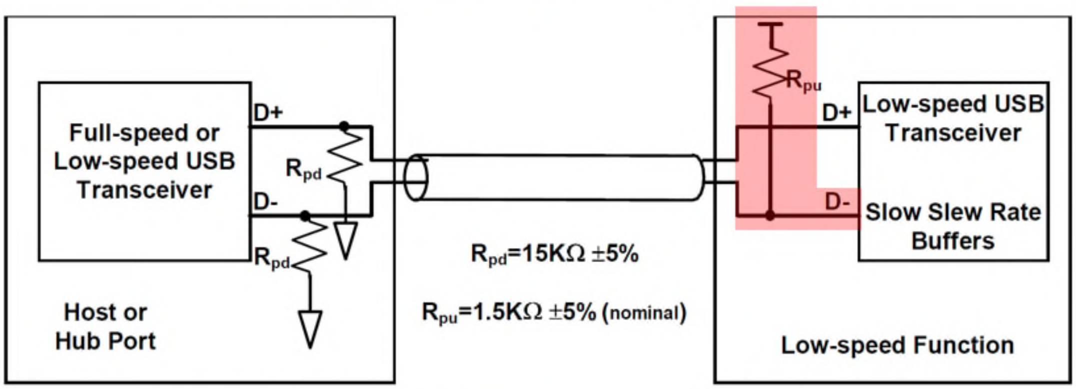


Figure 7-11. Low-speed Device Cable and Resistor Connections

USB 1.1 at 113 and 114 (annotated).

USB 1.1 also discloses that in the host or hub port "The pull-down terminators on downstream ports are resistors of 15kΩ+/-5% connected to ground." USB 1.1, 113. These resistors are annotated below and labeled R_{pd}.

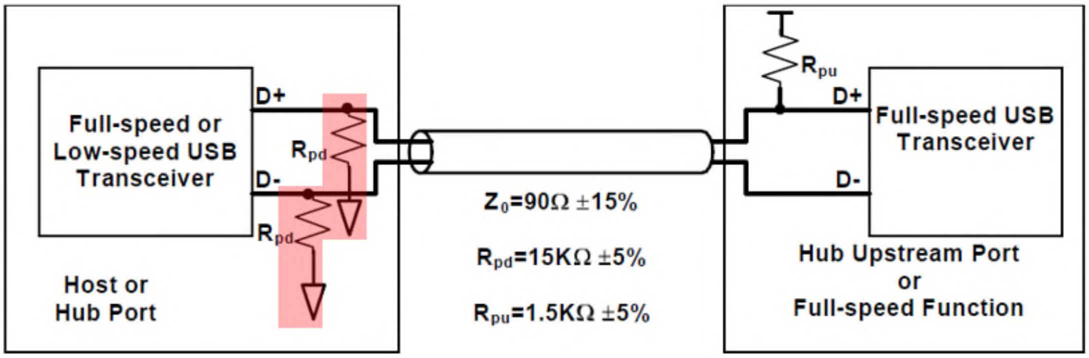


Figure 7-10. Full-speed Device Cable and Resistor Connections

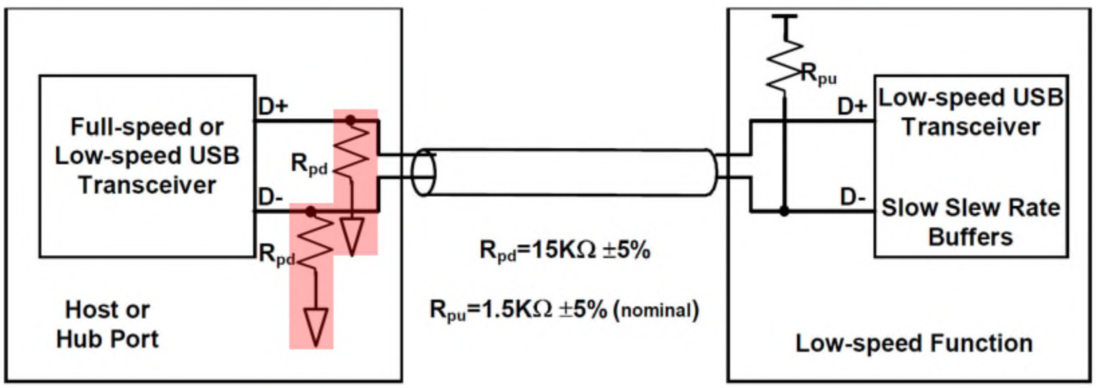


Figure 7-11. Low-speed Device Cable and Resistor Connections

USB 1.1, 113 and 114 (annotated).

When no pull-up resistor, R_{pu}, is present on D+ and/or D- the corresponding line is pulled to ground through R_{pd}. If both D+ and D- are at ground then no device is connected to the USB host or hub port. If D+ is pulled high and D- is at ground the connected device operates in full-speed. If D+ is at ground and D- is pulled high the connected device operates in low-speed. If D+ and D- are to be used for communications by either full- or low-speed devices then their voltages should never intentionally be pulled high (above 0.8V) at the same time. This is taught in the USB 2.0 specification "When determining the speed, full- or low-speed, the pull-up Low-speed and full-speed USB drivers ***must never 'intentionally'*** generate an SE1 on the bus. SE1 is a state in which both the D+ and D- lines are at a voltage above VOSE1 (min), which is 0.8 V." USB 2.0, 123 (emphasis added). As the below explains, while an SE1 is present on the data lines, the abnormal data line condition of D+ and D- both being high at the same time, communications are not possible. This situation, SE1, is outside normal USB operation. *Id.*; Baker, ¶¶ 78-80.

USB 1.1 states "if both D+ and D- are high at this time, the hub may stay in the Disabled state and set the C_PORT_ENABLE bit to indicate that the hub could not determine the speed of the device." USB 1.1, 252. A POSITA would have understood that if both the D+ and D- contacts are high at the same time (SE1) in the USB connector on a USB host or hub port the speed of a connected device cannot be determined and thus communications between the host or hub and the connected device are not possible. Baker, ¶ 81.

The USB 1.1 further states "After the device has been powered, it must not respond to any bus transactions until it has received a reset from the bus. After receiving a reset, the device is then addressable at the default address." USB 1.1, 178. The connected device, after being powered-up through the connection to the USB port though a USB cable, will not process commands until it receives a reset. However, if the connected device cannot communicate, because it is impossible for the host or hub to determine the communication speed, then the connected device cannot receive a reset command and thus cannot receive or process commands (to, for example, clear the set C_PORT_ENABLE bit which indicates the port speed cannot be determined or to power-down). ***The device simply continues to receive power*** via VBUS and GND and waits for the reset command, which it can never receive in this abnormal data line condition with both D+ and D- pulled high. Baker, ¶ 82. The connected device will default to drawing power as if it is connected to a Low-power port, and because enumeration is not possible, will only draw power at the Low-power port level. USB 1.1, 134. Baker, ¶ 82.

A summary of the relationship between the D+ and D- levels on a USB connector and the port configurations discussed in this section is shown below:

D+	D-	Port configuration
Low	Low	No device connected
High	Low	Full-speed
Low	High	Low-speed
High	High	Abnormal condition

B. Use of SE1 State in Various Contexts

As explained herein, the '586 Patent teaches pulling USB D+ and D- lines high as an identification signal, which identifies, for example to a mobile device, that the adapter and/or power socket is not a typical host or hub. *See* Section IV.A. The Challenged Claims are directed to the simple act of detecting the identification signal. As further explained herein, pulling D+ and D- high was well known and referred to as an SE1 condition or state in the USB specification. *See* Section VI.A.

It was also well-known that one could use, i.e., both generating and detecting, the SE1 condition as an identifying signal in various contexts. Indeed, a POSITA would have understood that the SE1 condition would be a logical choice for signaling information about a device without interfering with USB signaling because the SE1 is an abnormal condition outside the USB specification's teaching on USB communications. Baker, ¶ 84. Below are just a few prior art references that disclose using, including detecting, SE1 for this purpose. None of the below references was before the Examiner during prosecution.

1. US Patent 6,531,845 ("Kerai") (Ex. 1010)

U.S. Patent 6,531,845 was filed as Application No. 09/864,273 on May 25, 2001, claimed a priority date of May 26, 2000, and issued on March 11, 2003 to Kanji Kerai and Kalle Tuulos. Thus, Kerai is prior art under at least pre-AIA §102(e).

Kerai used a high state on USB D+ and D- for charging a mobile device (e.g., laptop computer) with a charging system. Kerai, Fig 3, 5:43-51. Kerai states "A battery charging circuit is described in which power is derived from a communications port such as a USB interface (22) and is supplied to a rechargeable battery of a communications device." Kerai, Abstract. "***As is well known***, the data lines of a serial connection (D+ and D- in the USB interface) are held high when the connection is inactive and will vary between a high and low state whilst communication over the ports takes place." Kerai, 5:45-48 (emphasis added); Baker, ¶ 85. Kerai discloses two instances of a "logic detector 50," and each instance "detects the state of" a data line (i.e., D+ or D-). *Id.*, 5:49-53. Kerai further discloses that the logic detectors detect if each line is high (i.e., a SE1 state) and configures its circuitry to charge a battery in response to the detection of the SE1 signal. Kerai, 5:45-56; Baker, ¶ 85.

2. US Patent 6,625,738 ("Shiga") (Ex. 1011)

U.S. Patent 6,625,738 was filed as Application No. 09/454,621 on December 6, 1999, claimed a priority date of December 15, 1998, and issued on September 23, 2003 to Sadakazu Shiga. Thus, Shiga is prior art under at least pre-AIA §102(e).

Shiga recognizes that, according to USB standards at the time and as discussed above, there are three (D+, D-) signal line states representing three modes: (1) low-speed mode (D+ signal line is set to a low level ("L") and D- line is set to a high level ("H")); (2) full-speed mode (D+ is high and D- is low); and (3) unconnected mode (both D+ and D- are low). These three states are shown in Shiga's Table 1 seen below. Shiga, 5:38-60; Baker, ¶ 86.

TABLE 1

	Low Speed	Full Speed	Unconnected
D+	L (Hi-Z)	H	L (Hi-Z)
D−	H (Hi-Z)	L (Hi-Z)	L (Hi-Z)

In contrast to these three USB standard modes, Shiga also explains that the "fourth mode" signal, which is when both D+ and D- are in the H level state (i.e., an SE1 condition), is "not a USB standard state" and can therefore "be easily distinguished from USB standard data signals." Shiga, 5:60-62, 6:48-58. This fourth mode signal is transmitted by a USB apparatus (*e.g.*, keyboard) to wake up a host computer. Shiga, Abstract, 6:35-47. Shiga further discloses circuitry in the host computer (e.g., comparing means and an AND gate) to detect the SE1 signal and trigger the wake-up process). *Id.*, 6:59-7:15; Baker, ¶ 87. Accordingly, in 1999, using the signal state that it is not a USB standard mode (*i.e.*, in which both D+ and D- are in the H state – the SE1 signal), including detecting it, was well-known. Shiga, 5:60-62; 6:48-50; Baker, ¶¶ 86-87.

3. US Patent Application Publication US20030135766 ("Zyskowski") (Ex. 1012)

U.S. Patent App. Publication No. 2003/0135766 was filed as Application No. 09/453,656 on December 3, 1999 and issued on July 17, 2003 to Paul J. Zyskowski and Greg E. Scott. Thus, Zyskowski is prior art under at least pre-AIA §102(e).

Zyskowski is another example of prior art that discloses an SE1 condition (with D+ and D- being set at 5 V) being used by a device (*e.g.*, computer) as an identification signal, specifically, to signal its full power state to a different device (*e.g.*, mass storage device, consumer electronic device). Zyskowski, ¶ 19; Baker, ¶ 88. In particular, Zyskowski discloses that "[w]hen the host 104 is in a full power state, data lines D1 and D2 may be raised to a predefined DC voltage level, for example, 5 volts (systems operating at lower voltages might raise the data paths to 3 volts, 2 volts, or even less)," i.e., a SE1 signal is sent by the host. *Id.* Further, Zyskowski discloses "device 106 may detect the power state of host 104 by detecting the presence or absence of the predefined DC voltage level on the data paths D1 and D2." *Id.* Note that device 106 "may be virtually any electronic device," such as consumer electronic devices (video cassette recorders, music devices, etc.)." *Id.* Thus, this again illustrates that in 1999, using the signal state that it is not a USB standard mode (*i.e.*, in which both D+ and D- are in the H state – the SE1 signal), including detecting it, was well-known.

4. US Patent 6,625,790 ("Casebolt") (Ex. 1013)

U.S. Patent 6,625,790 was filed as Application No. 09/409,683 on October 1, 1999, claimed a priority date of July 8, 1998, and issued on September 23, 2003 to Mark W. Casebolt and Lord Nigel Featherston. Thus, Casebolt is prior art under at least pre-AIA §102(e).

Casebolt discloses that an SE1 condition could be used as a special signaling mode in which the D+ and D- data lines would be connected to Vcc (+5V) to identify and signal the presence of a PS/2 adapter. Casebolt, 7:40-54; Baker, ¶ 89. Indeed, the SE1 state for USB (*i.e.*, when both the D+ and D- data lines are both at H level) is shown in Casebolt's Table 1 below.

TABLE 1

I/O State	D+/CLK	D−/DAT	USB	PS/2
0	L	L	SEO (Single Ended O) or Reset	Host Inhibit
1	L	H	J, Idle	Host Inhibit
2	H	L	K, Xmit Resume	Host Xmit
3	H	H	SE1 (Single Ended 1)	Idle, Confirm Connect

Casebolt, Table 1, *see also* 6:55-7:8.

Further, Casebolt discloses that "controller 144," which is part of a peripheral device, detects the SE1 condition. *Id.*, 6:6-16, 7:30-45; Baker, ¶ 89. Thus, this yet again illustrates that by 1999, using the signal state that it is not a USB standard mode (*i.e.*, in which both D+ and D- are in the H state – the SE1 signal), including detecting it, was well-known.

5. Cypress Semiconductor enCoReUSB Datasheet (Ex. 1014)

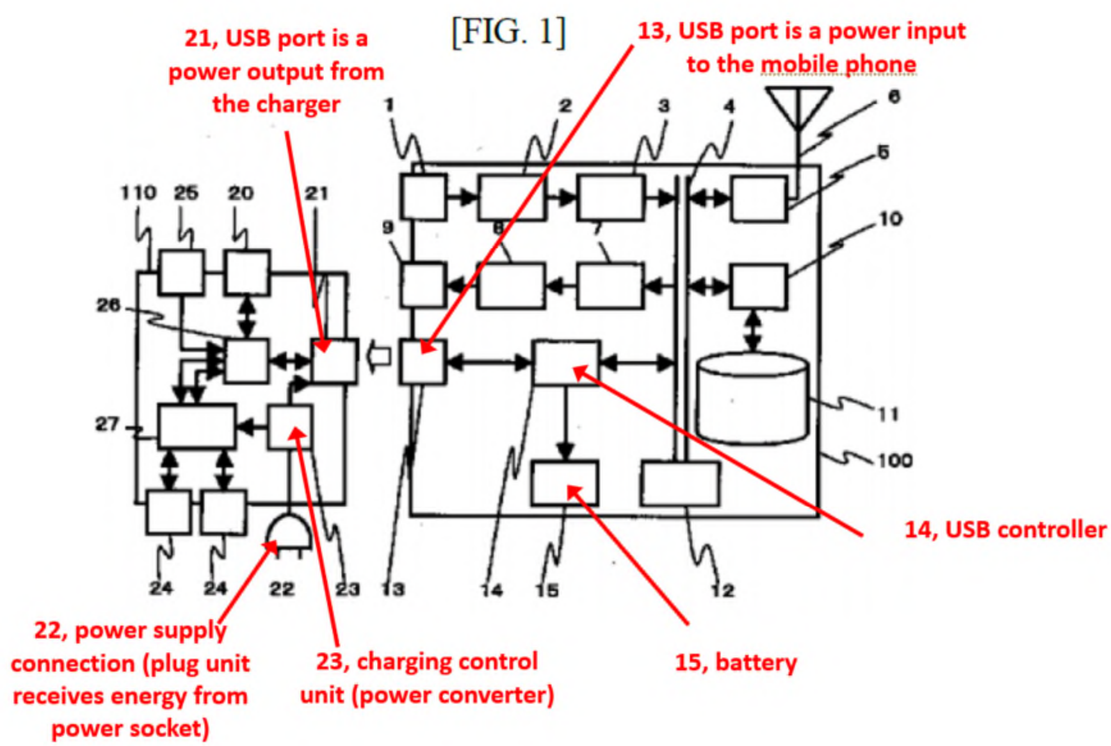
Knowledge regarding the use of a state in which D+ and D- are both high was so common that Cypress Semiconductor integrated it into its enCoReUSB product in 2000. Cypress, 24-25; Baker, ¶ 90.

C. Overview of Morita (Ex. 1015)

Ex. 1015, Japanese Patent Application No. 2000-165513A ("Morita"), titled "Charger," was filed on November 30, 1998. Morita is prior art under at least 35 U.S.C. §102(b). Morita was not considered during prosecution.

The aim of Morita is to "provide a hub-controllable charger capable of accessing a plurality of external devices in a state wherein a mobile phone is coupled to the charger, and capable of managing transmission and branching of signals between each." Morita, Abstract. Morita thus discloses a "charger capable of charging a mobile phone and coupling to an external device," specifically, a "USB format charger provided with a HUB function capable of connecting to a plurality of devices." Morita, Technical Field.

Figure 1 of Morita, below, depicts a block diagram of one embodiment of the charger (adapter) and mobile videophone:



Morita, Figure 1 (annotated).

In Figure 1, mobile videophone device 100 draws power from the charger 110. Morita, [0016]. The charger has USB port 21, the mobile device has USB ports 13, and the mobile videophone device draws power through USB port 13. *Id.*, [10013]-[0016]. The charger draws power from the power supply connection 22 where the power supply cable from an electrical outlet is connected to an outlet (e.g., a typical wall power socket). *Id.*, [0016]. The charging control unit 23 takes the power supply voltage supplied from the power supply and supplies a voltage to USB port 21. *Id.*, [0014]. The power from USB port 21 is coupled to the mobile videophone's USB port 13, which is coupled to USB controller 14, which in turn, is coupled to battery 15 to charge the batter. *Id.*, [0013]-[0014]; Baker, ¶¶ 94-96.

VII. CLAIM CONSTRUCTION

The Board construes claims in an IPR in accordance with *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). 83 Fed. Reg. 51340, 51340-44 (Oct. 11, 2018). Under the *Phillips* standard, "words of a claim are generally given their ordinary and customary meaning." *Phillips*, 415 F.3d at 1312-13 (internal quotations omitted).

Claim construction is only necessary to the extent it is required to resolve disputes presented in the Petition. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Petitioners submit that no terms need to be construed to resolve the issues presented by this Petition and the claims should be afforded their plain and ordinary meaning in view of the '586 Patent's specification and prosecution history, as would have been understood by a POSITA.

Note that in a prior litigation not involving Petitioner, USB was construed to mean Revision 2.0 and related versions of the USB specification. *Fundamental Systems International LLC v. Samsung Electronics Co., LTD*, 2:17-cv-00145, 22 (E.D. Tex. 2018). The Court reasoned that "USB" "should be limited to the Universal Serial Bus standards that existed at the time of the claimed invention." *Id.*, 20. This construction is irrelevant to this Petition. USB 1.1 is a related version to USB 2.0 because like USB 2.0, it "existed at the time of the claimed invention";

thus, any prior art disclosures for USB 1.1 apply to the claimed USB terms. In any event, the power requirements for the ports are identical in both versions (*compare* Ex. 1008, 142 *with* Ex. 1009, 178), and thus the rationale for seeking to charge from a High-power port is equally applicable to USB 1.1 and 2.0. Both USB 1.1 and 2.0 versions were well known at the time of the alleged invention (*see* Section VI.A.) and USB 2.0 is fully backward compatible with USB 1.1. Finally, with respect to the USB specification, the Challenged Claims only recite "a Universal Serial Bus ('USB') interface," and this interface was the same for USB 1.1 and 2.0. *Compare* Ex. 1008, 81-82 *with* Ex. 1009, 93-94).

VIII. ANALYSIS

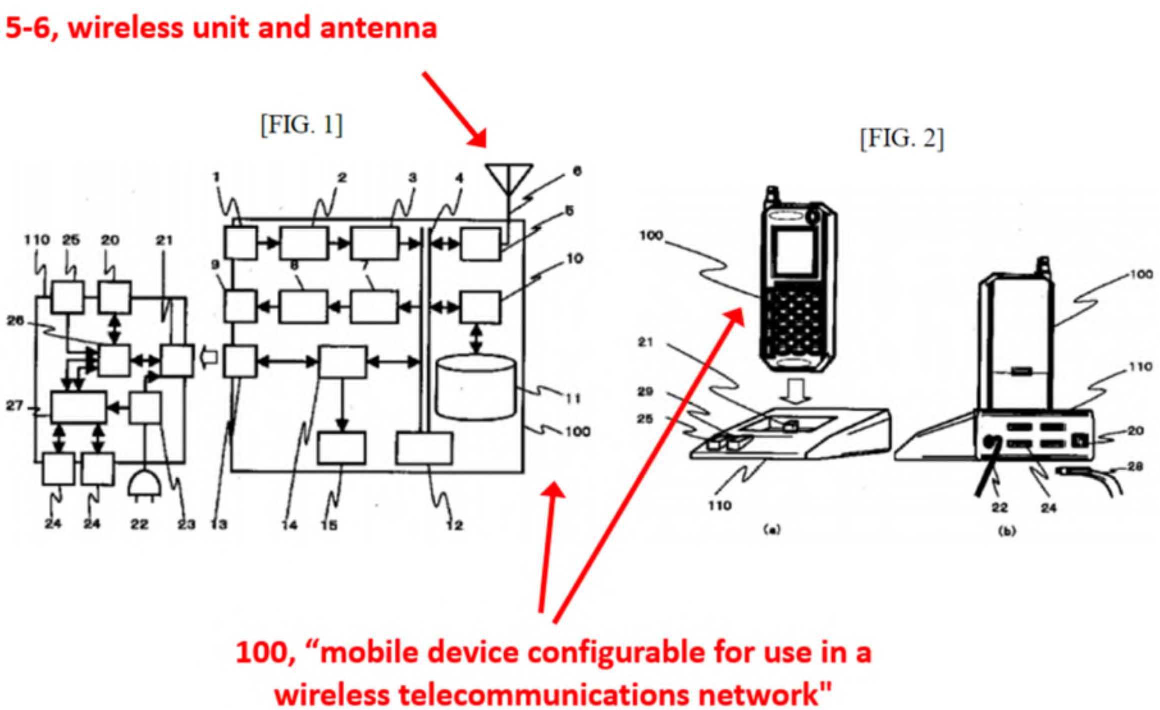
A. CLAIMS 1-2 AND 8-9 ARE UNPATENTABLE AS OBVIOUS UNDER 35 U.S.C. §103 OVER MORITA AND THE KNOWLEDGE OF A POSITA

1. Claim 1

a. 1[Pre]: A mobile device, the mobile device configurable for use in a wireless telecommunications network, comprising:

To the extent the preamble of claim 1 is limiting, it is disclosed by Morita. Baker, ¶ 98.

Morita discloses a "mobile videophone device 100." Morita, [0012]. Further, Morita discloses that mobile videophone device 100 includes a "wireless unit for transmitting and receiving data" (5) and "antenna" (6). *Id.* Thus, Morita discloses a mobile device that is "configurable for use in a wireless telecommunications network." Baker, ¶ 99.

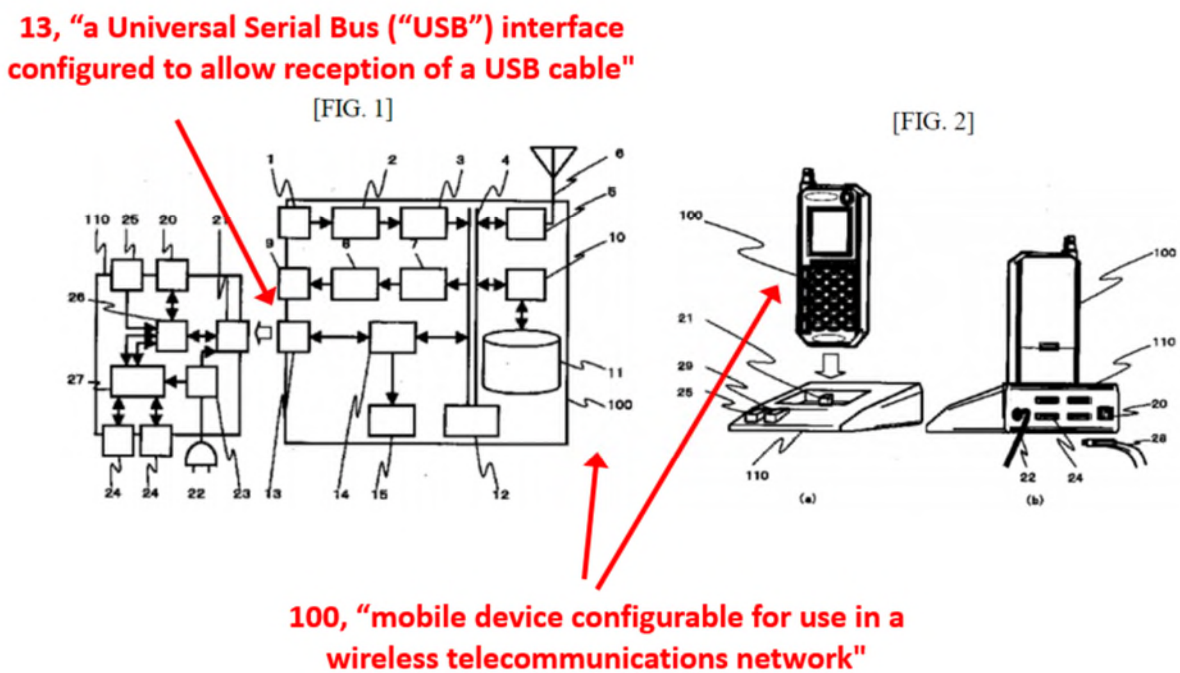


Morita, Figures 1-2 (annotated).

b. 1[a]: a Universal Serial Bus ("USB") interface configured to allow reception of a USB cable;

Morita discloses, and at a minimum renders obvious, this limitation.

Morita that its mobile videophone device 100 includes "USB port [13] for transmitting and receiving data to and from an external device and supplying power." Morita, Figs. 1-2, [0012]. Morita further discloses that "the mobile videophone device 100 couples the USB port 13 to the second USB port 21 of the USB-compatible charger 110 …." Morita, Figs. 1-2, [0013]; *see also id.,* [0014] ("USB port 21 is connected to the USB port 13"). Thus, as shown below, Morita discloses USB port 13 that is an "Universal Serial Bus ("USB") interface configured to allow reception of a USB cable." Baker, ¶¶ 102-04.



Morita, Figures 1-2 (annotated).

Note that it would be understood that USB port is "configured to allow reception of a ***USB cable***." As an initial matter, the specification of the '586 Patent does not even refer to a USB cable other than in the claim language. Nevertheless, a USB cable simply refers to a four-wire cable, that is, a four-wires that travel together:

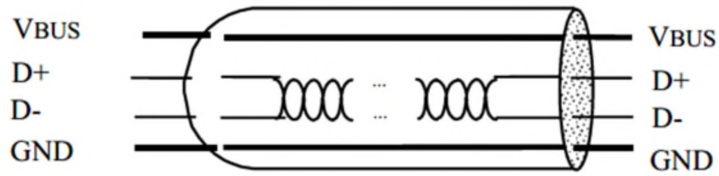
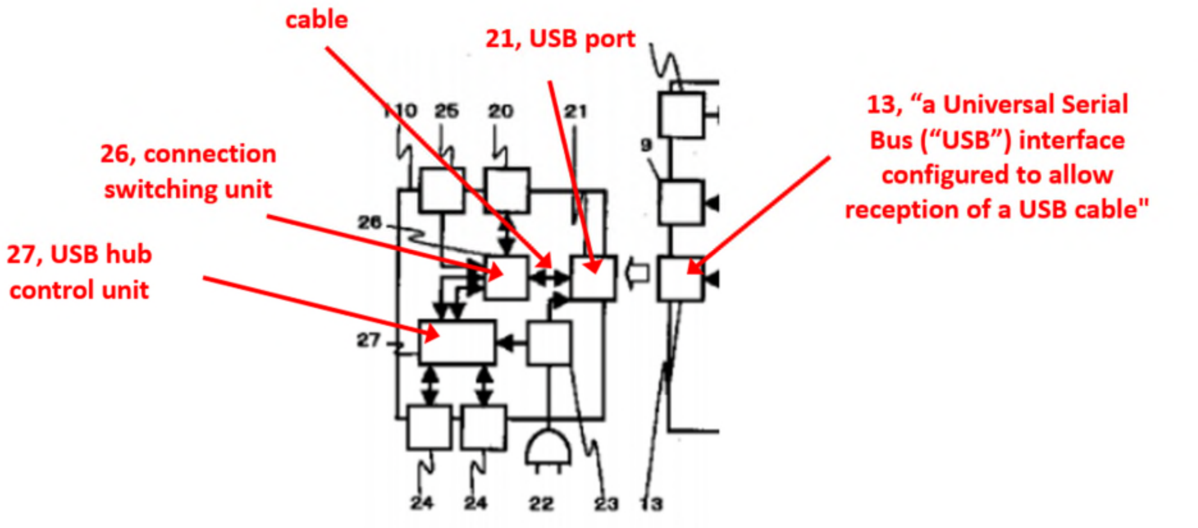


Figure 4-2. USB Cable

USB 1.1, 17, Baker, ¶¶ 103-04.

Morita's USB port 13 couples to USB port 21. A USB "port," such as port 13, refers to "the point where the USB device is attached." USB 1.1, 8. It was well known that these ports were for connections to USB cables to connect the USB device (the adapter in Morita's disclosure). *Id.*, 73-76. Thus, Morita's USB port 13 is "configured to allow reception of a USB cable" because a USB cable is attachable to it. Baker, ¶ 104.

Further, USB port 21 would be understood, and certainly it would have been obvious, to be part of a USB cable. In particular, as shown below, USB port 21 would include a cable of 4 wires that connects it to switching unit 26 of the Morita charger, and thus USB port 21 is the end-point connector of a USB cable. Baker, ¶¶ 105-06.



Morita, Figures 1-2 (partial, annotated).

Specifically, switching unit 26, for example, switches between connecting USB hub control unit 27 to either USB port 20 and 21. Morita, [0014]. The USB hub control unit provides the USB signaling to USB ports 20 and 21, and thus it would have been understood, and certainly obvious, for there to be a cable of 4 lines between hub control unit 27 and switching unit 26, and a further cable of 4 lines between switching unit 26 and USB hub port 21 to provide the USB 4-signaling lines to the endpoint connector USB hub port 21. Morita, [0012] ("USB hub control unit [27] has "functions for branching and transmitting signals, attaching and removing external devices, determining low speed devices and high speed devices, and supplying and managing power."); Baker, ¶ 105.

c. **1[b]: a charging subsystem, the charging subsystem operably connected to the USB interface V-bus power line;**

Morita discloses this limitation.

First, Morita discloses "a charging subsystem,"[4] namely, USB controller 14. In particular, Morita discloses that "the power supply of the mobile videophone device 100 is supplied from the USB controller 14 to the battery 15 by coupling to a charger via a USB format capable of supplying data and power." Morita, [0013]; *see also id.*, [0012] (discussing that the Morita charger charges the mobile phone by providing power from a power outlet to the mobile phone via USB ports 13 and 21). In other words, as shown below, the USB controller 14 receives power from the Morita charger and provides it to battery 15, thus charging it (or it feeds power from the battery to the mobile device). *Id.*; Baker, ¶ 108.

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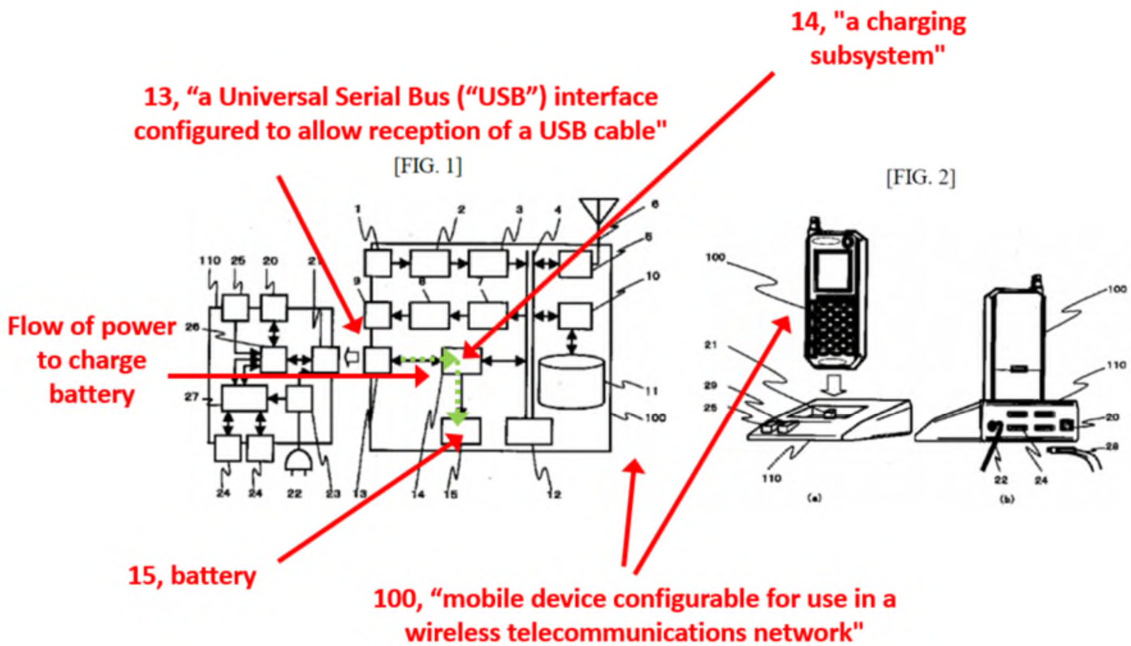
[4] The ’586 Patent does not alter the plain and ordinary meaning of "charging subsystem," i.e., components that perform a charging function. Baker, ¶ 107. The ’586 Patent largely discusses what its "charging subsystem" "may be capable of" and "may have the ability" to do. ’586 Patent, 6:17-32. The only thing that the ’586 Patent states that its "charging subsystem" can do is either use an external USB connection to power the device or charge the battery (or both), and this is precisely what USB controller 14 of Morita does. *Id.*, 7:60-64.



Morita, Figures 1-2 (annotated).

Second, Morita discloses that "the charging subsystem [Morita's USB controller 14] [is] operably connected to the USB interface V-bus power line. Note that "V-bus power line" refers to the power line, or "V_{BUS}", of the standard USB lines:

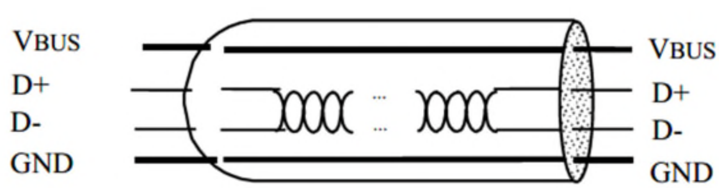
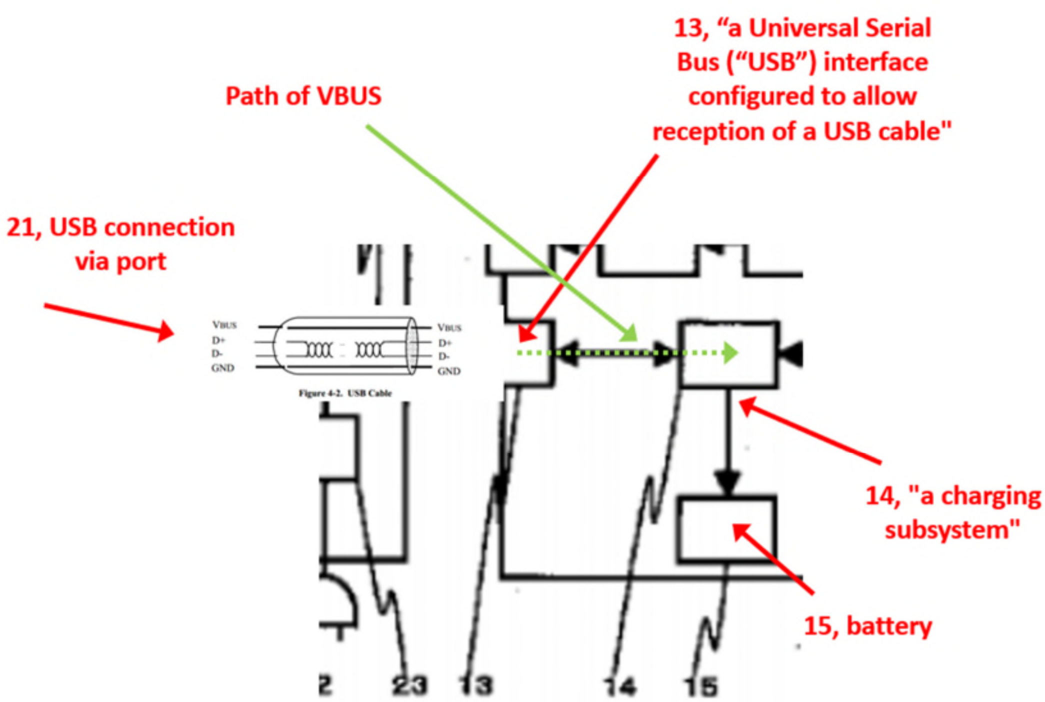


Figure 4-2. USB Cable

USB 1.1, 17, Baker, ¶ 109.

Morita discloses that the mobile videophone 100 has USB port 13, which connects to USB port 21 of the adapter. Morita, [0013]. In other words, USB port 13 receives power on USB port 13's V_{BUS} connection from the adapter USB port 21 V_{BUS} line. USB port 13's V_{BUS} connection feeds through a line to USB controller 14 (the "charging subsystem"), and the USB controller 14 uses the power from the V_{BUS} line to charge the battery. Morita, [0013] (disclosing that "the power supply of the mobile videophone device 100 is supplied from the USB controller 14 to the battery 15 by coupling to a charger via a USB format capable of supplying data and power"); Baker, ¶ 110.

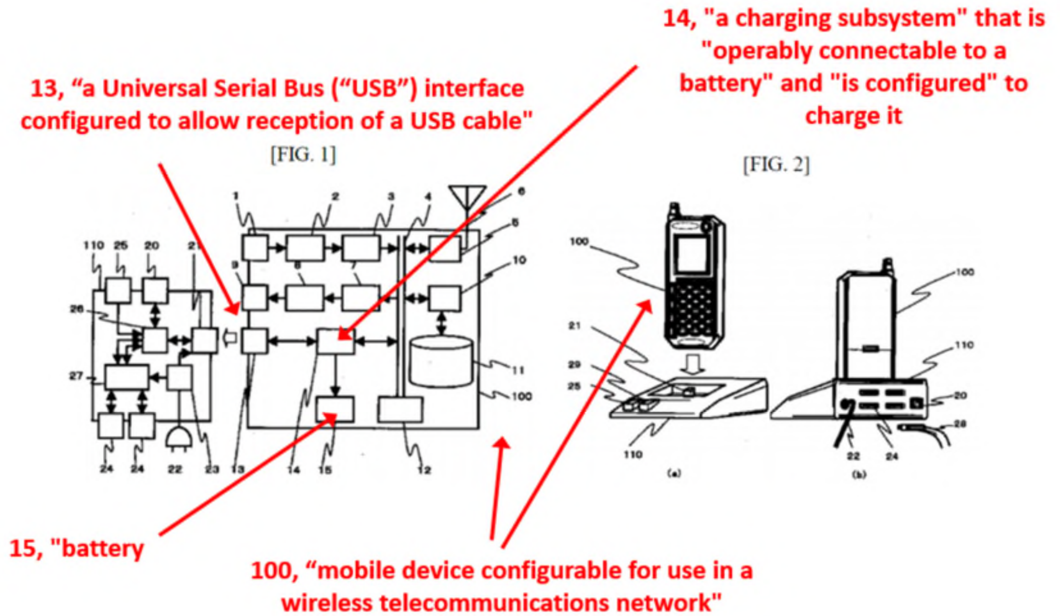


Morita, Figures 1-2 (partial, annotated).

d. 1[c]: the charging subsystem operably connectable to a battery, and configured to charge a battery if a battery is operably connected;

Morita discloses this limitation.

Morita discloses that its charging subsystem (USB controller 14) is "operably connectable to a battery" (there is a connection between USB controller 14 and battery 15) and it is "configured to charge a battery if a battery is operably connected" (USB controller 14 charges battery 15). Morita, [0012]-[0013], Figs. 1-2. In particular, Morita discloses that "the power supply of the mobile videophone device 100 is supplied from the USB controller 14 to the battery 15 by coupling to a charger via a USB format capable of supplying data and power." Morita, [0013]; *see also id.*, [0012] (discussing that the Morita charger charges the mobile phone by providing power from a power outlet to the mobile phone via USB ports 13 and 21, i.e., the Morita charger chargers the mobile videophone by providing power to USB port 13, which then connects to USB controller 14, which in turn, provides power to battery 15); Baker, ¶ 111.



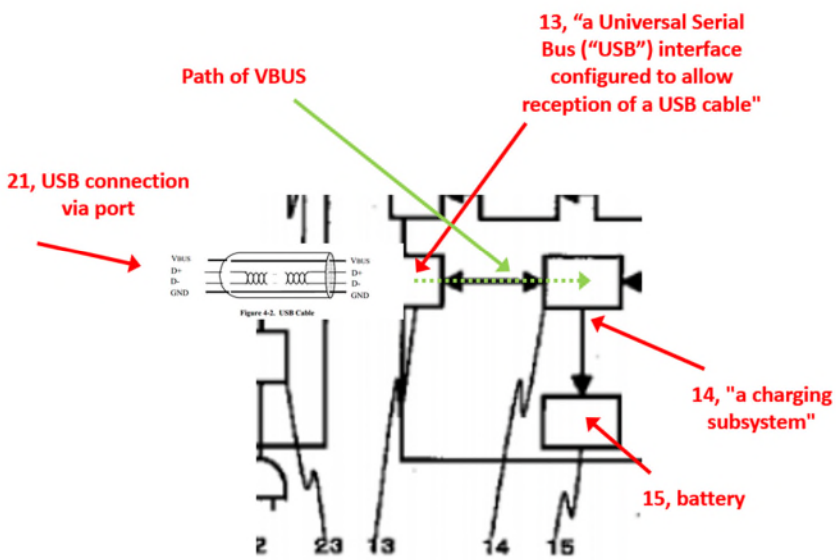
Morita, Figures 1-2 (annotated).

e. 1[d]: the charging system further configured to use power from the V-bus power line for the charging of a battery; and

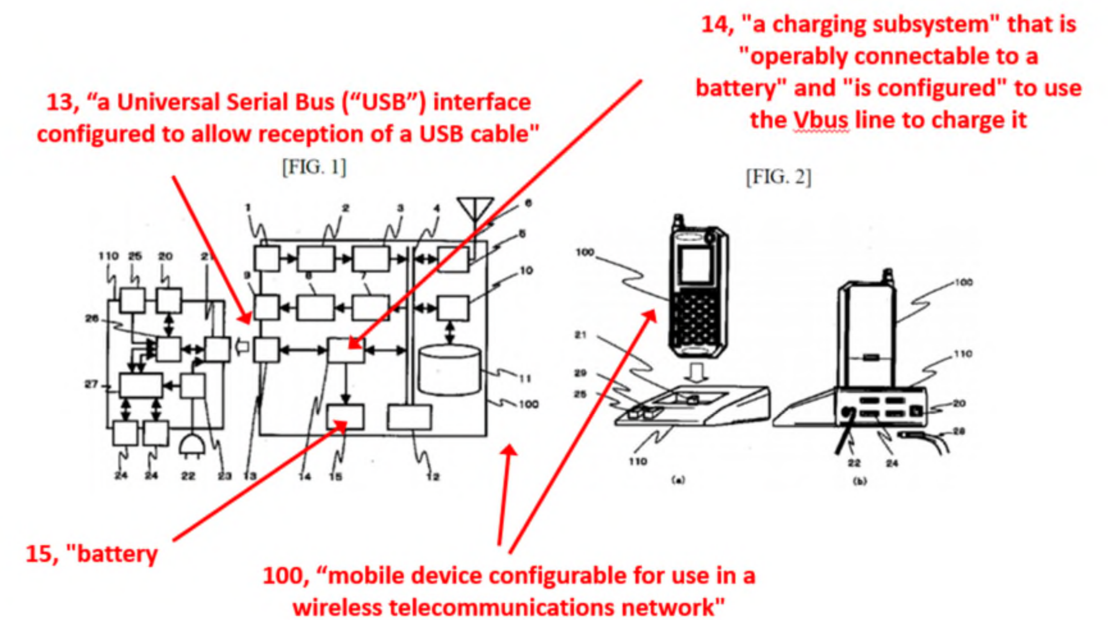
Morita discloses this limitation.

Morita discloses that its USB controller 14 (the charging system) is configured to use power from the V-bus power line (it only receives this power source as an external power source) for the charging of a battery (it uses this power to charge battery 15). Morita, [0012]-[0013], Figs. 1-2. In particular, Morita discloses that "the power supply of the mobile videophone device 100 is supplied from the USB controller 14 to the battery 15 by coupling to a charger via a USB format capable of supplying data and power." Morita, [0013]; *see also id.*, [0012] (discussing that the Morita charger charges the mobile phone by providing power from a power outlet to the mobile phone via USB ports 13 and 21, i.e., the Morita charger chargers the mobile videophone by providing power to USB port 13, which then connects to USB controller 14, which in turn, provides power to battery 15); Baker, ¶ 114.

As shown below, the USB controller 14 (the charging subsystem) uses the V_{BUS} line to charge the battery:



Morita, Figures 1-2 (partial, annotated).



Morita, Figures 1-2 (annotated).

f. 1[e] where the mobile device is configured to detect an identification signal at a D+ and a D− data line of the USB interface, the identification signal being different than USB enumeration.

Morita renders this limitation obvious in view of the knowledge of a POSITA. While Morita does not expressly disclose this limitation, it does disclose that a USB host or hub (e.g., a personal computer) is optionally connectable to the charger (also known as an adapter) and that the charger charges a mobile videophone. Morita, [0014-0015] (first USB port optionally connectable to a computer that functions as a USB host or hub). As the below explains, when the Morita adapter lacks a connection to a USB host or hub (e.g., a computer via USB port 20), it would have been obvious, and a POSITA would have been motivated with a high expectation of success, to use the Morita's adapter to send an identification signal, namely, a SE1 signal (i.e., a "signal at a D+ and a D− data line of the USB interface" that is "different than USB enumeration")[5], to identify that the Morita charger has available the charging capability of a High-power port and for the mobile device to detect the identification signal so that it can utilize the High-power source to charge battery 15.

Morita's device is a charger (again, also known as an adapter) and at least one of its express objectives is to charge a mobile device. Morita, Abstract. A POSITA would have found it obvious that although Morita's charger was capable of handling a "plurality of external devices," one possibility would have been that the charger was merely plugged into the power socket (e.g., wall outlet) to charge the mobile device without any other external device (*e.g.*, USB host or hub). It goes without saying that charging a mobile device is a critical function, and often users just need

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[5] The '586 Patent includes embodiments in which the SE1 signal is an identification signal that identifies that the adapter (and its corresponding power socket) is not a host or hub, and another device ***detects*** this signal. *See* '586 Patent, 9:18-34. Thus, it is indisputable that the SE1 signal qualifies is an example of an identification signal that another device ***detects***. Again, it was widely known to use (send and detect) the SE1 signal as an identification signal. *See* Section VI.B.

to charger their mobile device. Baker, ¶ 116. In other words, although Morita discloses that a USB host or hub (e.g., personal computer) is ***optionally*** connectable to the adapter via USB port 20, it also discloses its device merely acting as a charger.[6] Morita, [0014-0015]. Without this optional connection, 1) normal USB communications through the USB adapter with a connected mobile device are not possible (USB communications require a USB host and root hub as discussed above in Section VI.A) and 2) powering the USB adapter from the absent, and unconnected, USB host or hub is not possible. Baker, ¶ 118. Morita embraces this scenario, because it discloses that the adapter can provide power to the phone via USB connector 21 using the power from a wall outlet. Morita, at [0016]. Thus, in this common situation, the sole source of power to the connected device through Morita's adapter would have to come from the power socket (outlet) via the plug unit (power supply cable 22). Baker, ¶ 118.

[6] Note that when Morita's adapter connects to the mobile phone to charge it under this ground, the mobile device would not act as the host USB, because that would mean the host (Morita's phone) would be responsible for providing power to the adapter. Baker, ¶ 118, n. 2. In other words, this obviousness ground considers Morita's adapter performing its charging function to charge the mobile device.

Without this connection to a USB host or hub via USB port 20, a POSITA would have found it obvious to provide an identification signal via USB port 21 to indicate that the adapter is powered by a power socket and is not a typical USB host or hub, and for Morita's videophone to detect it so that it can draw current at a High-power level. A POSITA would have known that the benefit of an adapter powered by a power socket—i.e., which does not have the current limitations of a USB host or hub—is that in all cases the adapter's USB port connected to the mobile phone can operate as a "High-power Hub Port" that can supply at least 500 mA of current as seen below in Table 7-5 from USB 1.1. Baker, ¶¶ 119-20. A POSITA would have also known that if the USB adapter were powered by a USB host or hub instead of a power socket then the connection powering the USB adapter could be a "Low-power Hub Port" that can supply at least 100 mA of current to a connected mobile device. *Id.*

Table 7-5. DC Electrical Characteristics

Parameter	Symbol	Conditions	Min.	Max.	Units
Supply Voltage:					
High-power Port	VBUS	Note 2, Section 7.2.1	4.75	5.25	V
Low-power Port	VBUS	Note 2, Section 7.2.1	4.40	5.25	V
Supply Current:					
High-power Hub Port (out)	ICCPRT	Section 7.2.1	500		mA
Low-power Hub Port (out)	ICCUPT	Section 7.2.1	100		mA

USB 1.1 at 142.

Given this, a POSITA would have been motivated, in this common situation where the power socket is not a USB host or hub (i.e., Morita's adapter without a connection via USB port 20), to identify this to the mobile device so that the mobile device can detect it and could always know to charge from a "High-power Hub Port" to effectuate faster charging. Baker, ¶¶ 119-20. Indeed, this identification signal would be necessary to enable the mobile device to charge from the High-power port level because the mobile device defaults to charging from a low power port level. USB 1.1, 134; Baker ¶ 121. In other words, without the identification signal, the Morita's phone would only draw 100 mA instead of 500 mA and thus charge battery 15 much slower. *Id.* It was well known that a source greater than 100 mA was ideal for faster charging. Ex. 1019, 1:5-8, 1:30-34; Baker, ¶ 121.

It would have been obvious to use the SE1 signal state (i.e., logic high values on the data lines) to provide this identification. Note that the SE1 signal is not enumeration; enumeration is not possible during application of the SE1 signal. USB 1.1, 179 (e.g., issuing reset command as part of enumeration), 120 (reset requires using data lines to communicate); Baker, ¶ 123. It would have been obvious to use the SE1 signal for several reasons. The data lines were already used to signal connection states. *See* Section VI.A-B. Further, because normal USB communications at low- or full-speed (D+ low and D- high or D+ high and D- low, respectively) are not possible when a USB host or hub is not connected to the USB adapter, and there is a mobile device connected to the USB adapter (so both D+ and D- cannot be low), a POSITA would have logically looked to ***the only other possible state of the data lines***, that is, both D+ and D- being high, to identify to the connected mobile device that the power socket is not a USB host or hub so that the connected mobile device knows that: 1) it cannot communicate via normal USB communications and 2) it is connected to a "High-power Hub Port." Baker, ¶ 120.

Pulling both D+ and D- high[7], as discussed in Section VI.A, is an abnormal condition (SE1) since normal USB communications are not possible. Baker, ¶ 122. A POSITA would have known, because SE1 is an abnormal condition and thus does not fall with normal USB operation, that it could be used as an identification signal (outside normal USB operation and thus would not impact other USB devices' operations) to a connected mobile device to indicate to the device that the adapter was not a USB host or hub and capable of operating as a High-power Hub Port. Baker, ¶ 122. What's more, the Morita adapter providing the SE1 device would

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[7] As this analysis and Section VI.A. explains, the SE1 states involves pulling both data lines in the USB connector high (i.e., to a high voltage). Thus, the SE1 signal "comprises a voltage level that is applied to at least one of the data lines in the primary USB connector, and the identification signal comprises a logic high signal on the D+ data line and a logic high signal on the D− data line." Baker, ¶ 114.

further confirm and indicate that communication will not occur, but the signal results in the mobile device continuing to receive power over the power lines so that it can charge. *See* Section VI.A. Because this was the known result of the SE1 signal, and this is the exact purpose that Morita's adapter would seek to achieve without a host USB connection (i.e., charge without any USB communications), it would be obvious to select this known SE1 signal as the identification signal (and again, it is a selection from among a finite number of known choices). Baker, ¶¶ 120, 22.

Indeed, holding D+ and D- high in this situation (for charging a battery and no communications) was known before the priority date of the '586 Patent. *See* Section VI.B., above. For example, Kerai discloses "A battery charging circuit is described in which power is derived from a communications port such as a USB interface (22) and is supplied to a rechargeable battery of a communications device." Kerai, Abstract. "***As is well known***, the data lines of a serial connection (D+ and D- in the USB interface) are held high when the connection is inactive and will vary between a high and low state whilst communication over the ports takes place." *Id*., 5:45-48 (emphasis added); Baker, ¶ 125.

Notably, it was known to use the SE1 signal to identify a power state (analogous to High-power port charging being available). Zyskowski employs the SE1 signal to identify a its full power state to a different device (*e.g.*, mass storage device, consumer electronic device). Zyskowski, ¶ 19; Baker, ¶ 124. In particular, Zyskowski discloses that "[w]hen the host 104 is in a full power state, data lines D1 and D2 may be raised to a predefined DC voltage level, for example, 5 volts (systems operating at lower voltages might raise the data paths to 3 volts, 2 volts, or even less." *Id.*

Further, a POSITA would have found it routine to use the SE1 signal as an identification signal—and detect it, with a high expectation of success, because the SE1 signal can "be easily distinguished from USB standard data signals." Shiga, 5:60-62, 6:48-58. As such, it was well known how to use the SE1 signal as an identifying signal, e.g., to signal a wake-up condition, and to detect it. Shiga, Abstract, 6:35-47. Again, the use of SE1 as an identification signal to identify, and detect, various states was well known: Shiga, Abstract, 6:35-47 (wake up signal), Zyskowski, ¶ 19 (full power state), Casebolt, 7:40-54 (presence of PS/2 adapter). Baker, ¶ 125.

In particular, the prior art is replete with disclosures of detecting SE1 signals. *E.g.*, Kerai, 5:49-53 (disclosing two instances of a "logic detector 50," and each instance "detects the state of" a data line (i.e., D+ or D-) to detect the SE1 signal); Shiga, 6:59-7:15 (disclosing comparing means and an AND gate to detect the SE1 signal); Zyskowski, ¶ 19 (detecting high voltage on D lines to recognize SE1 state); Casebolt, 6:6-16, 7:30-45 (disclosing "controller 144" to detect the SE1 condition); Baker, ¶ 126.

The claims require only detecting the SE1 signal—not generating it. To the extent that Patent Owner argues that it would not be obvious, or predictable, to generate the SE1 signal using Morita's adapter, Patent Owner's argument fails for two reasons. First, the claims do not recite any component that generates the SE1 signal. Second, the above prior art illustrates that it was routine to generate the SE1 signal as an identifying signal. Indeed, a POSITA would have understood how to pull D+ and D- high to provide the SE1 identifying signal. Baker, ¶¶ 127-29. As stated in USB 1.1, "Hubs, and the devices to which they connect, use a combination of pull-up and pull-down resistors to control D+ and D- in the absence of their being actively driven. These resistors establish voltage levels used to signal connect and disconnect and maintain the data lines at their idle values when not being actively driven." USB 1.1, 256. This would have informed a POSITA that pulling D+ and D- high is a simple matter of connecting the R_{pd} resistors high, as the R_{pu} is resistor is connected in the mobile device in the annotated Figure 7-10 from USB 1.1 seen below, instead of to ground. The claimed identification subsystem configured to generate an identification signal, both D+ and D- pulled high, are the resistors, R_{pd}, connected high instead of to ground as indicated in the annotated figure seen below.

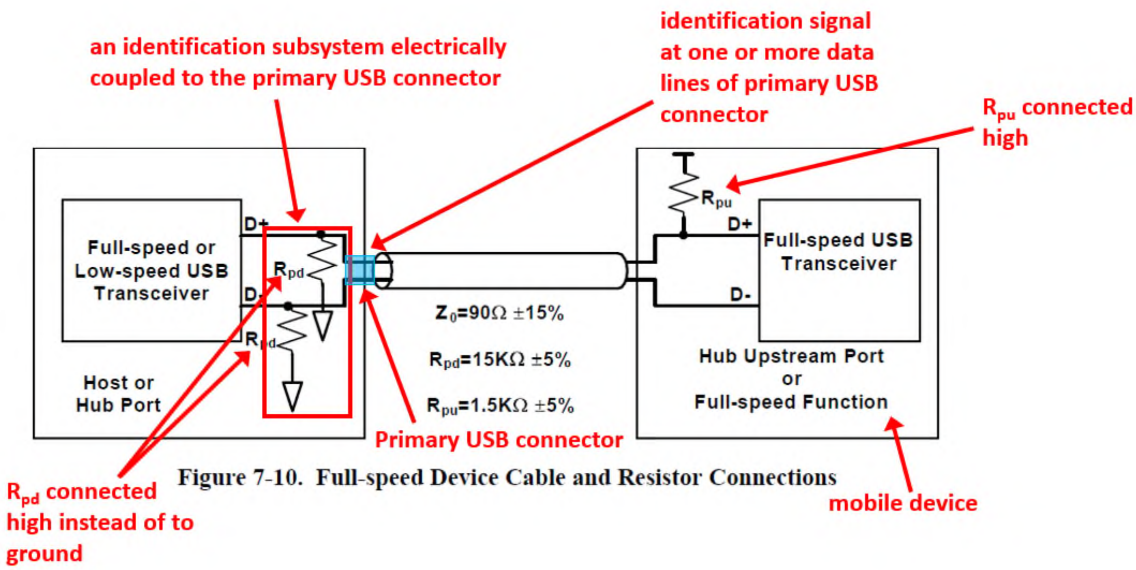
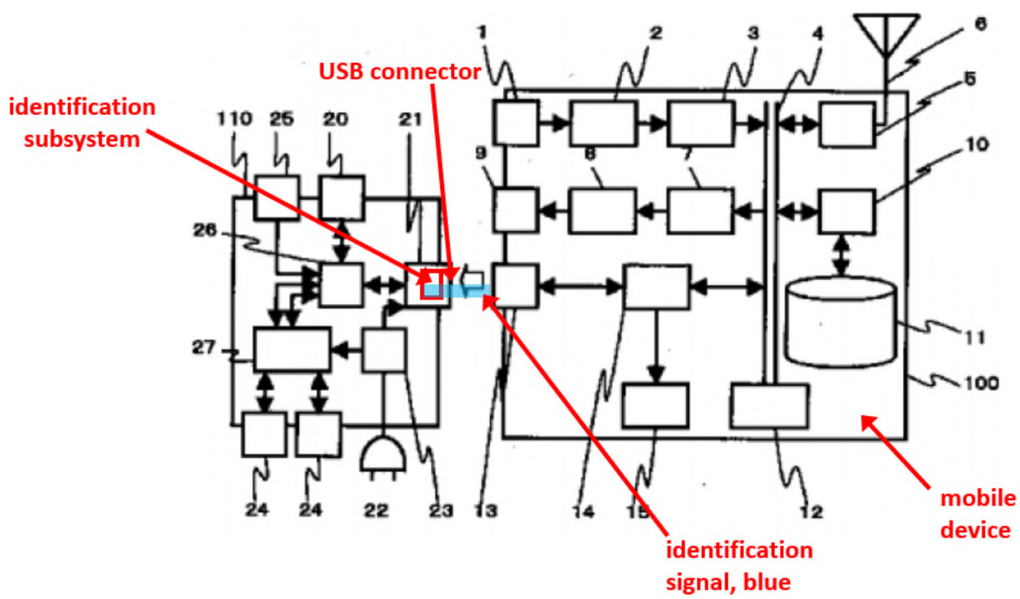


Figure 7-10. Full-speed Device Cable and Resistor Connections

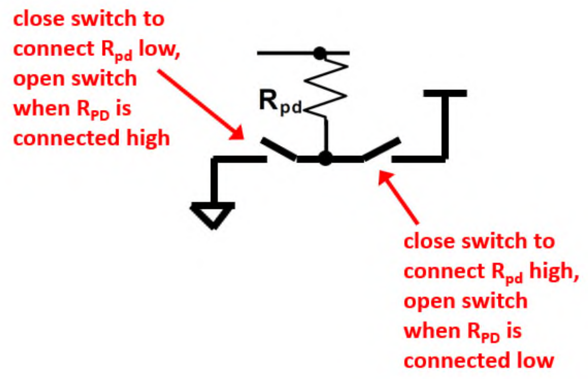
USB 1.1, 113 (annotated).

[FIG. 1]



Morita FIG. 1 (annotated).

In order to ensure that the USB port could continue to operate as a normal USB port, and not just a "High-power Port Hub," a POSITA would have known that R_{pd} resistors in a USB host or hub port must also connect low (to ground) as seen above in Figure 7-10 from USB 1.1. The addition of two simple switches to each R_{PD} resistor, *see* annotated image below, would have allowed the port to operate as either a normal USB port with normal communications or an abnormal port (SE1 where D+ and D- are both high) where communications are not possible. Baker, ¶ 128.



USB 1.1, 113 (annotated portion of Figure 7-10).

In short, a POSITA would have understood, found obvious, and would have had a high expectation of success that this simple modification would have allowed Morita to maintain all of its stated functionality and operation, while adding the desired benefit of identifying and allowing charging in the common situation when no other USB host or hub was connected. Accordingly, for all of the reasons discussed above, a POSITA would have understood that Morita's system, in view of the knowledge of a POSITA, would have rendered obvious this limitation. Baker, ¶ 129.

2. Claim 2

a. The mobile device of claim 1 wherein the identification signal comprises a voltage level that is applied to at least one data line in the USB connector.

Morita renders this limitation obvious in view of the knowledge of a POSITA.

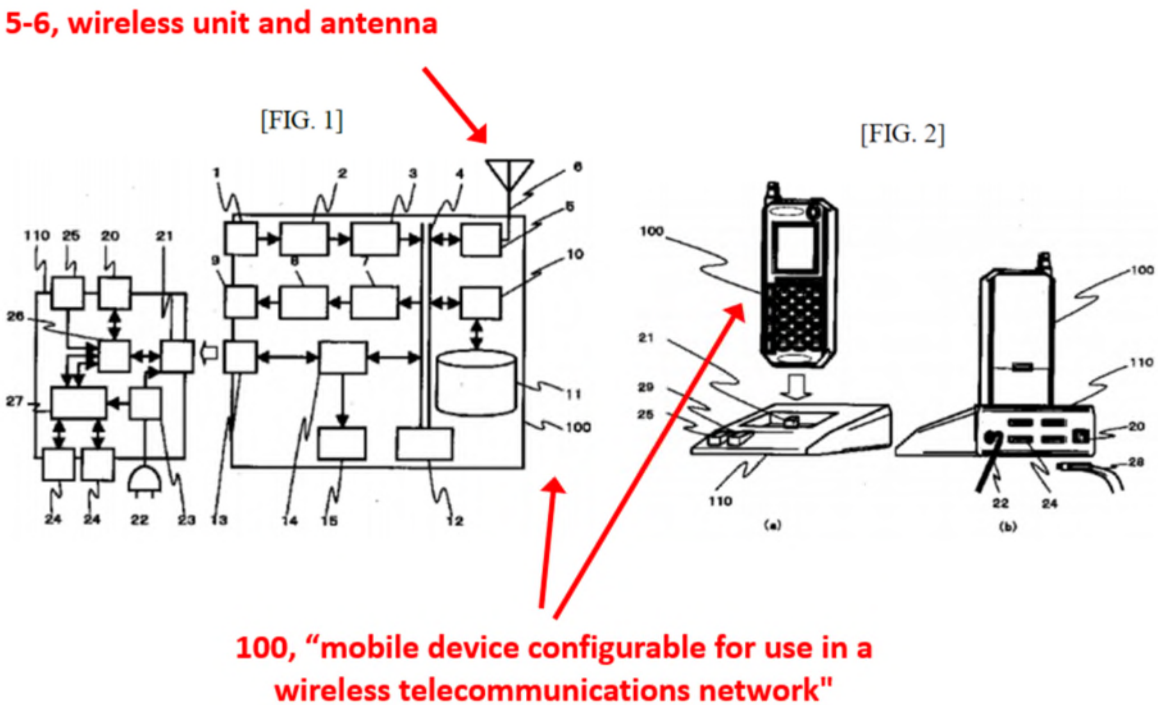
As the above explains, it would be obvious for Morita's videophone to detect the SE1 signal, which is a high voltage level on each of the data lines of Morita's USB port 13. USB 2.0, 123; *see* claim limitation 1[e], Section VIII.A.1.f; Baker, ¶¶ 122, 130.

3. Claim 8

a. 8[Pre]: A method of charging a battery in a mobile device, the mobile device configurable for use in a wireless telecommunications network, comprising:

To the extent the preamble of claim 1 is limiting it is disclosed by Morita. Baker, ¶¶ 131-32.

Morita discloses a "mobile videophone device 100." Morita, [0012]. Further, Morita discloses that mobile videophone device 100 includes a "wireless unit for transmitting and receiving data" (5) and "antenna" (6). *Id.* Thus, Morita discloses a mobile device that is "configurable for use in a wireless telecommunications network." Baker, ¶ 131.



Morita, Figures 1-2 (annotated).

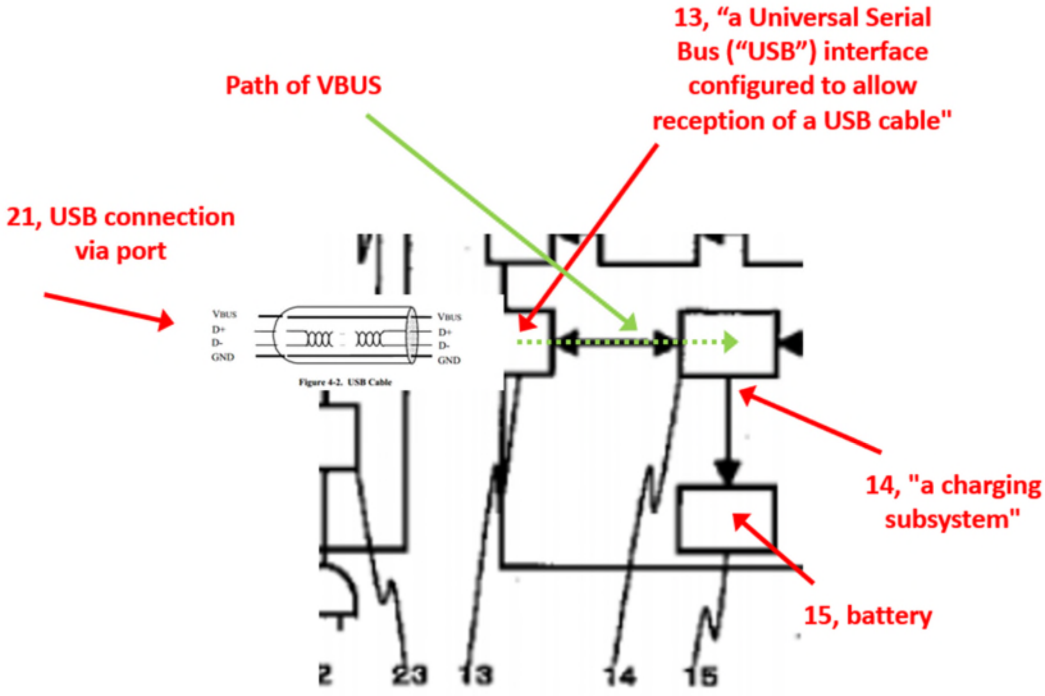
Further, Morita discloses that its charger (adapter) charges battery 15, i.e., a method for a charging a battery. In particular, Morita discloses that “the power supply of the mobile videophone device 100 is supplied from the USB controller 14 to the battery 15 by coupling to a charger via a USB format capable of supplying data and power.” Morita, [0013]; *see also id.*, [0012] (discussing that the Morita charger charges the mobile phone by providing power from a power outlet to the mobile phone via USB ports 13 and 21, i.e., the Morita charger chargers the mobile videophone by providing power to USB port 13, which then connects to USB controller 14, which in turn, provides power to battery 15); Baker, ¶ 132.

b. 8[a] providing a Universal Serial Bus ("USB") interface configured to allow reception of a USB cable, and, receiving power on a V-bus power line at the USB interface;

Morita discloses, and at a minimum renders obvious, this limitation.

First, Morita discloses "providing a Universal Serial Bus ("USB") interface configured to allow reception of a USB cable." This portion of the claim language is identical, other than "providing," to claim limitation 1[a]. *See* analysis for claim limitation 1[a], Section VIII.A.1.b. Note that Morita provides this interface in that it discloses its use as part of videotelephone 100. *Id.*

Second, Morita discloses "receiving power on a V-bus power line at the USB interface." Morita discloses that the mobile videophone 100 has USB port 13, which connects to USB port 21 of the adapter. Morita, [0013]. In other words, USB port 13 receives power on USB port 13's V_{BUS} connection from the adapter USB port 21 V_{BUS} line. USB port 13's V_{BUS} connection feeds through a line to USB controller 14 (the "charging subsystem"), and the USB controller 14 uses the power from the V_{BUS} line to charge the battery. Morita, [0013] (disclosing that "the power supply of the mobile videophone device 100 is supplied from the USB controller 14 to the battery 15 by coupling to a charger via a USB format capable of supplying data and power"); Baker, ¶ 134.



Morita, Figures 1-2 (partial, annotated).

c. 8[b] providing an operable connection between the power received at the USB interface on the V-bus power line and a charging subsystem;

Morita discloses this limitation.

This limitation is the method equivalent of limitation 1[b]. *See* analysis for claim limitation 1[b], Section VIII.A.1.c. As that section explains, Morita discloses charging subsystem 14 (USB controller 14 in Morita), which receives power from the V-bus power line of USB port 13. *Id.*; Baker, ¶¶ 108-10, 35.

d. 8[c] having a battery in operable connection to the charging subsystem;

Morita discloses this limitation.

This limitation is the method equivalent of limitation 1[c]. *See* analysis for claim limitation 1[c], Section VIII.A.1.d. As that section explains, Morita discloses charging subsystem 14 (USB controller 14 in Morita), which connects to and charges Morita's battery 15. *Id.*; Baker, ¶¶ 111-12, 36.

e. 8[d] providing power to the battery using the charger subsystem; and,

Morita discloses this limitation.

This limitation is the method equivalent of limitation 1[d] except that unlike limitation 1[d], it does not require that the charging subsystem use power from the V_{BUS} line. *See* analysis for claim limitation 1[d], Section VIII.A.1.e. As that section explains, Morita discloses charging subsystem 14 (USB controller 14 in Morita) that provides power to the Morita's battery 15. *Id.*; Baker, ¶ 113-14, 37.

f. 8[e] detecting an identification signal at a D+ and a D− data line of the USB interface, the identification signal being different than USB enumeration.

Morita renders this limitation obvious in view of the knowledge of a POSITA.

This limitation is the method equivalent of limitation 1[e]. *See* analysis for claim limitation 1[e], Section VIII.A.1.f. As that section explains, Morita in view of the knowledge of a POSITA renders obvious detecting a SE1 signal (which is a voltage high signal on each data line). *Id.*; Baker, ¶¶ 115-29, 38.

4. Claim 9

a. The method claim 8 wherein the identification signal comprises a voltage level at least one data line in the USB connector.

Morita discloses this limitation.

This limitation is the method equivalent of claim 2. *See* analysis for claim 2, Section VIII.A.2. As that section explains, Morita in view of the knowledge of a POSITA renders obvious detecting a SE1 signal (which is a voltage high signal on each data line). *Id.*; Baker, ¶¶ 122, 30, 39.

IX. CONCLUSION

For the foregoing reasons, there is a reasonable likelihood that Petitioners will prevail as to the Challenged Claims of the ’586 Patent. Accordingly, *inter partes* review of claims 1-2 and 8-9 is requested.

Dated: February 26, 2021

Respectfully submitted,

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X. MANDATORY NOTICES – 37 C.F.R. §42.8

A. Real Party-in-Interest (37 C.F.R. §42.8(b)(1))

The real parties-in-interest in this Petition are TCT Mobile (US), Inc.; TCT Mobile (US) Holdings, Inc.; Huizhou TCL Mobile Communication Co. Ltd.; and TCL Communication, Inc. Petitioners certify that no other party exercised control or could exercise control over Petitioners' participation in this proceeding, the filing of this Petition, or the conduct of any ensuing trial.

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

To the best knowledge of the Petitioner, the '586 Patent is involved in the following litigation as of the filing date of this Petition:

- *Fundamental Innovation Systems International LLC v. Lenovo (United States) Inc., et al.,* No. 1-20-cv-00551 (D. Del.).
- *Fundamental Innovation Systems International LLC v. TCT Mobile (US) Inc., et al,* No. 1-20-cv-00552 (D. Del.).
    - ***Petitioner is the named Defendant in this pending case.*** Petitioners were served with the complaint in this action on April 23, 2020, and thus this Petition is timely under 35 U.S.C. §315(b).
- *Fundamental Innovation Systems International LLC v. Coolpad Group Limited, et al,* No. 2-20cv-00117 (EDTX)

To the best knowledge of the Petitioner, the '586 Patent was involved in three IPR proceedings: IPR2018-00274, 493, 485. *See* Section III.C.

C. Lead/Back-up Counsel (37 C.F.R. §42.8(b)(3))

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Petitioners consent to service by electronic mail at the following addresses: 3J6PTABDocket@orrick.com, R75PTABDocket@orrick.com, PTABDocketJJL2@orrick.com and TCL-FISI_OHS@orrick.com. Petitioners' Power of Attorney is attached.

The USPTO is authorized to charge the filing fee and any other fees incurred by Petitioners to the deposit account of Orrick, Herrington & Sutcliffe LLP: 15-0665.

D. Service Information (37 C.F.R. §42.8(b)(4))

Please direct all correspondence to lead and backup counsel at the above address. Petitioners consent to electronic service at the email addresses above.

XI. GROUNDS FOR STANDING – 37 C.F.R. §42.104(A)

Petitioner certifies that: (i) the '586 Patent is available for IPR and (ii) Petitioner is not barred or estopped from requesting an IPR challenging the '586 Patent's claims. Specifically, Petitioner certifies that: (1) no Petitioner entity or real party-in-interest has filed a civil action challenging the validity of any claim of the '586 Patent; (2) Petitioner filed this petition within one year of the date they were served with a complaint asserting infringement of the '586 Patent; and (3) the estoppel provisions of 35 U.S.C. §315(e)(1) do not prohibit this IPR.

XII. FEES – 37 C.F.R. §42.15(A)

The Office is authorized to charge the filing fee and any other necessary fees that might be due in connection with this Petition to Deposit Account No. 15-0665 for the fees set forth in 37 C.F.R. §42.15(a).

CERTIFICATION OF SERVICE ON PATENT OWNER

Pursuant to 37 C.F.R. §§42.6(e), 42.8(b)(4) and 42.105, the undersigned certifies that on February 26, 2021a complete and entire copy of this Petition for *Inter Partes* Review of U.S. Patent 7,834,586 and all supporting documents and exhibits were served via Federal Express, postage prepaid, on the Patent Owner by serving the correspondence address of record for the '586 Patent:

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A courtesy copy was provided on February 26, 2021 to Patent Owner's litigation counsel in the action *Fundamental Innovation Systems International LLC v. TCT Mobile (US), Inc.; TCT Mobile (US) Holdings, Inc.; Huizhou TCL Mobile Communication Co. Ltd.; and TCL Communication, Inc.*, District of Delaware Case No. 1:20-cv-00552, pending between Petitioners and Patent Owner and involving the '586 Patent:

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CERTIFICATE OF COMPLIANCE – 37 CFR § 42.24

Pursuant to 37 C.F.R. §42.24 *et seq*., the undersigned certifies that this document complies with the type-volume limitations. This document contains 11,010 words as calculated by the "Word Count" feature of Microsoft Word Office 365, the word processing program used to create it.

Dated: February 26, 2021

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