

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHENZHEN QIANFENYI INTELLIGENT TECHNOLOGY CO., LTD.,

Petitioner,

v.

WACOM CO. LTD.,

Patent Owner.

Patent No. 9,933,866

Issued: Apr. 3, 2018

Filed: Oct. 17, 2014

Inventors: Shahrooz Shahparnia et al.

Title: ACTIVE STYLUS WITH HIGH VOLTAGE

Inter Partes Review No. IPR2025-01495

PETITION FOR *INTER PARTES* REVIEW OF U.S. PAT. NO. 9,993,866

LISTING OF CHALLENGED CLAIMS

Limitation¹	Claim 1
1[pre]	A stylus comprising:
1[a]	one or more electrodes;
1[b]	one or more computer-readable non-transitory storage media embodying logic for transmitting signals wirelessly to a device through a touch sensor of the device, at least some of the signals comprising high-voltage signals associated with a high voltage comprising a relatively large potential difference compared to a voltage within a voltage range of approximately 1 to approximately 3 volts;
1[c]	a component operable to convert the voltage of approximately 1 to 3 volts to the high voltage; and
1[d]	a stylus tip, one or more of the one or more electrodes being disposed at the stylus tip;
1[e]	wherein the high-voltage signals result from the one or more electrodes receiving the high voltage.
Limitation	Claim 2
Claim 2	The stylus of claim 1, wherein the component is a transformer.
Limitation	Claim 3
Claim 3	The stylus of claim 1, wherein the high voltage comprises a voltage within the voltage range of approximately 10 to approximately 20 volts.
Limitation	Claim 4
Claim 4	The stylus of claim 1, wherein the high-voltage signals identify a location of the stylus relative to the touch sensor of the device.

¹ Petitioner refers to claim limitations throughout this petition in the manner shown here (*e.g.*, 1[a] will always refer to “one or more electrodes” as recited in claim 1).

Limitation	Claim 5
Claim 5	The stylus of claim 1, wherein, when the stylus is in contact with or in the proximity of the touch sensor of the device, the high-voltage signals are used to simulate or distinguish: contact by an object other than the stylus with the device; or a presence of the object near the touch sensor of the device.
Limitation	Claim 6
Claim 6	The stylus of claim 5, wherein the object is least a part of a human hand.
Limitation	Claim 7
Claim 7	The stylus of claim 5, wherein the high-voltage signals are based on a voltage used by at least a portion of the touch sensor of the device.
Limitation	Claim 15
15[pre]	One or more non-transitory computer-readable storage media embodying logic that is operable when executed to:
15[a]	transmit electromagnetic signals from a stylus to a device through a touch sensor of the device, at least some of the electromagnetic signals comprising high-voltage signals associated with a high voltage comprising a relatively large potential difference compared to a voltage within a voltage range of approximately 1 to approximately 3 volts, the stylus comprising:
15[a1]	one or more electrodes for wirelessly transmitting the signals to the device;
15[a2]	a component operable to convert the voltage of approximately 1 to 3 volts to the high voltage; and
15[a3]	a stylus tip, one or more of the one or more electrodes being disposed at the stylus tip;
15[a4]	wherein the high-voltage signals result from the one or more electrodes receiving the high voltage.
Limitation	Claim 16
Claim 16	The media of claim 15, wherein the component is a transformer.

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X.	Proof of Service and Service Information (37 C.F.R. §§ 42.6(e) and 42.105(a))	65

EXHIBITS

Exhibit	Reference
1001	U.S. Patent No. 9,933,866 (“’866 Patent”)
1002	Prosecution History of U.S. Patent No. 9,933,866
1003	Declaration of Nabil J. Sarhan, Ph.D.
1004	Curriculum Vitae of Nabil J. Sarhan, Ph.D.
1005	U.S. Patent Publication No. 20120105362 to Kremin et al. (“Kremin”)
1006	U.S. Patent Publication No. 20120050207 to Westhues et al. (“Westhues”)
1007	U.S. Patent No. 6,377,248 to Partow et al. (“Partow”)
1008	Profile of Shahrooz Shahparnia (available for download at https://www.linkedin.com/in/shahrooz-shahparnia-6596183/)
1009	Profile of Kishore Sundara-Rajan (available for download at https://www.linkedin.com/in/ksrajan/)
1010	Profile of Hrvoje Benko (available for download at https://www.linkedin.com/in/hrvojebenko/)
1011	Profile of Wayne Westerman (available for download at https://www.linkedin.com/in/westerma/)
1012	Jonathan Bray, <i>HTC Flyer Review: First Look</i> , PC PRO (2011) (available at https://web.archive.org/web/20110216170350/http://www.pcpro.co.uk/blogs/2011/02/15/htc-flyer-review-first-look/ ; archived as of February 16, 2011)
1013	HTC, <i>HTC Scribe Will Change the Way You Use Tablets</i> , TechRadar (2011) (available at https://web.archive.org/web/20110521024609/https://www.techradar.com/news/mobile-computing/htc-scribe-will-change-the-way-you-use-tablets-955427 ; archived as of May 21, 2011)
1014	Merriam-Webster, MERRIAM-WEBSTER.COM DICTIONARY, Electrode (available at https://www.merriam-webster.com/dictionary/electrode)
1015	Rudolf F. Graf, MODERN DICTIONARY OF ELECTRONICS (7 th ed. 1999)
1016	U.S. Provisional Patent Application No. 61/407,907
1017	U.S. Patent No. 8,766,954 to Vuppu et al.
1018	Florence Ion, <i>From Touch Displays to The Surface: A Brief History of Touchscreen Technology</i> , ARS TECHNICA (2013) (available at https://arstechnica.com/gadgets/2013/04/from-touch-displays-to-the-surface-a-brief-history-of-touchscreen-technology/).

I. INTRODUCTION

Petitioner, Shenzhen Qianfenyi Intelligent Technology Co., Ltd. (“Petitioner” or “Maxeye”), requests *Inter Partes* review of claims 1-7 and 15-16 (the “Challenged Claims”) of the ’866 Patent granted to Atmel Corporation and later assigned to Wacom Co. Ltd. (“Patent Owner” or “Wacom”). Ex. 1001; 1002. The claimed invention is nothing more than well-known and expressly taught practices in stylus technology. All Challenged Claims are anticipated and obvious in view of the references cited in this Petition and the knowledge of a person of ordinary skill.

II. REQUIREMENTS FOR PETITION FOR *INTER PARTES* REVIEW

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

Petitioner certifies the ’866 Patent is available for *Inter Partes* review, and Petitioner is not barred or estopped from requesting *Inter Partes* review as set forth herein. Specifically: (1) Petitioner is not the owner of the ’866 Patent; (2) Petitioner has not filed a civil action challenging the validity of any of the ’866 Patent claims; and (3) this Petition is filed more than 9 months after the ’866 Patent issued.

B. Fee for Inter Partes Review (§ 42.15(a))

The Director is authorized to charge the fee specified by 37 CFR § 42.15(a) from Deposit Account No. 506181.

C. Identification of Claims Being Challenged (37 C.F.R. § 42.104(b))

1. Claims for Which *Inter Partes* Review Is Requested Under 37 C.F.R. § 42.104(b)(1) and Relief Requested Under 37 C.F.R. § 42.22(a)(1)

Petitioner requests *Inter Partes* review of the Challenged Claims on the grounds set forth below and requests that each of the Challenged Claims be found unpatentable and cancelled.

2. Art and Statutory Grounds on Which the Challenge Is Based Under 37 C.F.R. § 42.104(b)(2)

Ground	'866 Patent Claims	Basis for Rejection of the Challenged Claims under 35 U.S.C. §§ 102 & 103
<u>Ground 1</u>	1-7 and 15-16	Anticipated by Kremin, or rendered obvious by Kremin in view of the knowledge of a person of ordinary skill in the art
<u>Ground 2</u>	1-7 and 15-16	Rendered obvious by Kremin in view of Partow
<u>Ground 3</u>	1-7 and 15-16	Anticipated by Westhues, or rendered obvious by Westhues in view of the knowledge of a person of ordinary skill in the art
<u>Ground 4</u>	1-7 and 15-16	Rendered obvious by Westhues in view of Kremin

The following references are prior art to the Challenged Claims under pre-AIA 35 U.S.C. § 102:

- 1) U.S. Patent Publication No. 20120105362 to Kremin et al. (“Kremin”) (filed August 19, 2011; published May 3, 2012; priority date October 28, 2010). Ex. 1005. Kremin is prior art – specifically, a published patent application with an earlier effective filing date than the claimed priority date of the '866 Patent. *See* 35 U.S.C. 102(e) (pre-AIA); 35

U.S.C. § 311(b); *Lynk Labs, Inc. v. Samsung Elec. Co. Ltd.*, 125 F.4th 1120, 1126 (Fed. Cir. 2025) (“[E]ven if a patent application was *published* after a claimed invention, it may serve as prior art to the invention if the application was *filed* before the invention.”) (emphasis in original).

2) U.S. Patent Publication No. 20120050207 to Westhues et al. (“Westhues”) (filed August 30, 2010; published March 1, 2012). Ex. 1006. Westhues is prior art—specifically, a published patent application with an earlier effective filing date than the claimed priority date of the ’866 Patent. *See id.*

3) U.S. Patent No. 6,377,248 to Partow et al. (“Partow”) (filed September 30, 1999; issued April 23, 2002). Ex. 1007. Partow is a prior-art patent, which was filed and issued before the earliest possible priority date of the ’866 Patent, and was published well over one year prior to the claimed priority date of the ’866 Patent.

D. Notice of Real Party in Interest (37 C.F.R. § 42.8(b)(1))

Petitioner Shenzhen Qianfenyi Intelligent Technology Co., Ltd is the real party in interest.

E. Notice of Related Matters (37 C.F.R. § 42.8(b)(2))

Petitioner is the Defendant in a pending action filed by Patent Owner alleging infringement of the '866 Patent, among others. That action is Case No. 2:24-cv-702-JRG in the United States District Court for the Eastern District of Texas, Marshall Division. The complaint in that action was served on October 17, 2024. Dkt. 10. This petition is filed less than one year from the date of service. 35 U.S.C. § 315(b).

F. Other Grounds for Denial

Pursuant to the *Interim Processes of PTAB Workload Management Memorandum* issued on March 26, 2025, and the associated guidance issued by the USPTO, Petitioner does not address any arguments relating to discretionary denial, including issues relating to 35 U.S.C. § 325(d), parallel proceedings, and other discretionary matters. In the event the Board requests supplemental briefing on discretionary issues, Petitioner will address them at that time.

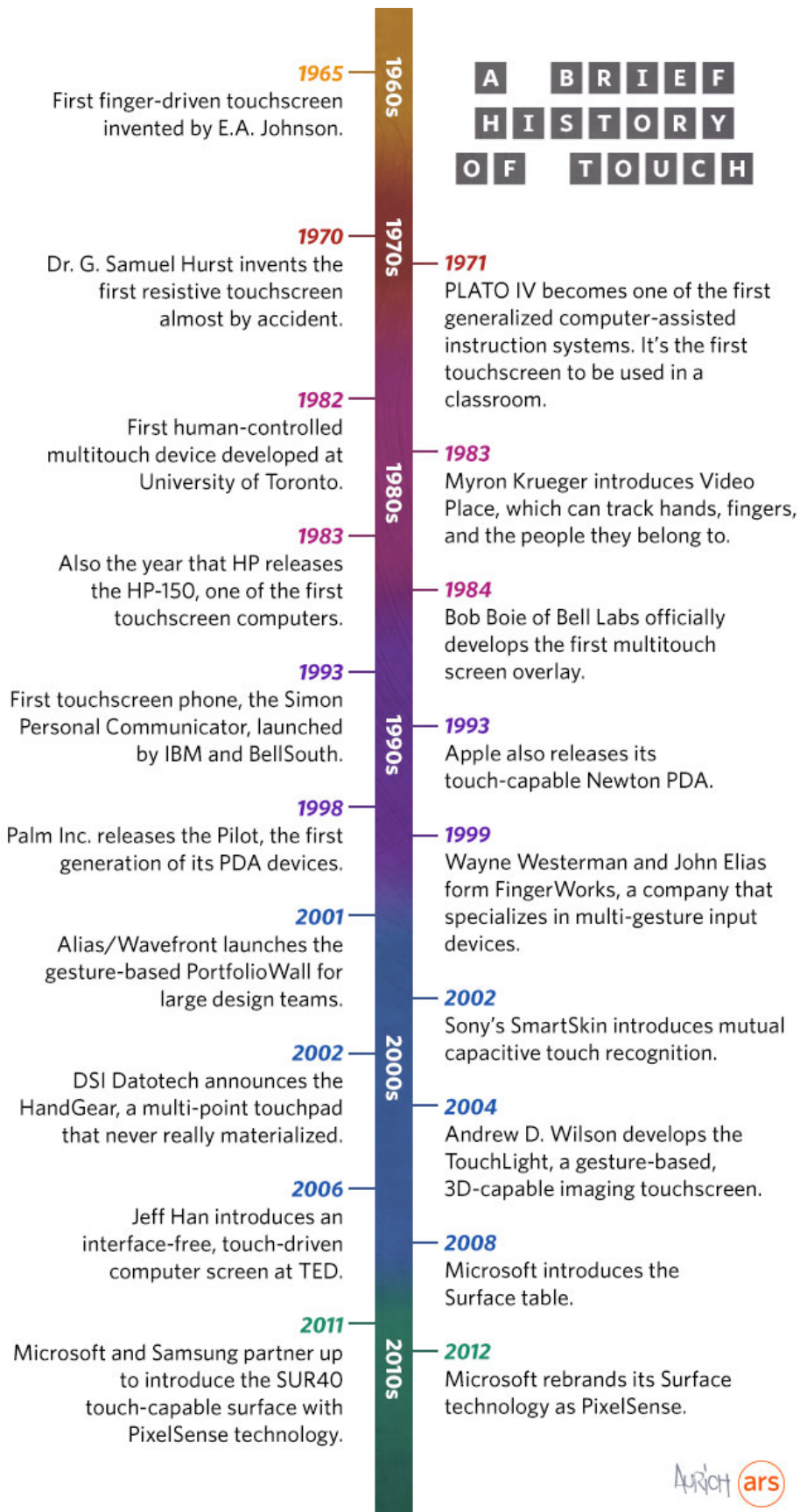
III. BACKGROUND AND OVERVIEW OF THE '866 PATENT

A. Brief Background of Prior Art

The '866 Patent describes a purported invention in the field of styluses used with a touch-sensitive device, such as a tablet or a computer screen. Ex. 1003 ¶32. These styluses communicate with the touch-sensitive device via the touchscreen's electrostatic field. *Id.* Styluses have been known and used for decades. *Id.* at ¶33. For example, the “Palm Pilot” product launched nearly three decades ago, in 1996, included a stylus to use with its handheld computing device. *Id.* Styluses can

generally be classified into two types: (1) “passive” styluses, which lack a power source and rely upon contact with the touchscreen for communication, perhaps with the aid of a conductive surface that absorbs some of the touchscreen’s electrostatic field using capacitive techniques, and (2) “active” styluses that typically have a power source and use internal electronics to generate electrostatic signals to communicate with the touchscreen. *Id.* at ¶34. Active and passive styluses may both use different techniques to communicate with a coupled device, which may include capacitive and/or inductive techniques. *Id.* Both active and passive styluses have been known for decades. *Id.* at ¶35. For example, Partow (Ex. 1007) a patent issued in 2002 and filed for in 1999, described an active stylus using a “high-voltage, sinusoidal” signal for communication with a “portable computer.” Ex. 1007 at Abstract, Title; Ex. 1003 ¶35.

Active and passive styluses can be used with touchscreen devices, such as tablet computers. *Id.* at ¶36. Touchscreen technology has likewise been known for decades, as illustrated in the below timeline illustrating the development and commercialization of touch technologies, including resistive touchscreens and capacitive touchscreens. *Id.*



Ex. 1018 (available at <https://arstechnica.com/gadgets/2013/04/from-touch-displays-to-the-surface-a-brief-history-of-touchscreen-technology/>).

B. Brief Description of the '866 Patent

The '866 Patent is titled “Active Stylus With High Voltage.” Ex. 1001, p.1. The disclosed technology relates to using a stylus to transmit signals wirelessly to a device through a touch sensor of the device. *Id.* The signals include “high-voltage signals” generated using “a relatively large potential difference compared to a voltage within a range of approximately 1 to approximately 3 volts.” *Id.*

In disclosed embodiments, one or more components (*e.g.*, a transformer or charge pump) of an active stylus can produce “substantially high voltage,” which is defined as “a relatively large potential difference compared to voltages used by an active stylus in normal operation...” Ex. 1001, 11:43-49. For example, voltages used in normal operation may be approximately 1-3 volts, whereas the high voltage may be approximately 10-20 volts. *Id.* at 11:49-54. The high voltage is used to power one or more electrodes to transmit the high-voltage signals. *Id.* at 11:54-61.

In an example embodiment, the stylus 20 of the '866 Patent is near a touch-sensitive display 54 of a touch-sensitive device 52, and the tip 26 is located a distance D1 away from the touch-sensitive display 54 (illustrated in FIG. 6A below). *Id.* at 11:66-12:2. One or more electrodes in the tip 26 of the stylus 20 receive the high voltage and output high-voltage signals that can be sensed at the touch-sensitive

device 52. *Id.* at 12:3-13. The high-voltage signals can be used to communicate information about the type of contact, such as for differentiating the stylus from another object (*e.g.*, a user's finger). *Id.* at 12:30-36.

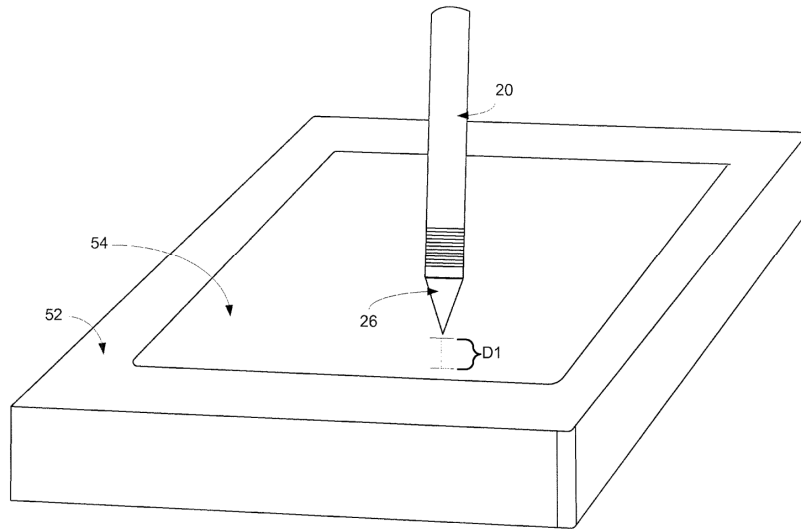


FIG. 6A of '866 Patent (Ex. 1001)

C. Prosecution History Summary

The '866 Patent was filed on October 17, 2014 and claims priority to a provisional application filed on October 28, 2011. Ex. 1001, p. 1. The '866 Patent issued following six office actions and various amendments and arguments related to obviousness, enablement, and indefiniteness of the claims. Ex. 1002 & Ex. 1003 ¶¶48-54. None of the references discussed herein were applied in any claim rejections. *See generally* Ex. 1002.

D. Priority Date for the Challenged Claims

The '866 Patent claims the benefit of U.S. Provisional Application No. 61/553,114, filed on October 28, 2011. Ex. 1001, p. 1. In its Infringement Contentions in the related patent litigation proceeding described in Part II.E, above, Patent Owner contended that the priority date for the '866 Patent is October 28, 2011. All prior art relied upon in this Petition was published more than one year before October 28, 2011 (Partow, Ex. 1007), or has an earlier effective filing date than the Patent Owner's claimed priority date for the '866 Patent (Kremin and Westhues, Exs. 1005 & 1006). Petitioner uses Patent Owner's claimed priority date for the purposes of this Petition, but reserves the right to challenge that date in other proceedings or, if warranted by Patent Owner's response, in this proceeding.

IV. PERSON HAVING ORDINARY SKILL IN THE ART

As of October 28, 2011, a person having ordinary skill in the art ("POSITA") relevant to the '866 Patent would have at least a four-year bachelor's degree in computer engineering, electrical engineering, or similar, and at least two years of experience working with computing systems and their interaction/communication with other devices, or an advanced degree in computer engineering, electrical engineering, or the like. *See* Ex. 1003, ¶47.

V. CLAIM CONSTRUCTION

Claims are construed according to the *Phillips* standard in an IPR. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*); 37 C.F.R. §§ 42.100(b).

The Board need only construe the claims when necessary to resolve the underlying controversy. *Lectrosonics Inc. v. ZaxCom, Inc.*, IPR2018-01129, Paper 33, 2020 Pat. App. LEXIS 2043 (P.T.A.B. Jan. 24, 2020) (precedential), *citing Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).²

Here, given the close relationship between the Challenged Claims and the asserted prior art, the Board need not formally construe any terms in order to invalidate the Challenged Claims. Any reasonable interpretation of the claims—as understood by a POSITA at the time of the alleged invention—reads on the prior art.

Petitioner notes that the “component operable to convert the voltage of approximately 1 to 3 volts to the high voltage,” as in claims 1 and 15, appears to be a means-plus-function term for which the corresponding structure is a transformer or charge pump. *See* Ex. 1001 at 11:43-54; Ex. 1003, ¶¶56-58. While the claims do not use the word “means,” the claimed “component” would not be understood as a structural term. *See Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347-49 (Fed. Cir. 2015); *see also* Ex. 1003, ¶¶56-58. Accordingly, the “component operable to convert the voltage of approximately 1 to 3 volts to the high voltage” should be understood as a means-plus-function term encompassing a transformer, a charge pump, and equivalents thereof. *Id.*

² Petitioner reserves the right to raise claim construction arguments in the co-pending district court action and any other proceedings as appropriate.

VI. CHALLENGED CLAIMS ARE UNPATENTABLE

All Challenged Claims are invalid because they merely recite limitations that were known in the art as of the priority date of the '866 Patent. All Challenged Claims are anticipated over the references discussed herein. Even if the Challenged Claims were not anticipated, they are nonetheless obvious in view of the knowledge of a POSITA and in view of the combined teachings of the references.

A. Conventional Knowledge of a POSITA

A POSITA would have known of various techniques and components related to using a stylus with a touch-sensitive device (*e.g.*, a tablet or the like) as of the earliest possible priority date for the '866 Patent. Ex. 1003, ¶72. Simple passive styluses were known, which may include a conductive surface that can absorb some of a touchscreen's electrostatic field, thus registering a touch at the touch-sensitive device. *Id.* A POSITA also would have been familiar with resistive touchscreens (and associated styluses), which may detect a touch when pressure is applied to a first sheet causing the first sheet to come into contact with a second sheet. *Id.* Active styluses (*e.g.*, styluses with power sources and more sophisticated components) were also known. *Id.* at ¶73.

Additionally, a POSITA would have known of high-voltage techniques and associated advantages in relation to active styluses. *Id.* at ¶¶74-80. While the stylus itself may use a lower power-supply voltage, a POSITA would have known that

using a relatively higher voltage for producing a signal may have various advantages. One advantage of higher voltage is improved detection of the stylus by the touch-sensitive device, even while the stylus is not in direct physical contact with the device. *Id.* Other advantages of using a relatively higher voltage is that it helps to differentiate the signal from noise, and allows for faster and more robust detection by the device, as described further below. *Id.* at ¶83.

B. Summary of Prior Art

1. Kremin (Ex. 1005)

Kremin describes a stylus 850 synchronized to a host device 805 (illustrated in FIG. 8 below). Ex. 1005 (Kremin), ¶[0080]. The stylus includes a booster 870 coupled to a tip driver 890. *Id.* at ¶[0081]. The booster 870 boosts a battery voltage to allow the tip driver 890 to amplify a signal to a higher voltage. *Id.* at ¶[0084]. The resulting high-voltage signal enables the host device 805 to detect the stylus 850 when it is “hovering,” or in close proximity to the capacitive sense array 810, but not physically touching an overlay disposed over the capacitive sense array 810. *Id.* The high-voltage signal may also provide for faster and more robust detection of the stylus 850. *Id.* In some examples, the battery voltage is provided by 1.5-volt AAA cells, while the higher voltage is in the range of 10 to 20 volts. *Id.*

Figure 4 N-Trig Stylus Block Diagram

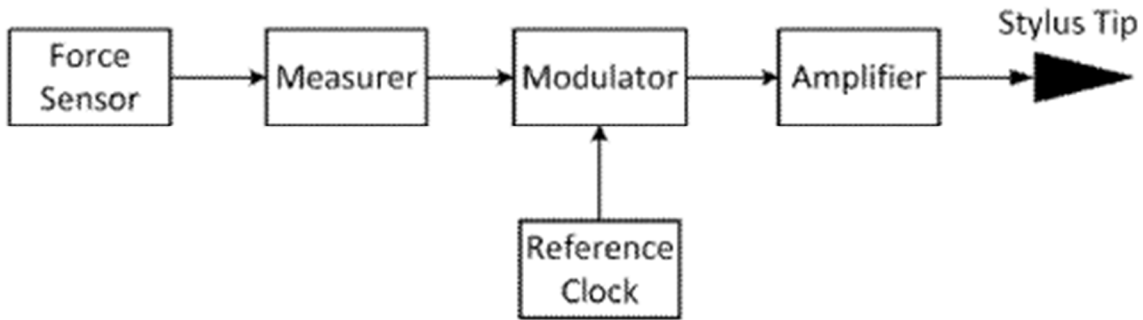


FIG. 4 of U.S. Provisional Patent App. No. 61/407,907 (Ex. 1016)

2. Westhues (Ex. 1006)

Westhues describes an active stylus capable of receiving or transmitting a signal through its tip, which may allow for a finer tip than other conductive styluses. Ex. 1006 (Westhues) ¶¶[0035]-[0037]. The position of the stylus is determined along axes of a two-dimensional sensor array using a matrix of conducting rows and columns. *Id.* at ¶¶[0031]&[0040]. The stylus receives a signal transmitted along a column of the matrix, and a position of the stylus along the respective axis is determined based on the received signal, such as based on a timeslot in which the signal is received. *Id.* at ¶¶[0040]-[0041]. The stylus then indicates its position along the other axis by transmitting a signal in a different timeslot, in which no columns of the matrix transmit a signal and the stylus instead transmits the same signal that would have been used to excite a column. *Id.* at ¶[0042]. The position of the stylus along this other axis is determined based on a row of the matrix along which the signal is received from the stylus. *Id.* Westhues, therefore, describes that

“[t]he stylus *transmits* to localize itself among the rows and *receives* to localize among the columns.” *Id.* (emphasis added). After the localization, interpolation can be performed to determine a more exact location of the stylus. *Id.*

The stylus used to perform the localization contains various components, as illustrated with reference to FIG. 3 of Westhues. Ex. 1006, ¶[0050]. A microcontroller 320 maintains timing for the stylus, computes coordinates, performs interpolation, and reports the coordinates back to the matrix, and so on. *Id.* at ¶[0051]. A transmit/receive switch 360 coupled to an electrode 370 is used to send and receive signals. *Id.* “The transmit/receive switch 360 can allow *a high voltage (e.g., around 100 V) output to be applied to the electrode 370 in the transmit mode*, and to receive a small current signal (e.g., around 1 uA) from the electrode 370 in the receive mode.” *Id.* (emphasis added).

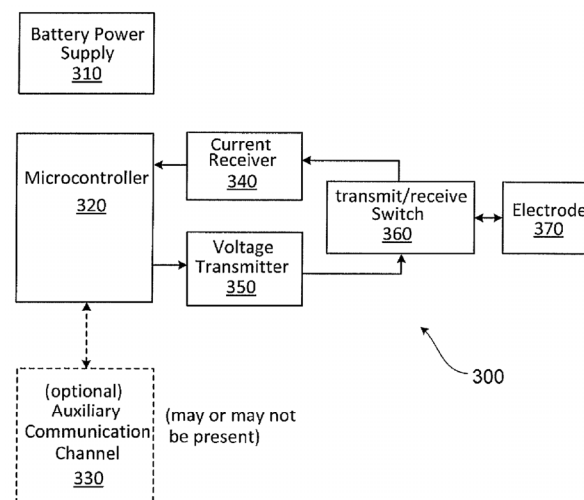


FIG. 3

FIG. 3 of Westhues (Ex. 1006)

The stylus of Westhues includes circuitry to transmit “a large voltage” and receive a small current using a single electrode, such as the circuit illustrated in FIG. 4. Ex. 1006, ¶[0055]. A transformer L2 of the circuit is coupled to a power supply voltage, which may be a battery voltage of approximately 3 volts. *Id.* Using the power supply voltage, the circuit generates a high voltage (e.g., ~100 volts) provided to the electrode. *Id.* at ¶[0056].

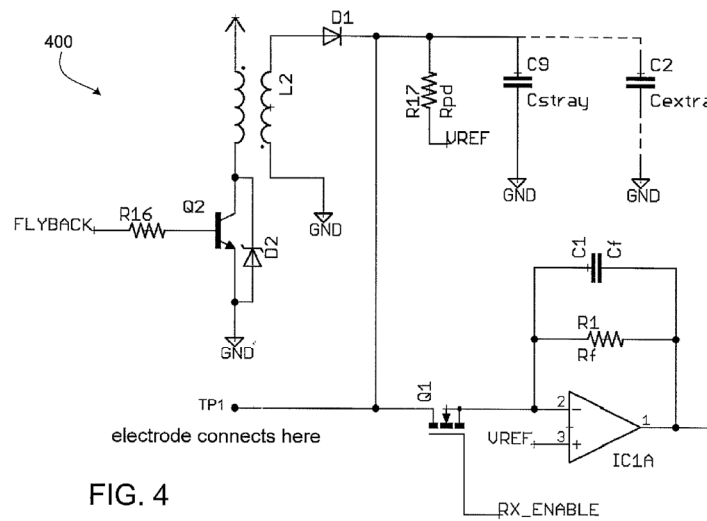


FIG. 4

FIG. 4 of Westhues (Ex. 1006)

3. Partow (Ex. 1007)

Partow describes advantages of providing a relatively large signal by a stylus, so that the stylus can be differentiated from noise, and problems related to generating such a signal due to constraints such as stylus size and available battery power. Ex. 1007, 1:47-57. Partow, thus, discloses techniques for generating a high-voltage signal. In an embodiment illustrated in FIGs. 8A-8D, a first amplifier A1 receives a sine wave from a sine-wave generator and a second amplifier A2 receives an inverted

sine wave (*i.e.*, the generated sine wave having been inverted by the inverter I). *Id.* at 2:51-58. The two amplifiers A1 and A2 feed the primary winding 15 of a transformer 18, each amplifier outputting a sine wave that is 5 volts peak-to-peak. *Id.* at 2:53-60. The transformer 18 outputs a wave that is 20 volts peak-to-peak. *Id.* at 3:28-29. 62. The output of the transformer 18 is applied to the tip of the stylus. *Id.* at 3:28-29.

VII. GROUNDS OF UNPATENTABILITY

Under 37 C.F.R. § 42.104(b)(4)–(5), the following sections (as confirmed in the Declaration of Nabil J. Sarhan, Ph.D., Ex. 1003) detail the grounds of unpatentability, the limitations of the Challenged Claims of the '866 Patent, and how these claims are anticipated and/or obvious in view of the prior art.

A. Ground 1: The Challenged Claims are anticipated and obvious over Kremin.

The Challenged Claims are anticipated and obvious over Kremin in view of the knowledge of a POSITA. *See* Ex. 1003, ¶87. Petitioner uses the claim mapping set forth *supra* at pp. i-ii and cites and incorporates the analysis in Appendix A to the Declaration of Nabil J. Sarhan, Ph.D. *See* Ex. 1003.

1. Claim 1

Claim 1 is anticipated by Kremin for the reasons discussed below. All limitations of claim 1 are disclosed in Kremin. In the alternative, claim 1 is obvious over Kremin in view of the knowledge of a POSITA.

a. Limitation 1[pre]

Kremin discloses 1[pre]. Ex. 1003, Appx. A, limitation 1[pre]; Ex. 1005 ¶[0051], Abstract (“A system and method for tracking a *stylus*...”) (emphasis added). For example, the component 850 of FIG. 8 of Kremin is a stylus synchronized to a host device 805. Ex. 1005, ¶[0080].

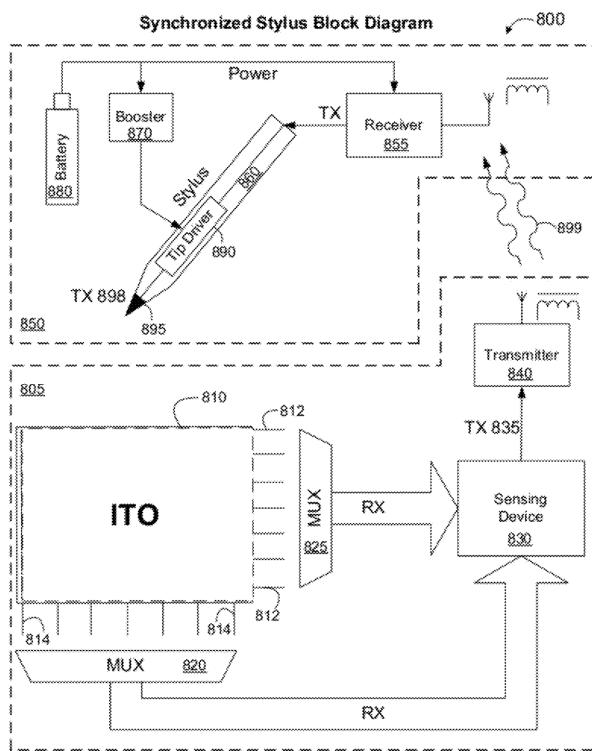


FIG. 8 of Kremin (Ex. 1005)

b. Limitation 1[a]

It would be appreciated that the stylus of Kremin includes at least one electrode, which is used in transmitting the signal from the stylus to the host device.

Ex. 1003, Appx. A, limitation 1[a]. An electrode would be understood as a compo-

ment used to electrically couple the stylus to the host device, which was commonplace for stylus technology. *Id.* Kremin describes that the disclosed stylus includes a stylus tip through which amplified transmit signals are provided to a capacitive sense array using capacitive coupling. Ex. 1005, claim 6 & ¶[0085]. A POSITA would appreciate that the described functions require the use of an electrode in the stylus tip. Ex. 1003, Appx. A, limitation 1[a]. Limitation 1[a] is, therefore, inherently disclosed in Kremin.

Additionally, even if limitation 1[a] were not inherent in Kremin, it would be obvious to a POSITA to include an electrode based on the disclosure of Kremin and the knowledge of a POSITA, and no undue experimentation is required for a POSITA to know that an electrode would be needed because it is the conventional way to provide this functionality. *Id.* Electrodes had been known for decades prior to the '866 Patent, and a POSITA would have known of and used one or more electrodes to perform the foregoing functions. Active styluses are known to have electrodes at the tip. *See, e.g.*, U.S. Patent Publication No. 20120050207 (Ex. 1006) ¶[0050] and U.S. Patent No. 8,766,954 (Ex. 1017) at 3:3-17. Kremin recognizes this. In describing the position tracking system for the stylus, Kremin discloses that the row 660 and column 640 electrodes in the sense array are capacitively coupled to the stylus 680, detecting the charge coupled at the contact point

695 with the stylus, which is inherently only possible if there is electrode in the stylus. Ex. 1005 at ¶[0073].

c. Limitation 1[b]

Kremin describes that disclosed techniques are implemented using instructions stored on a computer-readable medium. Ex. 1005, ¶[0140]. Additionally, Kremin discloses that the stylus includes a microcontroller, which would be understood as having computer-readable non-transitory storage media (*e.g.*, memory). Ex. 1003, Appx. A, limitation 1[b]. As discussed above, the booster 870 of Kremin is used to boost a battery voltage to allow the tip driver 890 to amplify a signal to a higher voltage. Ex. 1005, ¶[0084]. The resulting high-voltage signal enables the host device 805 to detect the stylus 850 when it is “hovering,” or in close proximity to the capacitive sense array 810, but not physically touching an overlay disposed over the capacitive sense array 810. *Id.* The battery voltage may be provided by 1.5-volt AAA cells, while the higher voltage for the signal is in the range of 10 to 20 volts. *Id.*

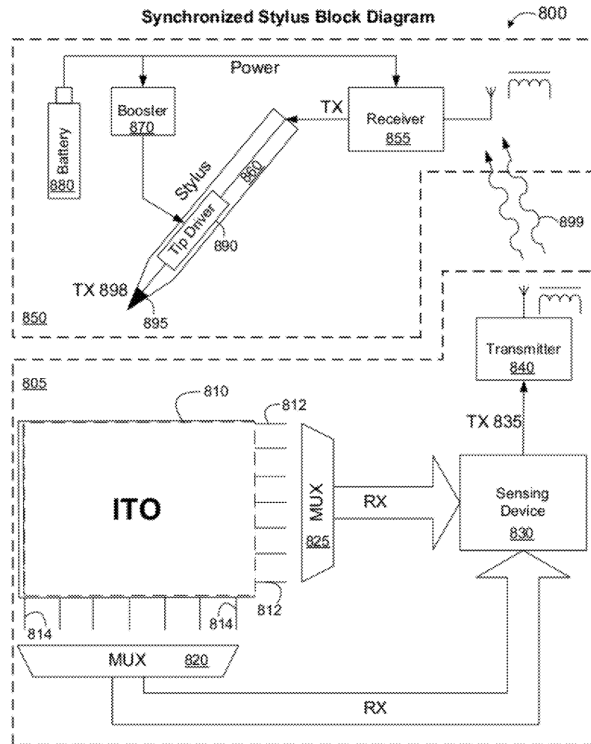


FIG. 8 of Kremin (Ex. 1005)

Limitation 1[b] further recites “transmitting signals wirelessly to a device through a touch sensor of the device,” and a POSITA would appreciate that Kremin implements this feature. Ex. 1003, Appx. A, limitation 1[b]. The term “wirelessly” in this context refers to communication of signals without the use of a hard-wired connection. *Id.* The transmission of signals via the stylus tip, as disclosed in Kremin, would thus be understood as “transmitting signals wirelessly to a device through a touch sensor of the device.” *Id.* Moreover, the “hovering” feature of Kremin would be understood as transmitting signals “wirelessly” from the stylus to the host device, as in limitation 1[b]. Ex. 1003, Appx. A, limitation 1[b]. Additionally, Kremin describes using various wireless techniques for transmitting signals from a

stylus to a host device, such as optical, ultrasonic, inductive, or RF signal transmissions. Ex. 1005, ¶[0111].

The use of the booster would be understood as providing a high-voltage signal associated with a high voltage comprising a relatively large potential difference compared to a voltage within a voltage range of approximately 1 to approximately 3 volts, as in limitation 1[b]. Ex. 1003, Appx. A, limitation 1[b]. For example, the battery voltage of Kremin is within the range of 1 to 3 volts (i.e., 1.5 volts), while the high-voltage signal is in the range of 10 to 20 volts. *Id.*

Kremin, thus, discloses all features of limitation 1[b]. Ex. 1005 at ¶[0011], [0064], [0065], [0066], [0093], [0099], [0102], [0104], [0106], [0111], [0139], [0140]. Even if one or more features were not expressly or inherently disclosed in Kremin, such features would be obvious in view of the knowledge of a POSITA. Ex. 1003, Appx. A, limitation 1[b]; Ex. 1005 at ¶[0010]; *see also* Ex. 1016 (describing N-Trig Stylus Block Diagram, one of “two known competitor solutions” with amplifier or other components to increase voltage); Ex. 1017 (U.S. Patent No. 8,766,954 to Vuppu et al.) at ABSTRACT, 3:36-49, 3:36-49, and 4:46-60, Claim 14.

d. Limitation 1[c]

As discussed in Dr. Sarhan's declaration, limitation 1[c] is likely a means-plus-function limitation corresponding to a transformer or a charge pump, as disclosed in the '866 patent specification. Ex. 1003, ¶¶56-58. For the reasons discussed below, the booster of Kremin performs the identical function specified in limitation 1[c] in substantially the same way, and produces substantially the same results as the corresponding element disclosed in the specification. Kremin, therefore, anticipates and renders obvious limitation 1[c] under a means-plus-function analysis. *See* Ex. 1003, Appx. A at limitation 1[c]. Even if limitation 1[c] were not interpreted as a means-plus-function limitation, Kremin still anticipates and renders obvious limitation 1[c] for the reasons discussed below.

As discussed above, the booster 870 of Kremin is used to boost a battery voltage to allow the tip driver 890 to amplify a signal to a higher voltage, and the battery voltage may be provided by 1.5-volt AAA cells, which can be boosted to a higher voltage of 10-20 volts. Ex. 1005, ¶[0084]; *see also id.* ¶¶[0048], [0099], [0104], [0109], Fig. 13. The booster 870 is, therefore, a "component operable to convert the voltage of approximately 1 to 3 volts to the high voltage," as in limitation 1[c]. Ex. 1003, Appx. A, limitation 1[c].

e. Limitation 1[d]

Kremin discloses that the stylus includes a stylus tip 895 used to capacitively couple the signal to the capacitive sense array of the host device. Ex. 1005, ¶[0085] & FIG. 8. It would be understood that the stylus tip 895 of Kremin necessarily includes an electrode to achieve this coupling. Ex. 1003, Appx. A, limitation 1[d]. Kremin, therefore, discloses a stylus tip at which one or more electrodes is disposed, as in limitation 1[d]. *Id.*; *see also id.* ¶¶[0106]-[0107].

f. Limitation 1[e]

Kremin discloses that the boosted voltage provided by the booster 870 is delivered to the tip driver 890 to provide a high-voltage signal. Ex. 1005, ¶[0084]. The high-voltage signal is capacitively coupled to the capacitive sense array of the host device using the stylus tip. Ex. 1005, ¶¶[0085]&[0106]-[107]. As discussed above with reference to limitation 1[d], the stylus tip of Kremin necessarily includes an electrode for capacitively coupling the signal to the capacitive sense array. Accordingly, it would be understood that Kremin discloses “wherein the high-voltage signals result from the one or more electrodes receiving the high voltage,” as in limitation 1[e]. Ex. 1003, Appx. A, limitation 1[e]. In other words, the electrode of the stylus tip of Kremin necessarily receives the high voltage as part of the capacitive coupling of the signal provided to the capacitive sense array of the host device. *See id.*

2. Claim 2

The use of a transformer to “step up” or “boost” a voltage was well known before the ’866 Patent. Ex. 1003, Appx. A, claim 2. It would have been obvious to a POSITA to include a transformer as a component operable to boost to a voltage in relation to amplifying the signal to a higher voltage, as described in Kremin. *Id.*; *see also* Ex. 1005, ¶¶[0084]. The use of a transformer to “boost” voltage was well-known in the art decades before the effective filing date of the ’866 Patent. Ex. 1003, Appx. A, claim 2. The transformer is one of a few main basic components that can boost voltage, and it would be the first or second choice that would come to a POSITA’s mind³. *Id.* The main devices to boost the voltage are transformers, amplifiers, and charge pumps. *Id.* No undue experimentation is needed by a POSITA to determine the component to use for boosting the voltage, especially if this component is the main or at least one of the main components used for this purpose. *Id.* Claim 2 is, therefore, obvious in view of Kremin and the knowledge of a POSITA. *See* Ex. 10005, ¶¶[0081]&[0084].

3. Claim 3

Kremin specifically states that the higher voltage used to generate the high-voltage signal can be 10 to 20 volts. Ex. 1005, ¶ 0084]. Claim 3 is, therefore, anticipated by Kremin because Kremin discloses “wherein the high voltage

³ *See* Ex. 1015, p. 80 (“Transformers are usually employed to boost ac voltages.”).

comprises a voltage within the voltage range of approximately 10 to approximately 20 volts.” Ex. 1003, Appx. A, claim 3.

4. **Claim 4**

The high-voltage signal of Kremin is used to locate the stylus relative to the capacitive sense array of the host device. Ex. 1005, ¶[0085]. This includes, for example, using the high-voltage signal to detect a “hovering” stylus. *Id.* at ¶[0084]. Kremin, therefore, discloses “wherein the high-voltage signals identify a location of the stylus relative to the touch sensor of the device,” as in claim 4. Ex. 1003, Appx. A, claim 4; *see also* Ex. 1005, ¶¶[0046], [0047], [0084], [0085], Figs. 20 & 21.

5. **Claim 5**

Kremin describes that the disclosed technology can be used to detect presence of a touch object and a stylus. Ex. 1005, ¶¶[0051]-[0052]. The touch object can be, for example, a user’s finger. *Id.* at ¶[0086].

In some implementations, Kremin describes that the stylus signal may have the same amplitude, frequency, phase, etc. used for “finger sensing.” Ex. 1005, ¶[0076]. Based on this, it would be understood that Kremin can use the high-voltage signals to simulate contact by an object other than the stylus, when the stylus is in contact with or in the proximity of the touch sensor of the device, as in claim 5. Ex. 1003, Appx. A, claim 5. In other words, the stylus of Kremin can simulate contact by a finger because a signal generated by the stylus can simulate features of a signal

used to detect a user's finger.

Additionally, Kremin describes that a touch by the stylus can be distinguished from a touch by the user's palm because a signal provided by the stylus tip may be much stronger than a signal generated by a palm. Ex. 1005, ¶[0102]. This would be understood as distinguishing contact by an object other than the stylus when the stylus is in contact with or in the proximity of the touch sensor of the device, as in claim 5. Ex. 1003, Appx. A, claim 5. For example, Kremin's stylus design emphasizes allowing for multi-touch and simultaneous input signals, including simultaneous use of a stylus and touch object. Ex. 1005, ¶[0003]. Kremin's use of high-voltage signals allows for, and distinguishes between, simultaneous use of a stylus 330 and touch object 340. Ex. 1005, ¶¶[0024], [0051], [0086]. Kremin further discloses how, for example, a stylus and palm contacting a device will both produce transmit signals but are distinguishable by the strong voltage of the stylus tip transmit signal, as opposed to the voltage of a palm or other contacting devices. Ex. 1005, ¶[0102]. This encompasses *distinguishing* between contact by the stylus and passive touch objects when the stylus is in contact with or in the proximity of the touch sensor of the device. Ex. 1005, ¶¶[0102], [00103]; Ex. 1003, Appx. A, claim 5.

Kremin, therefore, discloses or renders obvious all limitations of claim 5. Ex. 1005, ¶¶[0003], [0018], [0024], [0032], [0048], [0051], [0076], [0084], [0086],

[0099], [0102], [0103], Figs. 3 & 12A.

6. **Claim 6**

Claim 6 is also anticipated and/or obvious in view of Kremin. Ex. 1003, Appx. A, claim 6. As discussed above with reference to claim 5, Kremin describes using the stylus to generate a signal simulating a signal used to sense a user's finger. *See* Ex. 1005, ¶[0076]. A finger is “a part of a human hand,” as in claim 6.

Additionally, as discussed above with reference to claim 5, Kremin describes distinguishing a signal provided by the stylus tip from a signal generated by a palm. *See id.* at ¶[0102]. A palm is also “a part of a human hand,” as in claim 6. Kremin, therefore, discloses or renders obvious all limitations of claim 6. *Id.* ¶¶[0024], [0051], [0076], [0086], [0102], [0103], Figs. 12A & 12B.

7. **Claim 7**

Claim 7 is also anticipated and/or obvious in view of Kremin. Ex. 1003, Appx. A, claim 7. For example, Kremin describes implementations in which the signal 835 provided to the transmitter 840 of the host device 805 for transmission to the stylus 850 is the same signal generated and applied to the ITO panel 810 on the TX lines 812 or 814 during finger position tracking. Ex. 1005, ¶¶[0082]-[0083]. Once received at the stylus, the signal 835 is amplified using the boosted voltage supplied to the tip driver, thus providing a high-voltage signal. *Id.* at ¶[0084]. This would be understood as a high-voltage signal “based on a voltage used by at least a portion of

the touch sensor of the device,” as in claim 7, because the high-voltage signal is provided by boosting the received signal, which was provided at the array of the host device. Ex. 1003, Appx. A, claim 7; *see also id.*, Appx. B, claim 7; Ex. 1005 at ¶¶[0082]-[0085], [0098]-[0103], Figs. 8 & 11.

It was also known in the art prior to the effective filing date of the '866 Patent that the stylus can receive the signal from the touch-sensitive device, invert it (*i.e.*, convert to opposite polarity), non-invert it (*i.e.*, keep it with the same polarity), amplify it (*i.e.*, convert it to a higher voltage), or non-amplify it (*i.e.*, keep it at the same voltage level), and then send it back to the touch-sensitive device. *See, e.g.*, Vuppu (Ex. 1017) at ABSTRACT, 3: 36-49, 3:36-49, and 4:46-60, Claim 14. Amplifying the signal can decrease the size of the stylus tip and improve the precision of the touch, while inverting can help in the differentiation from the finger touch. Ex. 1017 at ABSTRACT, 1:27-41, 6:27-36, and 11:65-12:2. Therefore, it would have been obvious to a POSITA to implement claim 7 based on Kremin and the knowledge of a POSITA. Ex. 1005, ¶¶[0082]-[0085], [0098]-[0100], [0103], Figs. 8 & 11.

8. Claim 15

Claim 15 is anticipated by Kremin for the reasons discussed below. All limitations of claim 15 are disclosed in Kremin. In the alternative, claim 1 is obvious over Kremin in view of the knowledge of a POSITA.

a. Limitation 15[pre]

Kremin discloses limitation 15[pre]. Ex. 1003, Appx. A, limitation 15[pre]. Kremin describes that disclosed techniques are implemented using instructions stored on a computer-readable medium. Ex. 1005, ¶[0140]. Additionally, Kremin discloses that the stylus includes a microcontroller, which would be understood as having computer-readable non-transitory storage media (*e.g.*, memory). Ex. 1003, Appx. A, limitation 1[b].

b. Limitation 15[a]

As discussed above, the stylus of Kremin uses a booster 870 to boost a battery voltage to allow the tip driver 890 to amplify a signal to a higher voltage to provide a high-voltage signal to a touch sensor of a host device. Ex. 1005, ¶[0084]. The battery voltage may be provided by 1.5-volt AAA cells, while the higher voltage for the signal is in the range of 10 to 20 volts. *Id.* The use of the booster would be understood as providing a high-voltage signal associated with a high voltage comprising a relatively large potential difference compared to a voltage within a voltage range of approximately 1 to approximately 3 volts, as in limitation 15[a]. Ex. 1003, Appx. A, limitation 15[a]. For example, the battery voltage of Kremin is within the range of 1 to 3 volts (*i.e.*, 1.5 volts), while the high-voltage signal is in the range of 10 to 20 volts. *Id.* Additionally, a POSITA would appreciate that the transmitted signals are electromagnetic signals, which would be understood as a

general term referring to a signal communicated based on electrical and/or magnetic forces produced by an electric current, such as signals transmitted via a stylus tip that includes an electrode. *Id.* For example, a POSITA would appreciate that capacitive coupling utilizes the electric field variations, which also generate magnetic fields, as governed by Maxwell's Equations (specifically Ampère-Maxwell law). Ex. 1003, Appx. A, limitation 15[a]. A POSITA would, therefore, appreciate that signals transmitted using capacitive coupling are electromagnetic signals. Ex. 1003, Appx. A at limitation 15[a].

Kremin, thus, discloses all features of limitation 15[a]. Even if one or more features were not expressly or inherently disclosed in Kremin, such features would be obvious in view of the knowledge of a POSITA. Ex. 1003, Appx. A, limitation 15[a].

c. Limitation 15[a1]

It would be appreciated that the stylus of Kremin includes one or more electrodes, which are used in transmitting the signal from the stylus to the host device. *See* Sections VII(A)(1)(b)&(c); Ex. 1003, Appx. A, limitation 15[a1]. An electrode would be understood as a component used to electrically couple the stylus to the host device, which was commonplace for stylus technology. *Id.*

d. Limitation 15[a2]

See limitation 1[c] above, Section VII(A)(1)(d).

e. Limitation 15[a3]

See limitation 1[d] above, Section VII(A)(1)(e).

f. Limitation 15[a4]

See limitation 1[e] above, Section VII(A)(1)(f).

9. Claim 16

See claim 2 above, Section VII(A)(2).

B. Ground 2: The Challenged Claims are further obvious over Kremin in view of Partow.

While all Challenged Claims are anticipated and obvious over Kremin, Petitioner further demonstrates that all Challenged Claims are also obvious in view of Kremin and Partow. Ex. 1003, ¶88. Kremin anticipates and/or renders obvious all limitations of the Challenged Claims. *See* Section VII(A). Alternatively, to the extent any limitation is not disclosed in Kremin, the limitation is disclosed in Partow.

1. Motivation to Combine Kremin and Partow.

As discussed in Dr. Sarhan's more fulsome analysis at Appendix A of Exhibit 1003, Kremin and Partow discuss similar technologies and solve similar problems related to using a stylus with a high voltage for interacting with touch screens. Partow in particular focuses primarily on how to generate a high voltage and how designs related to high-voltage features can be adapted for different situations. Ex. 1003, Appx. A; Ex. 1003, ¶82. A POSITA implementing a stylus as disclosed in Kremin would, thus, benefit from the disclosure of Partow, and would be motivated

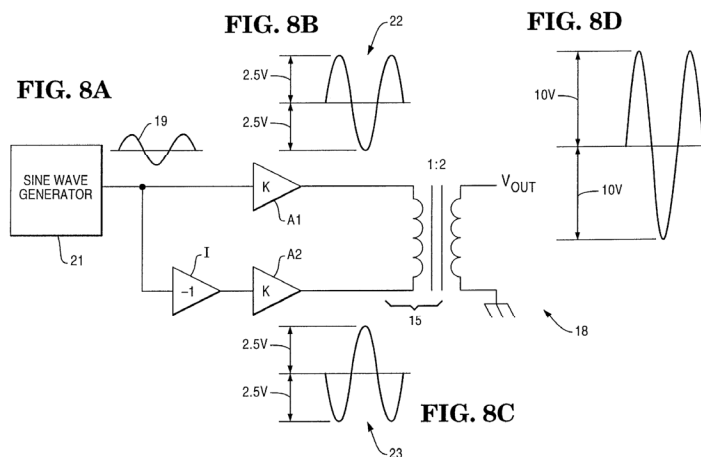
to modify Kremin based on Partow for the obvious benefit of providing additional ways to generate a high voltage in a stylus. *Id.*; *see also* Ex. 1007 (Partow) at 1:67-2:64. As discussed above, higher voltage has several advantages including improved detection of the stylus by the touch-sensitive device, even while the stylus is not in direct physical contact with the device, and better ability to differentiate the signal from noise, and to allow for faster and more robust detection by the device. Ex. 1003, ¶83. A POSITA would have been motivated to so modify the stylus of Kremin for the obvious benefit of more easily producing a boosted voltage. *See* Ex. 1007 (Partow) at 1:67-2:64. In addition, Partow specifically discloses how the system can be modified as the circumstances require, including the factors contributing to the value of the output voltage. It contains an entire section titled “Important Considerations” that discusses several examples with different voltage levels. *See* Ex. 1007 (Partow) at 1:35-4, cols. 3-6; Ex. 1003, ¶84.

2. Claim 1

In addition to being anticipated by Kremin and obvious over Kremin in view of the knowledge of a POSITA, claim 1 is further obvious over Kremin in view of Partow based on the example disclosures of Partow discussed below in combination with the disclosures of Kremin discussed above in Section VII(A). *See* Ex. 1003, Appx. A, claim 1.

a. Limitation 1[b]

Partow also discloses “high-voltage signals associated with a high voltage comprising a relatively large potential difference compared to a voltage within a voltage range of approximately 1 to approximately 3 volts,” as in limitation 1[b]. Ex. 1003, Appx. A, limitation 1[b]. The technology disclosed in Partow relates to “an improved stylus for a portable digitizing pad, which produces a large position signal.” Ex. 1007 (Partow) at 1:65-67. In a particular embodiment, the stylus of Partow uses a transformer to output a signal that is “about 20 volts, peak-to-peak.” *Id.*, 2:51-62. This is illustrated, for example, in FIGs. 8A-8D of Partow. This voltage (i.e., 20 volts peak to peak or 10 volts zero to peak) is specifically described as being a high voltage within the meaning of the ’866 Patent. *See* ’866 Patent (Ex. 1001), 11:51-54 & claim 3. In another embodiment, Partow describes receiving a power supply voltage of 3 volts, which is fed into a transformer, and outputting 60 volts zero to peak (i.e., 120 volts peak to peak). *See* Ex. 1007 (Partow) at 3:37-46. This would also be a “high voltage” within the meaning of the ’866 Patent.



FIGS. 8A-8D of Partow (Ex. 1007)

It would have been obvious for a POSITA to modify the stylus of Kremin to implement the particular way of producing a high-voltage signal, as disclosed in Partow, and a POSITA would have been motivated to make this modification for one or more obvious benefits, including the benefit of more easily producing a boosted voltage. Ex. 1003, Appx. A, limitation 1[b]; *see also* Ex. 1007 (Partow) at 1:67-2:64; Section VII(B)(1) above.

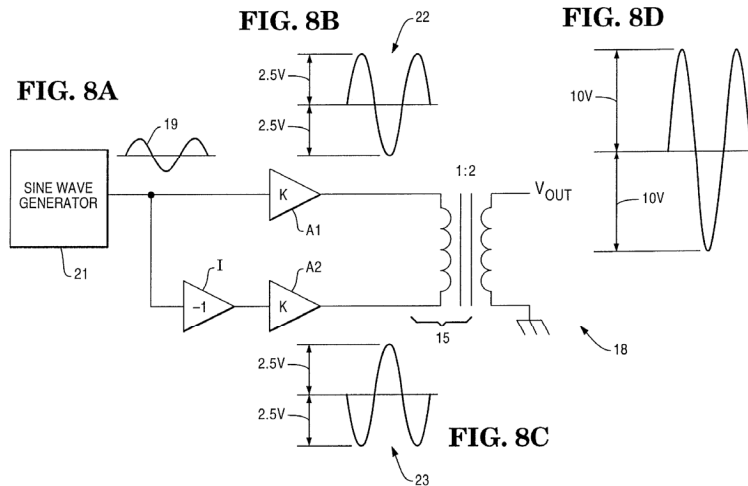
b. Limitation 1[c]

Partow also discloses “a component operable to convert the voltage of approximately 1 to 3 volts to the high voltage,” as in limitation 1[c]. Ex. 1003, Appx. A, limitation 1[c]. As discussed above with reference to limitation 1[b], Partow describes generating a high-voltage signal by increasing a voltage of a received signal to a high voltage. Ex. 1007 (Partow) at 2:51-62. The component illustrated in FIGS. 8A-8D of Partow would be understood as a component operable to convert

the voltage of approximately 1 to 3 volts to the high voltage, as in limitation 1[c]. Ex. 1003, Appx. A, limitation 1[c]. A POSITA would appreciate that this feature of Partow can be easily combined with Kremin, such as by implementing the component illustrated in FIGs. 8A-8D as the booster of Kremin. *Id.*

3. **Claim 2**

Claim 2 is obvious over Kremin in view of Partow. Ex. 1003, Appx. A, claim 2. As discussed in Section VII(A)(1)(d), Kremin discloses a booster 870, which is a component operable to convert the voltage of approximately 1 to 3 volts to the high voltage, as in limitation 1[c]. Ex. 1003, Appx. A, limitation 1[c]. Similarly, Partow discloses a stylus that produces a “large position signal.” Ex. 1007, 1:65-67. The “large position signal” of Partow would also be understood as having a high voltage, as in the Challenged Claims. As illustrated in FIGs. 8A through 8D of Partow, a sine wave generator 21 provides a sine wave to amplifiers A1 and A2. *Id.* at 2:51-58. A transformer 18 receives a sine wave output by each amplifier, each having a voltage of 5 volts peak-to-peak. *Id.* at 2:59-62. The transformer 18 outputs a signal with a voltage of 20 volts peak-to-peak. *Id.* The transformer 18 of Partow would be understood as a component operable to convert the voltage of approximately 1 to 3 volts to the high voltage. Ex. 1003, Appx. A, claim 2.



FIGS. 8A-8D of Partow (Ex. 1007)

It would have been obvious to a POSITA to modify the stylus of Kremin to implement the particular way of producing a high-voltage signal disclosed in Partow, such as by implementing the technique illustrated in FIGS 8A through 8D of Partow using the booster 870 of Kremin, such that the booster 870 would use the transformer 18 as the component operable to boost the voltage. Ex. 1003, Appx. A, claim 2. Partow's description of a transformer would easily provide further technical descriptions that a POSITA would incorporate into Kremin's existing design to more easily boost voltage. Ex. 1003, Appx. A, claim 2. Accordingly, the limitation "wherein the component is a transformer," as in claim 2, is also obvious in view of the Kremin/Partow combination. *Id.*

4. **Claim 3**

Claim 3 is also obvious over Kremin in view of Partow. Ex. 1003, Appx. A, claim 3. In particular, the high-voltage signal illustrated in FIG. 8D of Partow

above has a voltage of 10 volts when measured zero to peak and 20 volts when measured peak to peak, which is precisely within the range of “approximately 10 to approximately 20 volts,” as recited in claim 3. Ex. 1007 (Partow) at 2:60-62 & FIG. 8D. It would, therefore, be obvious to a POSITA to generate a high-voltage signal in this range in view of Kremin and Partow. Ex. 1003, Appx. A, claim 3.

5. Claim 4

Kremin discloses the additional limitations of claim 4 for the reasons discussed in Section VII(A)(4). Claim 4 depends from claim 1, which is obvious over Kremin in view of Partow for the reasons discussed above in Section VII(B)(2).

6. Claim 5

Kremin discloses the additional limitations of claim 5 for the reasons discussed in Section VII(A)(5). Claim 5 depends from claim 1, which is obvious over Kremin in view of Partow for the reasons discussed above in Section VII(B)(2).

7. Claim 6

Kremin discloses the additional limitations of claim 6 for the reasons discussed in Section VII(A)(6). Claim 6 depends from claim 5, which is obvious over Kremin in view of Partow for the reasons discussed above in Sections VII(B)(2)&(6).

8. Claim 7

Kremin discloses the additional limitations of claim 7 for the reasons discussed in Section VII(A)(7). Claim 7 depends from claim 5, which is obvious over

Kremin in view of Partow for the reasons discussed above in Sections VII(B)(2)&(6).

9. Claim 15

In addition to being anticipated by Kremin and obvious over Kremin in view of the knowledge of a POSITA, claim 15 is further obvious over Kremin in view of Partow based on the example disclosures of Partow discussed below in combination with the disclosures of Kremin discussed above in Section VII(A)(2)&(8). *See* Ex. 1003, Appx. A, claim 15.

a. Limitation 15[a]

Partow also discloses “high-voltage signals associated with a high voltage comprising a relatively large potential difference compared to a voltage within a voltage range of approximately 1 to approximately 3 volts,” as in limitation 15[a], for the reasons discussed above with reference to limitation 1[b]. Ex. 1003, Appx. A, limitation 15[a]; Ex. 1007 at 1:65-67, 2:51-62, 3:37-46, 11:51-54, Figs. 8A-8D, claim 3. Additionally, a POSITA would appreciate that the signals generated by the stylus of Partow are “electromagnetic signals,” as in limitation 15[a], which would be understood as a general term referring to a signal communicated based on electrical and/or magnetic forces produced by an electric current, such as signals transmitted via a stylus tip that includes an electrode. *Id.*

b. Limitation 15[a2]

Partow also discloses limitation 15[a2] for at least the reasons discussed above with reference to limitation 1[c]. Ex. 1003, Appx. A, limitation 15[a2]; Section VII(B)(2)(b).

10. Claim 16

Claim 16 is obvious in view of Kremin and Partow for the same reasons discussed above with reference to claim 2. Ex. 1003, Appx. A, claim 2; Section VII(B)(3).

C. Ground 3: The Challenged Claims are anticipated and obvious over Westhues.

The Challenged Claims are anticipated and obvious over Westhues in view of the knowledge of a POSITA. *See* Ex. 1003, ¶89. Petitioner uses the claim mapping set forth *supra* at pp. i-ii and cites and incorporates the analysis in Appendix B to the Declaration of Nabil J. Sarhan, Ph.D. *See* Ex. 1003.

1. Claim 1

Claim 1 is anticipated by Westhues for the reasons discussed below. All limitations of claim 1 are disclosed in Westhues. In the alternative, claim 1 is obvious over Westhues (Ex. 1006) in view of the knowledge of a POSITA.

a. Limitation 1[pre]

Westhues discloses 1[pre]. Ex. 1003, Appx. B, limitation 1[pre]. For example, FIG. 1 of Westhues illustrates an active stylus 100 in accordance with the disclosed techniques. Ex. 1006 (Westhues), ¶[0038].

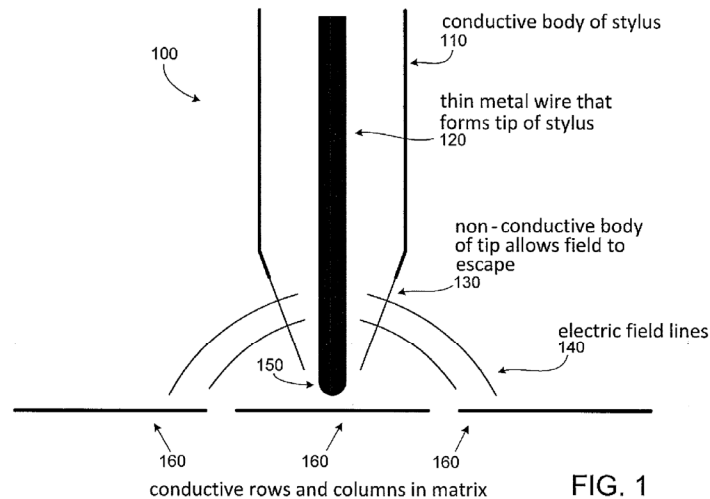


FIG. 1 of Westhues (Ex. 1006)

b. Limitation 1[a]

The stylus of Westhues includes an electrode 370, as illustrated in FIG. 3. Ex. 1006, ¶[0050]. Westhues discloses limitation 1[a]. Ex. 1003, Appx. B, limitation 1[a].

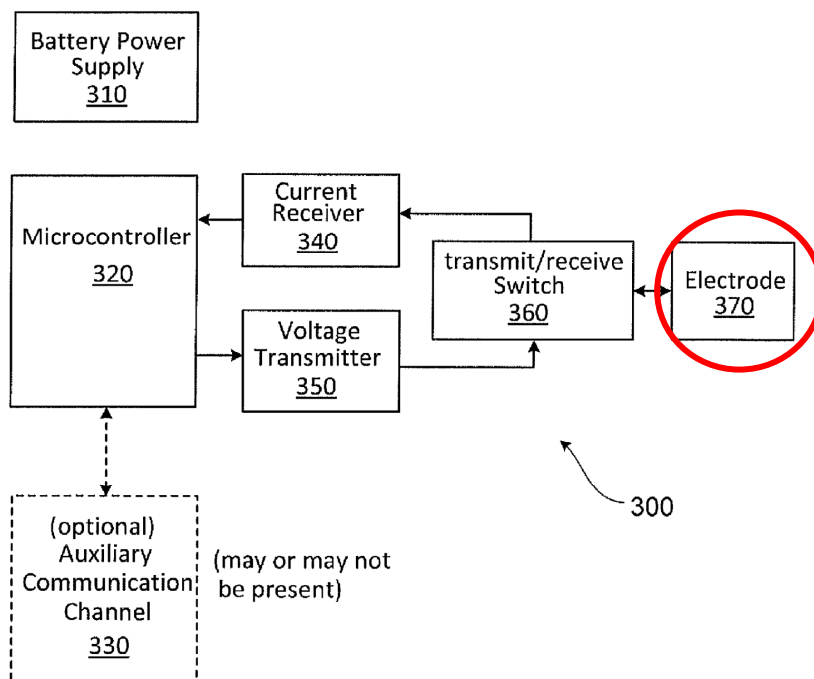


FIG. 3

FIG. 3 of Westhues (annotated) (Ex. 1006)

c. Limitation 1[b]

Westhues discloses limitation 1[b]. Ex. 1003, Appx. B, limitation 1[b]. For example, Westhues discloses that embodiments can be implemented using modules of a computer program encoded on a computer storage medium. Ex. 1006, ¶[0063]. Additionally, Westhues discloses that the stylus includes a microcontroller, which would be understood as including computer-readable non-transitory storage media. Ex. 1003, Appx. B, limitation 1[b]. Westhues discloses control software that utilizes the existing hardware, “where the software in the microcontroller 320 is responsible at least for maintaining the sense of time, for computing the coordinates, computing the interpolation, and reporting the coordinates back to the matrix, and

so on.” Ex. 1006, ¶¶[0046], [0051], Fig. 3. A POSITA would understand that a microcontroller includes a CPU to execute program instructions as well as both volatile and nonvolatile memory to store the programs to be executed and associated data. Ex. 1003, Appx. B, limitation 1[b]. The CPU also includes logic circuitry to execute programs and control the operation of the stylus, including computing the coordinate positions. *Id.* It would, therefore, be appreciated that the stylus of Westhues includes “one or more computer-readable non-transitory storage media embodying logic,” as in limitation 1[b]. Ex. 1003, Appx. B, limitation 1[b].

Additionally, Westhues would be understood as implementing the feature “transmitting signals wirelessly to a device through a touch sensor of the device,” as in limitation 1[b]. Ex. 1003, Appx. B, limitation 1[b]. For example, transmission of signals via the electrode of the stylus of Westhues would be understood as wirelessly transmitting signals, as in claim 1. *Id.*; see also Ex. 1006, ¶¶[0003]-[0020], [0046]-[0047], Claim 1, Claim 15, Claim 27, Claim 36, and Claims 42-44. Additionally, Westhues discloses various communication channels, including a wireless channel. Ex. 1006, ¶[0010].

Westhues further discloses “at least some of the signals comprising high-voltage signals associated with a high voltage comprising a relatively large potential difference compared to a voltage within a voltage range of approximately 1 to approximately 3 volts,” as in limitation 1[b]. Ex. 1003, Appx. B, limitation 1[b].

Specifically, Westhues discloses that a transmit/receive switch 360 included in the stylus “can allow a high voltage (*e.g.*, around 100 V) output to be applied to the electrode 370 in the transmit mode, and to receive a small current signal (*e.g.*, around 1 uA) from the electrode 370 in the receive mode.” Ex. 1006, ¶[0051]. Additionally, Westhues discloses that “the transmit/receive circuit uses a battery voltage (*e.g.*, approximately 3 V) and generates a high voltage at ~100V (delivering tens of microamps of current at a maximum), and a receiver can be placed on the same node.” Ex. 1006, ¶[0056]; *see also id.* at Figs. 4 & 6. It would be appreciated that the “high voltage” of Westhues meets all requirements of limitation 1[b] regarding “at least some of the signals comprising high-voltage signals associated with a high voltage comprising a relatively large potential difference compared to a voltage within a voltage range of approximately 1 to approximately 3 volts.” Ex. 1003, Appx. B, limitation 1[b]. For example, the “high voltage” of approximately 100 V, as in Westhues, would be understood as being used to transmit “high-voltage signals,” as claimed, and the “high voltage” of Westhues has a relatively large potential difference compared to a voltage in a range of approximately 1 to approximately 3 volts. *Id.*

d. Limitation 1[c]

As discussed in Dr. Sarhan's declaration, limitation 1[c] is likely a means-plus-function limitation corresponding to a transformer or a charge pump, as disclosed in the '866 patent specification. Ex. 1003, ¶¶56-58. For the reasons discussed below, the illustrated circuit of Westhues (which includes a transformer) performs the identical function specified in limitation 1[c] in substantially the same way, and produces substantially the same results as the corresponding element disclosed in the specification. *See* Ex. 1003, Appx. B, limitation 1[c]. Westhues, therefore, anticipates and renders obvious limitation 1[c] under a means-plus-function analysis. Even if limitation 1[c] were not interpreted as a means-plus-function limitation, Westhues still anticipates and renders obvious limitation 1[c] for the reasons discussed below.

As discussed above, the stylus of Westhues includes a transmit/receive switch 360 that “can allow a high voltage (*e.g.*, around 100 V) output to be applied to the electrode 370 in the transmit mode, and to receive a small current signal (*e.g.*, around 1 uA) from the electrode 370 in the receive mode.” Ex. 1006, ¶[0051]. “[T]he transmit/receive circuit uses a battery voltage (*e.g.*, approximately 3 V) and generates a high voltage at ~100V (delivering tens of microamps of current at a maximum), and a receiver can be placed on the same node.” Ex. 1006, ¶[0056].

Westhues further discloses that “[t]he high voltage can be generated using a flyback circuit, similar to the flyback circuit used to excite a cathode ray tube display, or used in a switchmode power supply. The flyback circuit includes the transformer L2, which stores energy. Energy may flow into the first or primary winding of L2, be stored as a magnetic field, within the core of L2, and then flow out of the core of L2, through the secondary winding of L2. The voltage may be transformed according to the turns ratio of the transformer L2, and according to the timings of the applied signals. The energy flowing out through the secondary winding of L2 may flow into the stray capacitance at the output through D1, and develop the high voltage across that stray capacitance.” Ex. 1006, ¶[0056].

Based on this, a POSITA would appreciate that the stylus of Westhues includes “a component operable to convert the voltage of approximately 1 to 3 volts to the high voltage,” as in limitation 1[c], which may be at least a portion of the circuit illustrated in FIG. 4. Ex. 1003, Appx. B, limitation 1[c].

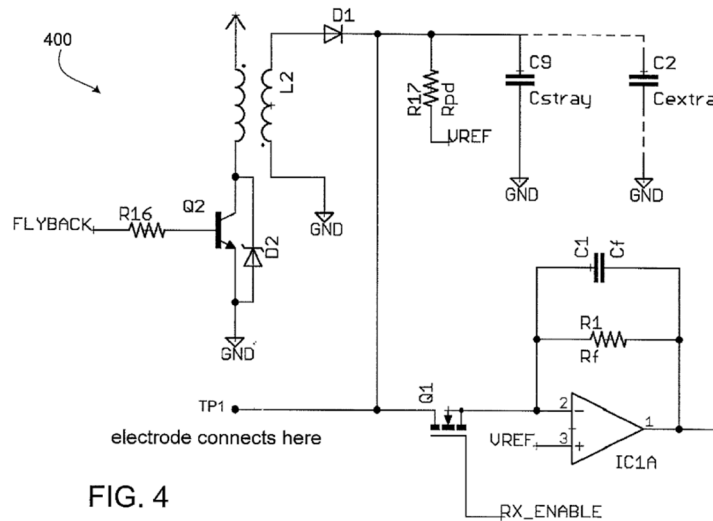


FIG. 4 of Westhues (Ex. 1006)

e. Limitation 1[d]

Westhues discloses limitation 1[d]. Ex. 1003, Appx. B, limitation 1[d]. For example, Westhues discloses that the stylus includes “a tip that is configured to interact with the matrix of the capacitive touch sensor.” Ex. 1006, ¶[0006]. Additionally, Westhues describes that “a thin metal wire forming [a] tip 120” of the stylus is used to transmit the signal. Ex. 1006, ¶[0038]. Westhues, therefore, discloses “a stylus tip,” as in limitation 1[d]. Ex. 1003, Appx. B, limitation 1[d].

To transmit the high-voltage signal, the “transmit/receive switch 360 can allow a high voltage (*e.g.*, around 100 V) output to be applied to the electrode 370 in the transmit mode, and to receive a small current signal (*e.g.*, around 1 uA) from the electrode 370 in the receive mode.” Ex. 1006, ¶[0051]. As illustrated in FIG. 4

above, “[a] cathode of diode D1 is coupled to node TP1 where the electrode connects.” Ex. 1006, ¶[0056]; *see also* Fig. 3. Based on this, it would be appreciated that the electrode of Westhues is “one or more of the one or more electrodes being disposed at the stylus tip,” as in limitation 1[d].

f. Limitation 1[e]

As discussed above the stylus of Westhues includes a transmit/receive circuit used to transmit high-voltage signals. Furthermore, FIG. 4 of Westhues illustrates that “[t]he energy flowing out through the secondary winding of [transformer] L2 may flow into the stray capacitance at the output through [diode] D1, and develop the high voltage across that stray capacitance.” Ex. 1006, ¶[0056]. “A cathode of diode D1 is coupled to node TP1 where the electrode connects.” Ex. 1006, ¶[0056]. In other words, the electrode of Westhues receives the high voltage, provided using the transformer, via the node TP1. As discussed above with reference to limitation 1[d], the electrode is disposed in the tip and used to transmit the high-voltage signals. Therefore, Westhues discloses “wherein the high-voltage signals result from the one or more electrodes receiving the high voltage,” as in limitation 1[e]. Ex. 1003, Appx. B, limitation 1[e].

2. Claim 2

FIG. 4 of Westhues clearly illustrates the use of a transformer L2 as a component operable to provide a high voltage. *See* Ex. 1006, ¶¶[0055]-[0060]. As

discussed in Westhues, “[t]he high voltage can be generated using a flyback circuit, similar to the flyback circuit used to excite a cathode ray tube display, or used in a switchmode power supply. The flyback circuit includes the transformer L2, which stores energy. Energy may flow into the first or primary winding of L2, be stored as a magnetic field, within the core of L2, and then flow out of the core of L2, through the secondary winding of L2. The voltage may be transformed according to the turns ratio of the transformer L2, and according to the timings of the applied signals.” Ex. 1006, ¶[0056]. Accordingly, Westhues discloses all limitations of claim 2. Ex. 1003, Appx. B, claim 2.

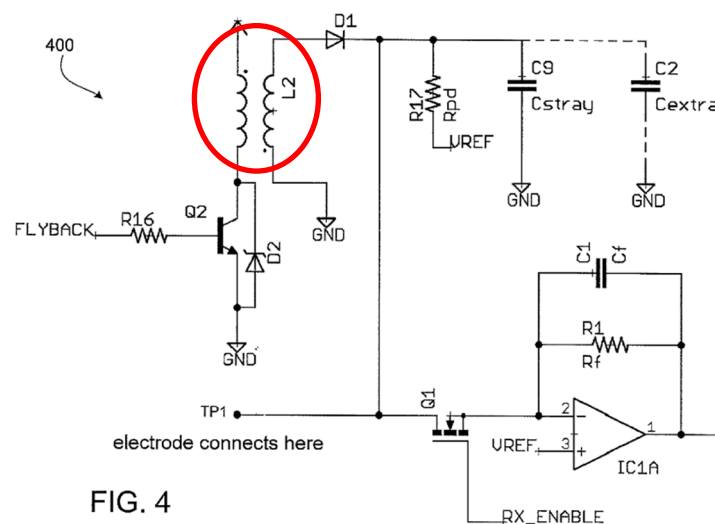


FIG. 4 of Westhues (annotated) (Ex. 1006)

3. Claim 3

A POSITA would appreciate that the limitations of claim 3 are at least inherent in Westhues. Ex. 1003, Appx. B, claim 3. While specific examples in

Westhues discuss a high voltage of approximately 100 volts (Ex. 1006, ¶¶[0051] & [0056]), Westhues makes clear that these examples are non-limiting (Ex. 1006, ¶¶[0070] & [0072]). Accordingly, a POSITA would appreciate that a voltage range of approximately 10 to approximately 20 volts would be contemplated by Westhues, and this particular voltage range would be merely a design choice that does not involve any inventive step. Ex. 1003, Appx. B, claim 3.

Alternatively, claim 3 would be obvious to a POSITA in view of Westhues and the knowledge of a POSITA. Ex. 1003, Appx. B, claim 3. Because the particular high-voltage range of “approximately 10 to approximately 20 volts” is merely a design choice, it would have been well within the capabilities of a POSITA to implement the stylus of Westhues using a high voltage in this particular range. *Id.*

4. Claim 4

Westhues discloses the limitations of claim 4. Ex. 1003, Appx. B, claim 4. For example, the stylus of Westhues transmits signals “to localize itself among the rows and receives to localize itself among the columns,” and uses these localizations to perform interpolation “to determine a more exact location in the touch sensor.” Ex. 1006, ¶[0042]. This would be understood as using high-voltage signals to “identify a location of the stylus relative to the touch sensor of the device,” as in claim 4. Ex. 1003, Appx. B, claim 4.

5. Claim 5

Westhues at least discloses *distinguishing* “contact by an object other than the stylus with the device” when the stylus “is in contact with or in the proximity of the touch sensor of the device” using the high-voltage signals, as in claim 5, because Westhues uses distinct techniques for localizing a finger touch and a stylus. Ex. 1003, Appx. B, claim 5; Ex. 1006 at ¶¶[0024], [0025], [0042]-[0046], Figs. 2A & 2B. Specifically, while the techniques of Westhues can be used to localize both a finger touch and one or more styluses, the techniques for localizing a stylus differ in that the stylus *receives* a signal to localize itself among columns of the touch sensor of the device, but *transmits* a signal to localize itself among rows of the touch sensor of the device, which a finger cannot do. Ex. 1006, ¶[0042]. To implement this feature, the technology of Westhues uses specific timeslots to communicate position information from the stylus to the host device, unlike localizing a finger touch, which is instead performed solely at the host device. *See, e.g.*, Ex. 1006, ¶¶[0044]-[0046]. Westhues would, therefore, be understood as meeting the limitations of claim 5. Ex. 1003, Appx. B, claim 5.

6. Claim 6

As discussed above with reference to claim 5, Westhues at least discloses distinguishing between contact by a user’s finger and contact by a stylus. Ex. 1003, Appx. B, claim 6; Section VII(C)(5). Westhues, therefore, discloses “wherein the

object is least a part of a human hand,” as in claim 6, because a finger is an object that is at least a part of a human hand. *Id.*

7. Claim 7

Claim 7 is also anticipated and/or obvious in view of Westhues. Ex. 1003, Appx. B, claim 7. As discussed above with reference to claim 5 (Section VII(C)(5)), Westhues uses distinct techniques for localizing a finger and localizing a stylus. *See* Ex. 1006, ¶¶[0044]-[0046]. Specifically, when localizing a stylus along a column of the touch sensor, “the stylus transmits the same signal as would have been used to excite a column,” and the position of the stylus on a y axis is determined by looking at the outputs of the receivers attached to each row. Ex. 1006, ¶[0042]. Based on this, a POSITA would appreciate that the signal transmitted by the stylus of Westhues would have characteristics similar to the signal that would otherwise be used to excite the column, such that this signal is at least “based on” a voltage used by columns and/or rows of the touch sensor. Ex. 1003, Appx. B, claim 7. Alternatively, it would be obvious to a POSITA, based on the foregoing disclosure, to use “high-voltage signals” that are “based on a voltage used by at least a portion of the touch sensor of the device,” as in claim 7. Ex. 1003, Appx. B, claim 7.

8. Claim 15

Claim 15 is anticipated by Westhues for the reasons discussed below. All

limitations of claim 15 are disclosed in Westhues. In the alternative, claim 1 is obvious over Westhues in view of the knowledge of a POSITA.

a. Limitation 15[pre]

Westhues discloses limitation 15[pre] for the reasons discussed above with reference to limitation 1[b] because the techniques of Westhues can be implemented as instructions “encoded on computer storage medium for execution by, or to control the operation of, data processing apparatus.” Ex. 1006, ¶[0063]; Ex. 1003, Appx. B, limitation 15[pre]. Additionally, Westhues discloses that the stylus includes a microcontroller, which would be understood as including computer-readable non-transitory storage media. Section VII(C)(1)(c).

b. Limitation 15[a]

Westhues discloses all features of limitation 15[a] for similar reasons discussed above with reference to limitation 1[b]. Section VII(C)(1)(c); Ex. 1003, Appx. B, limitation 15[a]. For example, Westhues discloses an active stylus 100. Ex. 1006, ¶[0038]. Furthermore, the stylus of Westhues transmits signals through a touch sensor of a device, which include high-voltage signals, as discussed above with reference to limitation 1[b]. These would be understood as “high-voltage signals associated with a high voltage comprising a relatively large potential differ-

ence compared to a voltage within a voltage range of approximately 1 to approximately 3 volts,” as in limitation 15[a]. Ex. 1003, Appx. B, limitations 1[b] & 15[a]; Ex. 1006, ¶¶[0038], [0047].

It would be appreciated that the signals transmitted by the stylus of Westhues are “electromagnetic signals,” as in limitation 15[a]. *Id.* In the context of the ’866 patent, “electromagnetic signal” would be understood as a general term referring to a signal communicated based on electrical and/or magnetic forces produced by an electric current, such as signals transmitted via a stylus tip that includes an electrode. *Id.* Westhues, therefore, discloses all features of limitation 15[a].

c. Limitation 15[a1]

Westhues discloses all features of limitation 15[a1] for similar reasons discussed above with reference to limitations 1[a] and 1[b]. Section VII(C)(1)(b)-(c). The stylus of Westhues includes an electrode 370, as shown in FIG. 3. Ex. 1006, ¶[0050]. Additionally, Westhues discloses transmitting signals wirelessly, including signal transmission between the stylus and a capacitive touch sensor using the electrode, and communication via a wireless channel. Ex. 1006, ¶¶[0003]-[0020]. Westhues, therefore, anticipates and/or renders obvious “one or more electrodes for wirelessly transmitting the signals to the device,” as in limitation 15[a1]. Ex. 1003, Appx. B, limitation 15[a1].

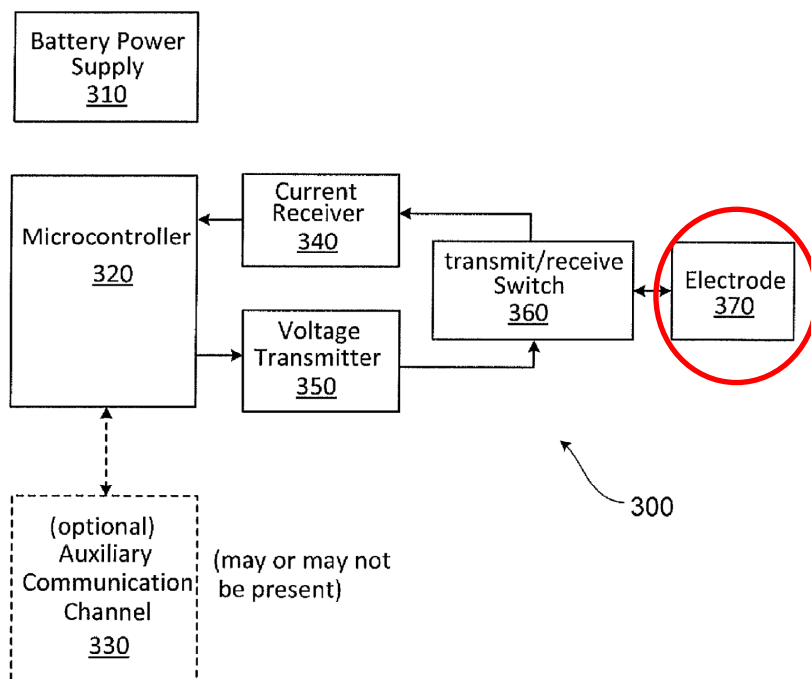


FIG. 3

FIG. 3 of Westhues (annotated) (Ex. 1006)

d. Limitation 15[a2]

See limitation 1[c] above. Section VII(C)(1)(d).

e. Limitation 15[a3]

See limitation 1[d] above. Section VII(C)(1)(e).

f. Limitation 15[a4]

See limitation 1[e] above. Section VII(C)(1)(f).

9. Claim 16

Claim 16 is anticipated and/or obvious in view of Westhues for the same reasons discussed above with reference to claim 2. Ex. 1003, Appx. B, claim 16; Section VII(C)(2).

D. Ground 4: The Challenged Claims are further obvious over Westhues in view of Kremin.

While all Challenged Claims are anticipated and obvious over Westhues, Petitioner further demonstrates that all Challenged Claims are also obvious in view of Westhues and Kremin. Ex. 1003, ¶90.

1. Motivation to Combine Westhues and Kremin

As discussed in Dr. Sarhan's more fulsome analysis at Appendix B of Ex. 1003, Westhues and Kremin discuss similar technologies and solve similar problems related to using a stylus with a high voltage for interacting with touch screens, and both references discuss, for example, determining a position of a stylus. Ex. 1003, ¶85. While both references discuss high-voltage techniques, Westhues discusses an example high voltage of 100 volts (Ex. 1006, ¶[0051]), whereas Kremin specifies an example high voltage of 10-20 volts while still implementing high-voltage features, such as hover detection (Ex. 1005, ¶[0084]). A POSITA implementing a stylus as disclosed in Westhues would, thus, benefit from the disclosure of Kremin, and would be motivated to modify Westhues based on Kremin for one or more obvious benefits, such as decreasing power consumption while still implementing high-voltage techniques. Ex. 1003, Appx. B. As described above, higher voltage has many benefits. *See* Section VII(B)(1). Achieving higher voltage with reduced power consumption has the obvious benefit of improved battery life. Ex. 1003, ¶86. For example, while the high-voltage signal of Westhues may use a voltage of, *e.g.*, 100

volts (Ex. 1006, ¶[0051]), Kremin describes embodiments that can perform hover detection using a high-voltage signal with a voltage of, e.g., 10-20 volts (Ex. 1005, ¶[0084]). A POSITA would appreciate that the 10-20 volt range used for the high-voltage signal of Kremin would have various advantages, such as decreased power consumption, while retaining the high-voltage features. Ex. 1003, ¶86. A POSITA, thus, would benefit from the disclosure of Kremin and use the disclosed techniques in the stylus of Westhues. *Id.* This task would have been routine and well within a POSITA's skill. *Id.* The below analysis discusses example disclosures in Kremin upon which a POSITA may rely when modifying the stylus of Westhues.

Westhues anticipates and/or renders obvious all limitations of the Challenged Claims for at least the reasons discussed in Section VII(C) above. Alternatively, to the extent that one or more limitations of the Challenged Claims are not disclosed in Westhues, the below analysis (and the discussion above at Section VII(A)) further illustrates that these limitations are disclosed in and/or obvious in view of Kremin.

2. Claim 1

In addition to being anticipated by Westhues and obvious over Westhues in view of the knowledge of a POSITA, claim 1 is further obvious over Westhues in view of Kremin based on the example disclosures of Kremin discussed below (and in Section VII(A) above) in combination with the disclosures of Westhues discussed above in Section VII(C). *See* Ex. 1003, Appx. B, claim 1.

a. Limitation 1[b]

Kremin also discloses limitation 1[b], as discussed above with reference to Ground 1. *See* Section VII(A)(1)(c). For example, Kremin also discloses transmitting “high-voltage signals associated with a high voltage comprising a relatively large potential difference compared to a voltage within a voltage range of approximately 1 to approximately 3 volts.” Ex. 1003, Appx. B, limitation 1[b]. The booster 870 of Kremin boosts a battery voltage, which maybe 1.5 volts, to allow a tip driver 890 to amplify a TX signal 835 received from a host device 805 to a higher voltage, which may be 10 to 20 volts. *See, e.g.*, Ex. 1005, ¶ [0084]. Additionally, for the reasons discussed above with reference to Ground 1, it would be appreciated that the high-voltage signal according to Kremin can be transmitted wirelessly, within the meaning of limitation 1[b]. *See, e.g.*, Ex. 1005, ¶¶ [0079], [0081], & [0084]-[0085].

It would be obvious to a POSITA to modify the stylus of Westhues to implement techniques disclosed in Kremin. Ex. 1003, Appx. B, limitation 1[b]. For example, while Westhues discloses using a voltage of ~100 volts to transmit the high-voltage signals (Ex. 1006, ¶ [0051]), Kremin describes that high-voltage techniques can be implemented using a voltage of only 10-20 volts (Kremin, ¶ [0084]). Based on this, a POSITA would appreciate that the stylus of Westhues can be modified to use a high voltage of only 10-20 volts, and one or more obvious benefits would be

achieved by this modification, including reduced power consumption, while still implementing high-voltage techniques. Ex. 1003, Appx. B, limitation 1[b].

b. Limitation 1[c]

Kremin also discloses limitation 1[c], as discussed above with reference to Ground 1. *See* Section VII(A)(1)(d). For example, the booster 870 of Kremin boosts a battery voltage, which may be 1.5 volts, to allow a tip driver 890 to amplify a TX signal 835 received from a host device 805 to a higher voltage, which may be 10 to 20 volts. *See, e.g.,* Kremin ¶ [0084]. The booster 870 of Kremin would also be understood as “a component operable to convert the voltage of approximately 1 to 3 volts to the high voltage,” as in limitation 1[c]. Ex. 1003, Appx. B, limitation 1[c].

As discussed above, it would be obvious to a POSITA to modify the stylus of Westhues to implement techniques disclosed in Kremin, and a POSITA would be motivated to so modify the stylus of Westhues for one or more obvious benefits, such as reduced power consumption. Ex. 1003, Appx. B, limitation 1[c].

3. Claim 2

Westhues discloses the limitations of claim 2 for at least the reasons discussed above with reference to Ground 3. *See* Section VII(C)(2). Claim 2 depends from claim 1, which is obvious over Westhues in view of Kremin for the reasons discussed above. *See* Section VII(D)(2).

4. Claim 3

Kremin explicitly discloses a high voltage of 10 to 20 volts. Ex. 1005, ¶[0084]. This is precisely the range specified by claim 3. Ex. 1003, Appx. B, claim 3. It would have been obvious to a POSITA to implement the booster 870 of Kremin in the stylus of Westhues, and the resulting stylus could produce a high-voltage signal in the range of 10 to 20 volts, as disclosed in Kremin, rather than the ~100 volts disclosed in Westhues, for one or more obvious benefits, such as reduced power consumption. *Id.*; *see* Sections VII(A)(3), VII(C)(3).

5. Claim 4

Kremin also discloses the limitations of this claim, and it would be obvious to a POSITA to implement claim 4 based on Westhues in combination with Kremin. *Id.* Kremin describes that the high voltage stylus signal 898 allows for robust detection of the stylus 850 location, as well as detection while hovering over but not physically touching a sensing device. Ex. 1005, ¶[0084]. This would also be understood as using high-voltage signals to “identify a location of the stylus relative to the touch sensor of the device,” as in claim 4, and it would be obvious to a POSITA to implement this feature in the stylus of Westhues based on the disclosure of Kremin. Ex. 1003, Appx. B, claim 4.; *see* Sections VII(A)(4), VII(C)(4).

6. Claim 5

Kremin also discloses the limitations of claim 5, and claim 5 would be obvious to a POSITA in view of Westhues and Kremin. Ex. 1003, Appx. B, claim 5. As

discussed above with reference to Ground 1, Kremin discloses both *simulating* contact by an object other than the stylus, when the stylus is in contact with or in the proximity of the touch sensor of the device, as in claim 5, and *distinguishing* contact by an object other than the stylus when the stylus is in contact with or in the proximity of the touch sensor of the device, as in claim 5. Ex. 1003, Appx. B, claim 5. For example, the techniques of Kremin can distinguish between contact by the stylus and contact by a user's palm based on the high voltage provided by the stylus. *See, e.g.*, Ex. 1005, ¶[0102].

Kremin further describes that the stylus signal amplitude, frequency, phase, or the like may be the same or similar to the signal utilized for finger sensing by the touch screen controller. Ex. 1005, ¶ [0076]. This would be understood as simulating contact by an object other than the stylus, as in claim 5. Ex. 1003, Appx. B, claim 5. *See* Section VII(A)(5).

As discussed above, it would be obvious to modify the stylus of Westhues to implement the techniques disclosed in Kremin, and a POSITA would be motivated to so modify the technology of Westhues for one or more obvious benefits, such as reduced power consumption. *Id.*

7. Claim 6

Kremin also discloses the limitations of claim 6. Ex. 1003, Appx. B, claim 6. As discussed above, the technology of Kremin can be used both to simulate a touch

by a user's finger and to distinguish the touch of a user's palm or finger. Ex. 1005, ¶¶[0024], [0051], [0076], [0086], [00102]-[00103]. Claim 6, therefore, is also obvious in view of Westhues and Kremin. Ex. 1003, Appx. B, claim 6. *See* Sections VII(A)(5)-(6), VII(C)(5)-(6).

8. **Claim 7**

Kremin also discloses the limitations of claim 7. Ex. 1003, Appx. B, claim 7; *id.*, Appx. A, claim 7; Section VII(A)(7). As discussed above with reference to Ground 1, Kremin describes multiple embodiments in which the high-voltage signal is generated by amplifying a signal originating from the device. *Id.* A POSITA would appreciate that the transmit signals described in Kremin are necessarily based on a voltage used by at least a portion of the touch sensor of the device because they are generated from the touch sensor of the device. *Id.*; *see* Ex. 1005 at ¶¶[0082]-[0085], [0098]-[0103], Figs. 8 & 11. Claim 7 is, therefore, obvious in view of Westhues and Kremin. *Id.*

9. **Claim 15**

In addition to being anticipated by Westhues and obvious over Westhues in view of the knowledge of a POSITA, claim 15 is further obvious over Westhues in view of Kremin based on the example disclosures of Kremin discussed below (and in Section VII(A)) in combination with the disclosures of Westhues discussed above in Section VII(C). *See* Ex. 1003, Appx. A, claim 15; Section VII(A)(8).

a. Limitation 15[a]

For the reasons discussed above with reference to limitation 1[b] (Section VII(A)(1)(c)), Kremin also discloses a stylus that transmits signals including “high-voltage signals associated with a high voltage comprising a relatively large potential difference compared to a voltage within a voltage range of approximately 1 to approximately 3 volts,” as in limitation 15[a]. It would be obvious to modify the stylus of Westhues to implement the techniques of Kremin, and a POSITA would be motivated to so modify the stylus of Westhues for one or more obvious benefits, such as reduced power consumption. *Id.*

b. Limitation 15[a2]

For the reasons discussed above with reference to limitation 1[c] (Section VII(A)(1)(d)), Kremin also discloses “a component operable to convert the voltage of approximately 1 to 3 volts to the high voltage,” as in limitation 15[a2].

10. Claim 16

Westhues discloses the limitations of claim 16 for the reasons discussed in Section VII(C)(9). Additionally, claim 16 depends from claim 15, which is obvious over Westhues in view of Kremin for the reasons discussed above. *See* Sections VII(C)(8), VII(A)(8), VII(A)(9). Claim 16 is, therefore, also obvious over Westhues in view of Kremin at least because the claim from which it depends is obvious.

VIII. CONCLUSION

The prior art references cited above are exemplary in nature and do not convey every way in which the references teach and disclose the claim limitations at issue. The cited references and this Petition show, however, that it is at least likely that the Challenged Claims of the '866 Patent are invalid for anticipation and obviousness over the cited references. Accordingly, Petitioner respectfully requests institution of *Inter Partes* review for the Challenged Claims for each presented ground.

IX. Notice of Lead and Backup Counsel and Service Information (37 C.F.R. § 42.8(b)(3))

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Powers of Attorney accompany this Petition pursuant to 37 C.F.R. § 42.10(b).

Please address all correspondence to lead and back-up counsel at the addresses above. Petitioner also consents to electronic service by email at the email addresses listed above.

X. Proof of Service and Service Information (37 C.F.R. §§ 42.6(e) and 42.105(a))

Attached is proof of service of this Petition on the Patent Owner through counsel of record listed on Patent Center at the U.S. Patent Office for the '866 Patent.

Dated: August 29, 2025

Respectfully submitted,

/Mark Miller/

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Telephone: +1(801) 933-4068

Attorney for Petitioner

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

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 of U.S. Patent No. 9,933,866 totals 12,809 words, excluding the parts exempted by 37 C.F.R. § 42.24(a). Accordingly, this Petition is under the word count limit of 14,000 words. This word count was made by using the built-in word count function tool in the Microsoft Word software Version 2308 used to prepare the document.

Dated: August 29, 2025

Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on August 29, 2025, a complete and entire copy of this Petition for *Inter Partes* Review and all supporting exhibits were provided by FedEx service, cost prepaid, to the Patent Owner by serving the correspondence address of record on USPTO Patent Center.

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A courtesy copy of the materials was provided to litigation counsel in the related proceeding.

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