

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. 9,280,220

Issued: Mar. 8, 2016

Filed: Jan. 9, 2015

Inventors: Shahrooz Shahparnia et al.

Title: PULSE- OR FRAME-BASED COMMUNICATION USING ACTIVE
STYLUS

Inter Partes Review No. IPR2025-01556

PETITION FOR *INTER PARTES* REVIEW OF U.S. PAT. NO. 9,280,220

LISTING OF CHALLENGED CLAIMS

Limitation¹	Claim 1
1[pre]	A stylus comprising:
1[a]	one or more sensors;
1[b]	one or more electrodes configured to communicate with a device by receiving signals from and transmitting signals to a touch sensor of the device; and
1[c]	one or more computer-readable non-transitory storage media embodying logic that is operable when executed to:
1[c1]	receive sensor data from the one or more sensors;
1[c2]	receive a first signal generated by the device;
1[c3]	generate a second signal by modulating a carrier signal based on the sensor data; and
1[c4]	transmit to the device, in response to the first signal, the second signal, the sensor data being obtainable by demodulating the second signal.
Limitation	Claim 2
Claim 2	The stylus of claim 1, wherein the first signal is the carrier signal modulated to generate the second signal.
Limitation	Claim 3
Claim 3	The stylus of claim 1, wherein the second signal is generated using one of: amplitude modulation; frequency modulation; and phase modulation.
Limitation	Claim 4
Claim 4	The stylus of claim 1, wherein: the one or more sensors comprise a pressure sensor and a button; and the sensor data comprises pressure data and button state data.
Limitation	Claim 5

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 sensors” as recited in claim 1).

Claim 5	The stylus of claim 1, wherein the sensor data is digital.
Limitation	Claim 7
7[pre]	One or more computer-readable non-transitory storage media embodying logic that is operable when executed to:
7[a]	receive sensor data from one or more sensors in or on a stylus, the stylus comprising one or more electrodes configured to communicate with a device by receiving signal from and transmitting signals to a touch sensor of the device;
7[b]	receive a first signal generated by the device;
7[c]	generate a second signal by modulating a carrier signal based on the sensor data; and
7[d]	transmit to the device, in response to the first signal, the second signal, the sensor data being obtainable by demodulating the second signal.
Limitation	Claim 8
Claim 8	The media of claim 7, wherein the first signal is the carrier signal modulated to generate the second signal.
Limitation	Claim 9
Claim 9	The media of claim 7, wherein the second signal is generated using one of: amplitude modulation; frequency modulation; and phase modulation.
Limitation	Claim 10
Claim 10	The media of claim 7, wherein: the one or more sensors comprise a pressure sensor and a button; and the sensor data comprises pressure data and button state data.
Limitation	Claim 11
Claim 11	The media of claim 7, wherein the sensor data is digital.
Limitation	Claim 13
13[pre]	A system comprising:
13[a]	a device comprising a touch sensor; and
13[b]	a stylus comprising:
13[b1]	one or more sensors;

13[b2]	one or more electrodes configured to communicate with a device by receiving signals from and transmitting signals to a touch sensor of the device; and
13[b3]	one or more computer-readable non-transitory storage media embodying logic that is operable when executed to:
13[b3A]	receive sensor data from the one or more sensors;
13[b3B]	receive a first signal generated by the device;
13[b3C]	generate a second signal by modulating a carrier signal based on the sensor data; and
13[b3D]	transmit to the device, in response to the first signal, the second signal, the device being operable to obtain the sensor data by demodulating the second signal.
Limitation	Claim 14
Claim 14	The system of claim 13, wherein the first signal is the carrier signal modulated to generate the second signal.
Limitation	Claim 15
Claim 15	The system of claim 13, wherein the second signal is generated using one of: amplitude modulation; frequency modulation; and phase modulation.
Limitation	Claim 16
Claim 16	The system of claim 13, wherein: the one or more sensors comprise a pressure sensor and a button; and the sensor data comprises pressure data and button state data.
Limitation	Claim 17
Claim 17	The system of claim 13, wherein the sensor data is digital.

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EXHIBITS

Exhibit	Reference
1001	U.S. Patent No. 9,280,220 (“’220 Patent”)
1002	Prosecution History of U.S. Patent No. 9,280,220
1003	Declaration of Nabil J. Sarhan, Ph.D.
1004	Curriculum Vitae of Nabil J. Sarhan, Ph.D.
1005	Japanese Patent Publication No. JP 2008-152640 to Kaneko (“Kaneko”)
1006	US. Patent No. 8,766,954 to Vuppu et al. (“Vuppu”)
1007	U.S. Patent No. 8,988,398 to Cao et al. (“Cao”)
1008	U.S. Patent Publication No. 20100085325 to King-Smith et al. (“King-Smith”)
1009	U.S. Patent Publication No. 20120105362 to Kremin et al. (“Kremin”)
1010	Profile of Shahrooz Shahparnia (available for download at https://www.linkedin.com/in/shahrooz-shahparnia-6596183/)
1011	Profile of Vemund Bakken (available for download at https://www.linkedin.com/in/vemundbakken/)
1012	Profile of Wayne Westerman (available for download at https://www.linkedin.com/in/westerma/)
1013	Profile of Hrvoje Benko (available for download at https://www.linkedin.com/in/hrvojebenko/)
1014	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)
1015	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)
1016	Rudolf F. Graf, MODERN DICTIONARY OF ELECTRONICS (7 th ed. 1999)
1017	U.S. Provisional Patent Application No. 61/407,907
1018	Ali Grami, INTRODUCTION TO DIGITAL COMMUNICATIONS (2016)
1019	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/).
1020	Merriam-Webster, MERRIAM-WEBSTER.COM DICTIONARY, Electrode (available at https://www.merriam-webster.com/dictionary/electrode)

Exhibit	Reference
1021	U.S. Patent No. 8,928,635 to Harley et al. (“Harley”)

I. INTRODUCTION

Petitioner, Shenzhen Qianfenyi Intelligent Technology Co., Ltd. (“Petitioner” or “Maxeye”), requests *Inter Partes* review of claims 1-5, 7-11, and 13-17 (the “Challenged Claims”) of the ’220 Patent granted to Atmel Corporation and later assigned to Wacom Co. Ltd. (“Patent Owner”). Ex. 1001; 1002. The claimed invention in the ’220 Patent 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 in the art (“POSITA”).

II. REQUIREMENTS FOR PETITION FOR *INTER PARTES* REVIEW

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

Petitioner certifies the ’220 Patent is available for *Inter Partes* review, and Petitioner is not barred from requesting *Inter Partes* review as set forth herein. Specifically: (1) Petitioner is not the owner of the ’220 Patent; (2) Petitioner has not filed a civil action challenging the validity of any ’220 Patent claims; and (3) this Petition is filed more than 9 months after the ’220 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) to 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.

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

Ground	'220 Patent Claims	Basis for Rejection of the Challenged Claims under 35 U.S.C. §§ 102 & 103
<u>Ground 1</u>	1-5, 7-11, and 13-17	Rendered obvious by Kaneko in view of Vuppu
<u>Ground 2</u>	1-5, 7-11, and 13-17	Rendered obvious by Kaneko in view of Vuppu, Cao, and/or King-Smith
<u>Ground 3</u>	1-5, 7-11, and 13-17	Rendered obvious by Kaneko in view of Harley
<u>Ground 4</u>	1-5, 7-11, and 13-17	Rendered obvious by Kaneko in view of Harley, Cao, and/or King-Smith
<u>Ground 5</u>	1-5, 7-11, and 13-17	Anticipated or rendered obvious by Kremin
<u>Ground 6</u>	1-5, 7-11, and 13-17	Rendered obvious by Kremin in view of Harley

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

- 1) Japanese Patent Publication No. JP 2008-152640 to Kaneko

(“Kaneko”) (published July 3, 2008). Ex. 1005.² Kaneko is prior art—specifically, a printed publication published more than one year prior to the earliest possible priority date for the ’220 Patent. *See* 35 U.S.C. 102(b) (pre-AIA); 35 U.S.C. § 311(b).

2) U.S. Patent No. 8,766,954 to Vuppu et al. (“Vuppu”) (filed December 21, 2010). Ex. 1006. Vuppu is prior art—specifically, a patent with an earlier effective filing date than the claimed priority date of the ’220 Patent. *See* 35 U.S.C. 102(e) (pre-AIA); 35 U.S.C. § 311(b).

3) U.S. Patent No. 8,928,635 to Harley et al. (“Harley”) (filed June 22, 2011). Ex. 1021. Harley is prior art—specifically, a patent with an earlier effective filing date than the claimed priority date of the ’220 Patent. *See* 35 U.S.C. 102(e) (pre-AIA); 35 U.S.C. § 311(b).

² Kaneko was originally published in the Japanese language. *See* Ex. 1005. Exhibit 1005 includes a declaration in compliance with 37 C.F.R. §§ 1.68 & 42.63(b), along with a certified translation of Kaneko and the original Japanese-language reference. Petitioner has, therefore, met all requirements to rely on Kaneko as a prior art reference in a language other than English.

- 4) U.S. Patent No. 8,988,398 to Cao et al. (“Cao”) (filed February 11, 2011). Ex. 1007. Cao is prior art – specifically, a patent with an earlier effective filing date than the claimed priority date of the ’220 Patent. *See* 35 U.S.C. 102(e) (pre-AIA); 35 U.S.C. § 311(b).
- 5) U.S. Patent Publication No. 20100085325 to King-Smith et al. (“King-Smith”) (published April 8, 2010). Ex. 1008. King-Smith is prior art – specifically, a printed publication published more than one year prior to the earliest possible priority date for the ’220 Patent. *See* 35 U.S.C. 102(b) (pre-AIA); 35 U.S.C. § 311(b).
- 6) U.S. Patent Publication No. 20120105362 to Kremin et al. (“Kremin”) (filed August 19, 2011; published May 3, 2012; priority date October 28, 2010). Kremin is prior art – specifically, a published patent application with an earlier effective filing date than the claimed priority date of the ’220 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).

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 '220 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.

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 '220 PATENT

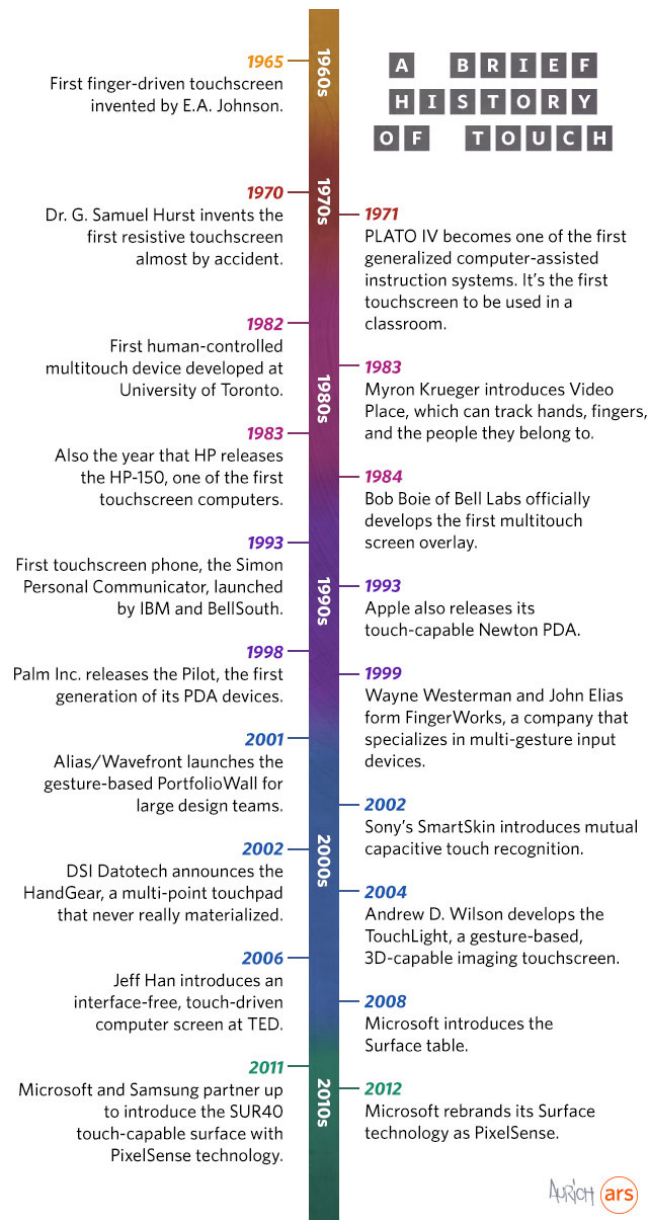
A. Brief Background of Prior Art

The '220 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 ¶31. 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 ¶32. 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 ¶33. 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 ¶34. For example, U.S. Patent No. 6,377,248 to Partow et al. (“Partow”) issued in 2002 from an application filed in 1999, and described an active stylus using a “high-voltage, sinusoidal” signal for communication with a “portable computer.” Partow at Abstract, Title; Ex. 1003 at ¶34.

Active and passive styluses can be used with touchscreen devices, such as tablet computers. Ex. 1003 at ¶35. 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. 1019 (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 '220 Patent

The '220 patent is titled “Pulse- or Frame-Based Communication Using Active Stylus,” and it is directed to techniques for receiving, through a touch sensor of a device, sensor data captured using one or more sensors in or on a stylus. Ex. 1001 at p. 1. Disclosed embodiments include an active stylus, which may include buttons (30 of FIG. 2) and sliders (32 & 34 of FIG. 2) to enable or alter functionality of the stylus. *Id.* at 6:20-29. Ridges or grooves in the stylus (24 of FIG. 2) may provide tactile feedback to or accept tactile input from a user. *Id.* at 7:2-9. Other components may include audio components (38 of FIG. 2) for transmitting and receiving audio signals and visual feedback components (36 of FIG. 2). *Id.* at 7:9-20.

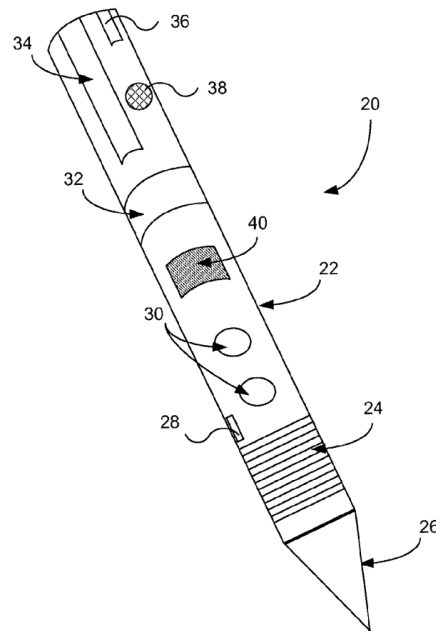
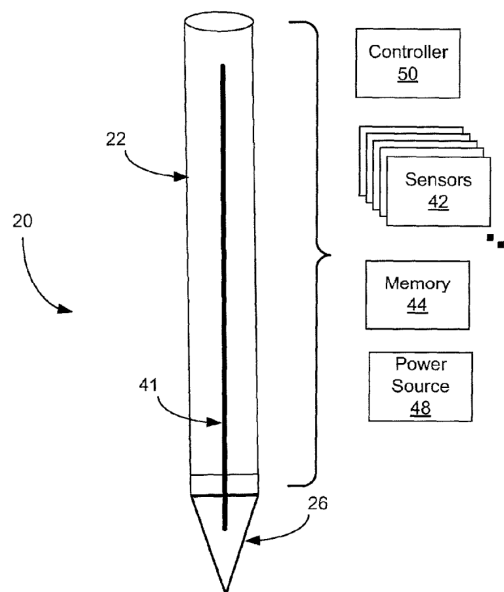


FIG. 2 of '220 Patent (Ex. 1001)

The stylus includes a tip (26 of FIG. 2) having one or more electrodes to communicate data to and from a different device. *Id.* at 7:38-41. Additionally, the stylus includes sensors (42 of FIG. 3), which may be touch sensors, gyroscopes, accelerometers, or contact sensors. *Id.* at 8:42-44. The sensors 42 may detect and measure one or more characteristics of the active stylus, such as acceleration, movement, orientation, contact, pressure, force, or vibration. *Id.* at 8:46-49.

**FIG. 3 of '220 Patent (Ex. 1001)**

Disclosed embodiments further include a method for communicating modulated data between the stylus and the device. *Id.* at 13:51-53. The stylus receives sensor data from the sensors 42. *Id.* at 13:53-54. The stylus receives a carrier signal from the touch controller of the device. *Id.* at 13:55-58. The stylus then

modulates the carrier signal to include the sensor data, so that the sensor data can be communicated from the stylus to the touch controller, and the modulated signal is then communicated. *Id.* at 13:58-63. The touch controller receives the modulated carrier signal including the sensor data, and the touch controller demodulates the carrier signal and extracts the sensor data. *Id.* at 13:64-67.

C. Summary of the Prosecution History of the '220 Patent

The '220 Patent was filed on January 9, 2015 as a continuation of U.S. Patent Application No. 13/363,043 (issued as U.S. Patent No. 8,933,899), filed on January 31, 2012. Ex. 1001 & 1002. The '220 patent claims priority to U.S. Provisional Application No. 61/553,114, filed on October 28, 2011. *Id.*

A preliminary amendment was filed on February 2, 2015, which cancelled the original claims and substituted new claims before examination began. Ex. 1002, pp. 96-101. No objections or rejections were stated, and the application was allowed on November 2, 2015. Ex. 1002, pp. 35-41. The '220 patent issued on March 8, 2016. Ex. 1001.

D. Priority Date for the Challenged Claims

The '220 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 '220 Patent is October 28, 2011. All prior art relied upon in this Petition was published more than one year before October 28, 2011 (Kaneko and King-Smith), or has an earlier effective filing date than the Patent Owner's claimed priority date for the '220 Patent (Vuppu, Harley, Cao, and Kremin). 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 POSITA relevant to the '220 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, ¶¶43-49.

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).³

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

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 '220 Patent. All Challenged Claims are anticipated over the prior art references discussed herein. Even if the Challenged Claims were not anticipated, they are nonetheless obvious in view of the knowledge of a person skilled in the art and in view of the combined teachings of the prior art 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 '220 Patent. Ex. 1003, ¶76. Simple capacitive

³ Petitioner reserves the right to raise claim construction arguments in the co-pending district court action and any other proceedings as appropriate.

or 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 ¶77.

Additionally, a POSITA would have been familiar with the inclusion of various sensors in a stylus-type input device, as well as various techniques for capturing and communicating data from the sensors (e.g., using various modulation techniques). *Id.* at ¶¶78-82.

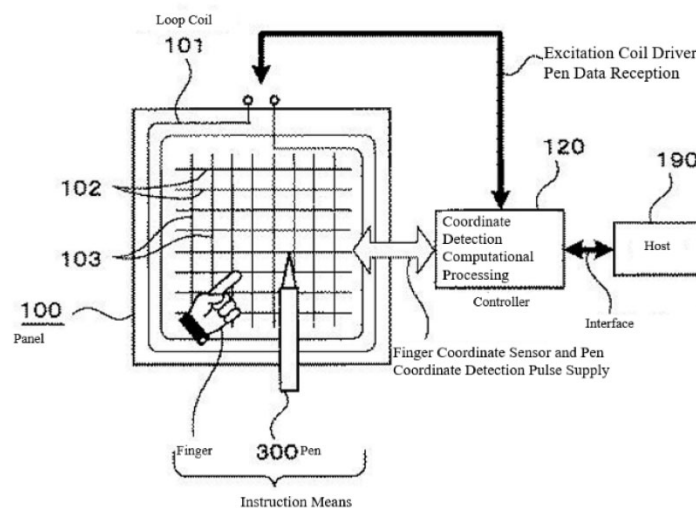
B. Summary of Prior Art

1. Kaneko (Ex. 1005)

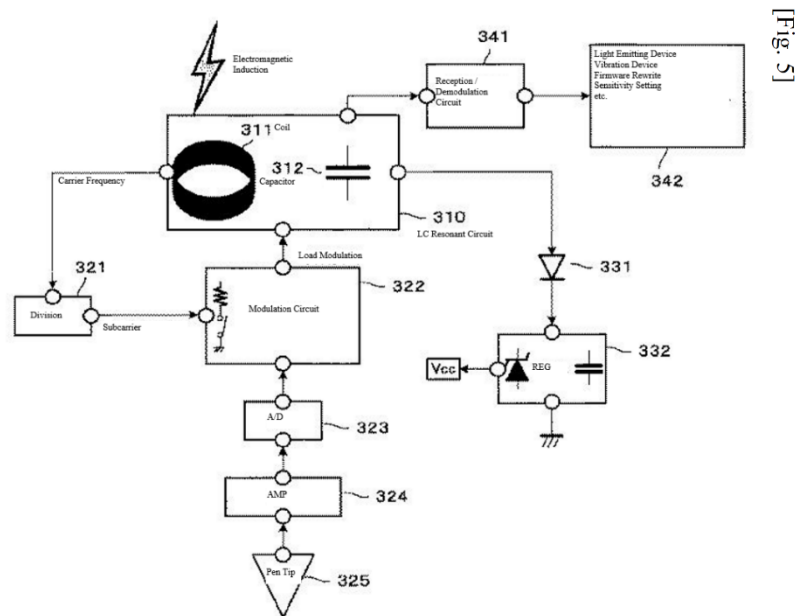
The technology disclosed in Kaneko includes a coordinate input device that detects contact or proximity of an object to a panel using a loop coil unit around the outer periphery of the panel. Ex. 1005, ¶[0016]. A sensor matrix unit is arranged on the panel to detect the coordinate position where the object comes into contact or close proximity to the panel. *Id.* A voltage applied to each electrode within the sensor matrix unit is switched sequentially. *Id.* Based on a change in capacitance detected

by the sensor matrix unit and/or a change in electric current in the loop coil unit, a computation processing unit detects the coordinate position where the object is in contact or near the panel. *Id.* The disclosed technology can be used to provide inputs using a finger and using a pen. *Id.* at ¶[0020].

[Fig. 1]

**FIG. 1 of Kaneko (Ex. 1005)**

The stylus of Kaneko includes a LC resonant circuit 310 used to receive signals from and communicate signals to the panel side (i.e., the host device). Ex. 1005, ¶¶[0040]-[0041]. For example, the stylus includes a modulation circuit that performs amplitude modulation to change an electric current through the loop coil on the panel side to transmit data from the stylus. *Id.* The signal is received at the panel side and demodulated to access the transmitted data. *Id.*

**FIG. 5 of Kaneko (Ex. 1005)**

Embodiments disclosed in Kaneko include sensors for capturing data to be transmitted, such as a pressure detection mechanism to detect pressure. Ex. 1005, ¶[0024].

2. Vuppu (Ex. 1006)

Vuppu discloses a stylus including a compound tip 105 having a center electrode 101 and a shroud electrode 102. Ex. 1006, 3:3-8. The center electrode detects electric field variations, which may emanate from a touch-sensitive surface due to an emitted periodic wave used to detect touch. *Id.* at 3:36-41. The center electrode is also described as a “receive electrode.” *Id.* at 6:1-3. The shroud electrode, also described as a “transmit electrode,” is used to inject a charge into a touch-sensitive interface. *Id.* at 6:3-7. Specifically, an active circuit applies a gain to the detected

FIG. 1

FIG. 1 of Vuppu (Ex. 1006)

3. Harley (Ex. 1021)

16

sensor. *Id.* at 1:59-66. And disclosed embodiments can act as a sense electrode for sensing capacitively coupled signals from stimulate drive rows and columns of the touch sensor panel. *Id.* at 1:66-2:1. An example stylus 200 is illustrated in FIG. 2 of Harley. *Id.* at 4:54-55. The stylus 200 includes drive circuitry 204 coupled to an electrode 202, which function together to generate and transmit a stimulus signal. *Id.* at 4:55-59. The drive circuitry 204 is connected to a power source 206. *Id.* at 4:66-5:1.

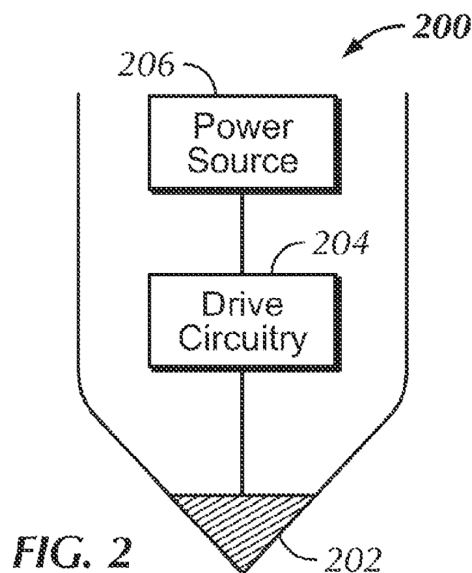


FIG. 2 of Harley (Ex. 1021)

4. Cao (Ex. 1007)

The technology disclosed in Cao relates to a multi-touch orientation sensing

input device, which may be in the form of a stylus or pen. Ex. 1007, 3:59-64. The input device of Cao includes various sensors, such as a compass, gyroscope, and accelerometers included in an inertial measurement unit. Ex. 1007, 4:30-35. The inertial measurement unit is used to detect and report orientation and movement of the input device. *Id.* The orientation information can be used, for example, to enable different functions of the input device. Ex. 1007, 1:20-30.

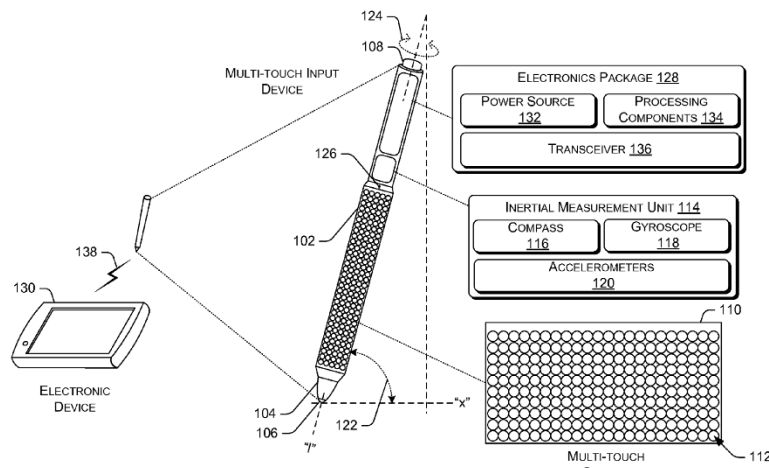


FIG. 1

FIG. 1 of Cao (Ex. 1007)

5. King-Smith (Ex. 1008)

The technology disclosed in King-Smith relates to a transducer, which may be a stylus, configured to transmit digital data to a sensor having an array of electrodes. Ex. 1008, Abstract. For example, pressure data, switch status data, or transducer ID data can be encoded and communicated to the sensor. *Id.* at ¶[0063]. In

disclosed embodiments, a microcontroller unit (MCU) of the transducer encodes the digital data using frequency shifts, amplitude shifts, or phase shifts. *Id.* The sensor receives the digital data, and the digital data is decoded. *Id.* Suitable encoding techniques include Frequency-Shift Keying (FSK), Amplitude-Shift Keying (ASK), Phase-Shift Keying (PSK), or Quadrature Amplitude Modulation (QAM). *Id.* at ¶[0112].

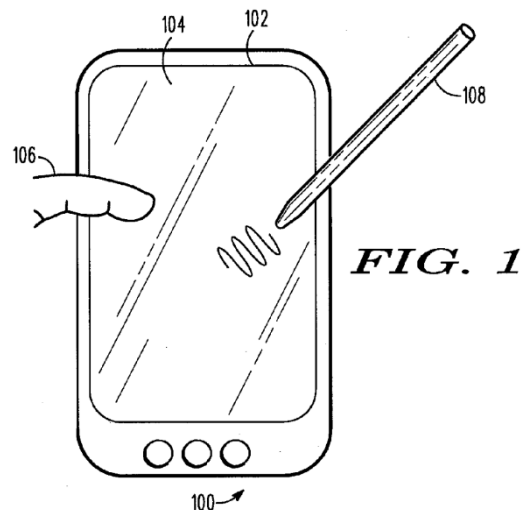


FIG. 1 of King-Smith (Ex. 1008)

6. Kremin (Ex. 1009)

The technology disclosed in Kremin includes embodiments of a system in which a stylus can be detected and tracked by a processing device. Ex. 1009, ¶¶[0051]-[0052]. In disclosed embodiments, the stylus of Kremin includes sensors, which may be used to capture and transmit various data, such as force sense data, battery data, acceleration data, and button status data. *Id.* at ¶¶[0109] & [0113].

The stylus of Kremin receives a signal from the sensing device, which is used as a carrier signal to transmit data back to the sensing device. *Id.* at ¶¶[0085] & [0105]-[0110].

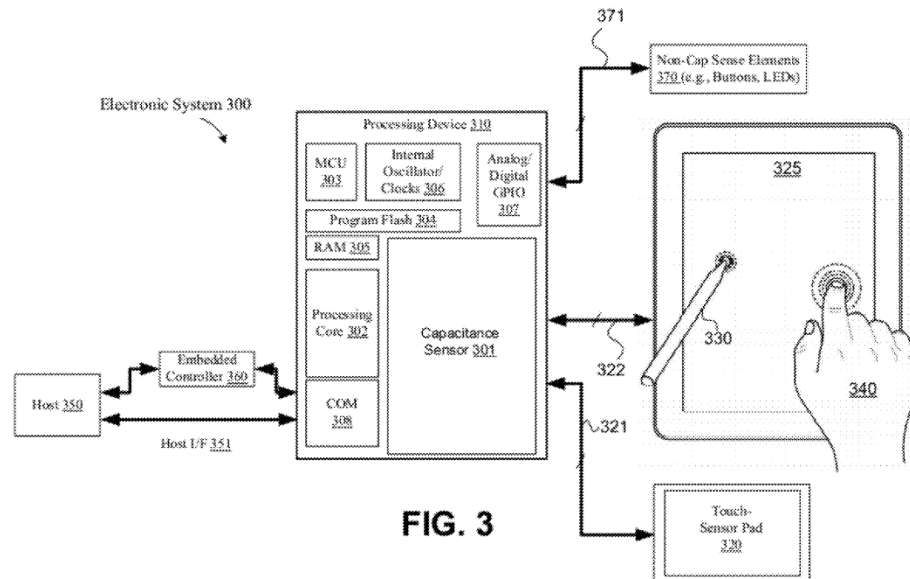


FIG. 3 of Kremin (Ex. 1009)

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 '220 patent, and how these claims are anticipated and/or obvious in view of the prior art.

A. Ground 1: The Challenged Claims are obvious over Kaneko in view of Vuppu.

The Challenged Claims are obvious over Kaneko in view of Vuppu *See* Ex.

1003, ¶93. Petitioner demonstrates obviousness of the Challenged Claims by adopting the claim mapping set forth *supra* at pages i-iii and in the Declaration of Nabil J. Sarhan, Ph.D. *See* Ex. 1003. Petitioner cites and incorporates Dr. Sarhan's more fulsome analysis of the Challenged Claims found at Appendix A1 of Ex. 1003, portions of which are excerpted and summarized below.

1. Motivation to Combine Kaneko and Vuppu

As discussed in Dr. Sarhan's more fulsome analysis at Appendix A1 of Exhibit 1003, Kaneko and Vuppu describe similar technologies and address similar problems. Both describe devices in the form of a stylus used to provide inputs to a touch sensor of a device, and both describe techniques for communicating signals from a stylus to a touchscreen device and vice versa. Ex. 1003, Appx. A1. Kaneko describes that the stylus includes an electric field sensor at the pen tip to detect the strength of an electric field received from the touchscreen device. Ex. 1005, ¶[0024]. Vuppu describes that the stylus includes a compound tip that includes a center electrode and a shroud electrode. Ex. 1006, 3:3-8. The center electrode detects electric field variations (e.g., a periodic wave transmitted by a touch-sensitive device), while a potential of the shroud electrode is changed using an active circuit to enable the compound tip to emit electric field variations to be detected by the touch-sensitive device. *Id.* at 3:36-41 & 3:50-61. It would be obvious for a

POSITA to modify the stylus of Kaneko based on Vuppu to receive and transmit signals using a compound tip having electrodes. Ex. 1003, Appx. A1. For example, the center electrode of Vuppu can be implemented as the electric field sensor of the stylus of Kaneko, and a shroud electrode as in Vuppu can be added to the stylus of Kaneko to allow the modified stylus to transmit signals to the touchscreen device using the compound tip. *Id.* A POSITA would have been motivated to so modify the stylus of Kaneko for one or more obvious benefits, such as creating a stronger signal by a stylus, which is easier for a touch-sensitive device to detect. *See* Ex. 1006, 2:40-54.

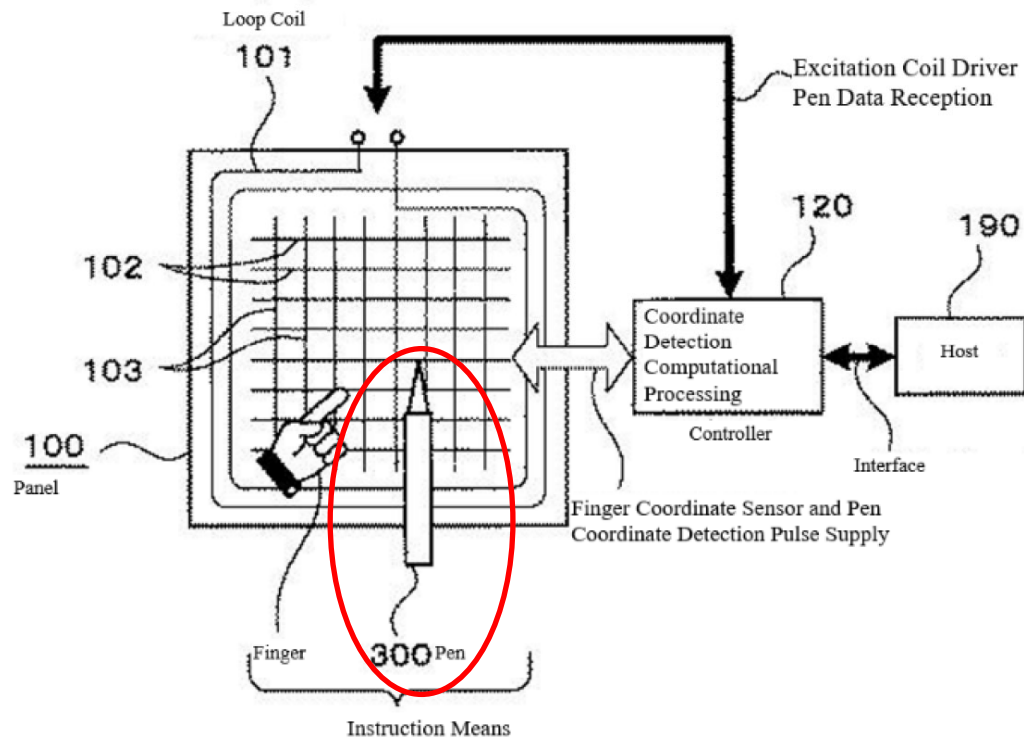
2. **Claim 1**

Claim 1 is obvious over Kaneko in view of Vuppu for the reasons discussed below. All limitations of claim 1 are disclosed in the prior art and/or obvious to a POSITA.

a. **Limitation 1[pre]**

Kaneko discloses an electronic pen, which is a stylus. Ex. 1003, Appx. A1, limitation 1[pre]; Ex. 1005, FIG. 1 & ¶¶[0020], [0024], and [0040].

[Fig. 1]

**FIG. 1 of Kaneko (annotated) (Ex. 1005)****b. Limitation 1[a]**

The stylus of Kaneko includes sensors. Ex. 1003, Appx. A1, limitation 1[a]. The sensors include an electric field sensor at the tip of the stylus, which detects the strength of an electric field generated by a matrix of electrodes of touchscreen. Ex. 1005, ¶[0024]. The stylus of Kaneko further includes a pressure detection mechanism to detect pressure according to usage, which necessarily includes a pressure sensor. *Id.*; *id.* at ¶[0041]; Ex. 1003, Appx. A1, limitation 1[a]. The stylus

of Kaneko also includes “mechanical switches” used, for example, to detect clicks, and these switches would also be understood as being or including sensors. *Id.*

c. Limitation 1[b]

The electric field sensor of Kaneko would be understood as an electrode configured to communicate with a device by receiving signals from a touch sensor of the device. Ex. 1003, Appx. A1, limitation 1[b]; Ex. 1005, ¶[0024]. Kaneko describes that the stylus receives a signal via the electric field sensor and from a loop coil of the touchscreen device (referred to as the “panel side”), and the stylus generates a counter magnetic field to communicate data to the panel side. Ex. 1005, ¶¶[0024] & [0040]. And Kaneko describes that a conductive material is arranged at the stylus tip to detect the electric field from the conductive film pattern on the panel side. Ex. 1005, ¶[0044]. An electrode could be understood as a conductor that establishes electrical contact with a nonmetallic component of a circuit. *See* Ex. 1020; Ex. 1003, Appx. A1, limitation 1[b]. Additionally, the electric field sensor of Kaneko is used for capacitive coupling with the touchscreen device, which inherently requires a pairing of electrodes. Ex. 1003, Appx. A1, limitation 1[b]; Ex. 1005, ¶¶[0031]&[0016]. Before the ’220 Patent, electrodes had been known for decades, and it was known to include an electrode in a stylus tip to communicate with a touchscreen device. *Id.* The electric field sensor of Kaneko is an electrode

configured to communicate with a device by receiving signals from a touch sensor of the device.

While Kaneko does not expressly disclose that the electric field sensor is configured to transmit signals to a touch sensor of the device, Vuppu discloses an electrode configured to transmit signals to a touch sensor of the device. Ex. 1003, Appx. A1, limitation 1[b]. The stylus of Vuppu includes a compound tip having a center electrode (e.g., 101 of FIG. 1) to detect electric field variations (i.e., to receive signals from the touch sensor) and a shroud electrode (e.g., 102 of FIG. 1), used with an active circuit to enable the compound tip to emit electric field variations (i.e., to transmit signals to the touch sensor). Ex. 1006, 3:3-8, 3:36-41, & 3:50-61. The shroud electrode of Vuppu may function as “a transmit electrode.” *Id.* at 6:3-7. The stylus of Vuppu can apply a positive or negative gain to a received signal to inject charge into a touch-sensitive display, which may provide a stronger signal that is easier for the touch-sensitive display to detect. *Id.* at 2:48-54. Additionally, the stylus of Vuppu can transmit signals to communicate data, such as force data or other sensor data. *Id.* at 6:37-42 & 6:48-64.

It would be obvious to include the electrodes of Vuppu in the stylus of Kaneko. Ex. 1003, Appx. A1, limitation 1[b]. Limitation 1[b] is, therefore, obvious in view of Kaneko and Vuppu. *Id.*

d. Limitation 1[c]

A POSITA would appreciate that the stylus of Kaneko includes computer-readable non-transitory storage media embodying logic to store instructions for performing operations performed at the stylus. Ex. 1003, Appx. A1, limitation 1[c]. For example, the stylus performs modulation using a LC resonance circuit and a modulation circuit to change electric current flow through a loop coil on the panel side. Ex. 1005, ¶[0041]. Additionally, the stylus of Kaneko receives commands to allow for reading pen-specific information, setting sensitivity settings, firmware updates, and enabling features like vibration via a vibration device or light notifications, and Kaneko describes using the stylus for bidirectional data transmission. *Id.* at ¶[0050]. These and other operations require the stylus to have computer-readable non-transitory storage media embodying logic to store instructions for performing operations. Ex. 1003, Appx. A1, limitation 1[c]. For example, the stylus of Kaneko would include firmware and a CPU, which meets limitation 1[c]. *Id.*; Ex. 1016, pp. 107 & 286.

e. Limitation 1[c1]

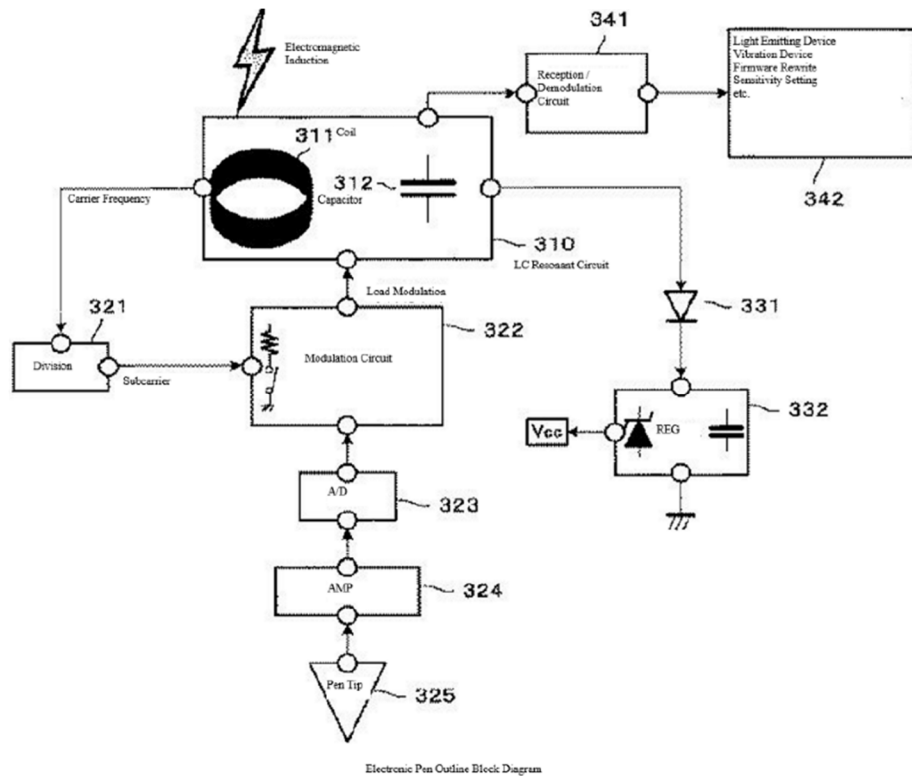
Kaneko discloses receiving sensor data from the one or more sensors. Ex. 1003, Appx. A1, limitation 1[c1]. For example, the stylus of Kaneko receives data from the electric field sensor related to the detected strength of the electric field,

which is converted to digital and sent to a modulation circuit. Ex. 1005, ¶[0024]. The modulation circuit modulates the LC resonance voltage to generate a counter magnetic field to alter the electric current flowing in loop coil 101 on the panel side. *Id.*; *see also id.* at ¶[0055]&[0041]. Kaneko, therefore, discloses receiving sensor data from the electric field sensor. Ex. 1003, Appx. A1, limitation 1[c1].

Moreover, as discussed above, the pressure detection mechanism of Kaneko necessarily is or includes a sensor. Ex. 1005, ¶[0024]; Ex. 1003, Appx. A1, limitation 1[c1]. While Kaneko does not expressly state that the detected pressure is received by the modulation circuit, it would be obvious to a POSITA that pressure data would be received at the modulation circuit to be communicated to the panel side. *Id.* Kaneko discloses that the LC resonant circuit is amplitude modulated by the modulation circuit, which changes the current flowing through the loop coil on the panel side, thus enabling transmission of data from the stylus to the controller. Ex. 1005, ¶[0041]. Kaneko does not limit the kinds of data that can be transmitted according to these techniques, and it would be obvious to a POSITA that the transmitted data would include data collected using the pressure detection mechanism. Ex. 1003, Appx. A1, limitation 1[c1]. Other kinds of sensor data that can be received, according to Kaneko, include data from mechanical switches, which would also be understood as sensors. *Id.*; Ex. 1005, ¶[0024].

f. Limitation 1[c2]

Kaneko discloses receiving a first signal generated by the device. Ex. 1003, Appx. A1, limitation 1[c2]. As illustrated in Figure 5 of Kaneko, the stylus receives a signal from the touch panel through electromagnetic induction, detects the carrier frequency of the signal, modulates this carrier signal based on data to be sent by the stylus, and transmits the output of the modulation process to the touch panel. *Id.*; *see also* Ex. 1005, ¶[0055]. Specifically, “[t]he modulation circuit 322 receives a signal obtained by dividing the carrier frequency detected by the LC resonant circuit 310 using the frequency divider 321.” Ex. 1005, ¶[0045]. “By changing the electric current flowing through the loop coil 101, this electric current change is detected on the panel side and converted to voltage by a detection resistor, enabling demodulation into the desired data for transmission of data from the electronic pen to the controller.” *Id.*; *see also id.* at ¶[0024].

**FIG. 5 of Kaneko (Ex. 1005)****g. Limitation 1[c3]**

The stylus of Kaneko generates a second signal by modulating a carrier signal based on the sensor data. Ex. 1003, Appx. A1, limitation 1[c3]. As discussed above, the stylus of Kaneko includes a modulation circuit that receives a signal obtained by dividing the carrier frequency detected by the LC resonant circuit using a frequency divider. Ex. 1005, ¶[0041] & FIG. 5. Moreover, Kaneko discloses that an excitation frequency provided from the panel side serves as a carrier. *Id.* at ¶[0037]. The modulation circuit of Kaneko modulates the LC resonance circuit to change electric current flow through a loop coil on the panel side to transmit data.

Id. at ¶[0041]. The signal generated by the stylus of Kaneko is based on sensor data, such as data intensity data determined using the electric field sensor, pressure data determined using the pressure detection mechanism, or other sensor data. *Id.* at ¶¶[0024]&[0055]; Ex. 1003, Appx. A1, limitation 1[c3].

h. Limitation 1[c4]

The stylus of Kaneko transmits the generated signal to the device in response to the received signal, the sensor data being obtainable by demodulating the transmitted signal. Ex. 1003, Appx. A1, limitation 1[c4]. As discussed above with reference to limitations 1[c2] and 1[c3], the modulation circuit included in the stylus of Kaneko modulates the LC resonance circuit to change electric current flow through a loop coil on the panel side, which allows data to be transmitted in the signal generated by the stylus. Ex. 1005, ¶[0041]. The electric current change is detected on the panel side and converted to voltage by a detection resistor, enabling demodulation into received data. *Id.*

As discussed with reference to limitation 1[c3] above, the stylus of Kaneko generates the second signal using a carrier signal provided by the panel side and by performing modulation to transmit data from the stylus to the panel side, which may include sensor data. Figure 4 of Kaneko illustrates a transmission and reception section of the panel side. Ex. 1005, ¶[0038]. At a controller on the panel side,

an impedance matching circuit is connected to a detection resistor for receiving signals, and the received signal obtained at the detection resistor is sent through a bandpass filter and an amplifier to a demodulator, from which the demodulated signal is output as a received signal at an output terminal. Ex. 1005, ¶[0039].

Kaneko also discloses that “[t]he transmission and reception processing unit 130 is also equipped with a receiving circuit 133, which detects data regarding the strength of the electric field from the electronic pen and performs demodulation of the received function within that receiving circuit 133” and that “[t]he detected data and demodulated data are sent to the pen coordinate/function calculation unit 129”. Ex. 1005, ¶[0037]. It also discloses that “[i]n the pen coordinate/function calculation unit 129, the supplied data and the clock provided from the frequency divider 123 are used to detect the coordinate position (or a nearby position) where the electronic pen contacts the panel” and that “[t]he data of the detected coordinate position is sent to the host 190 via interface 141”. *Id.*

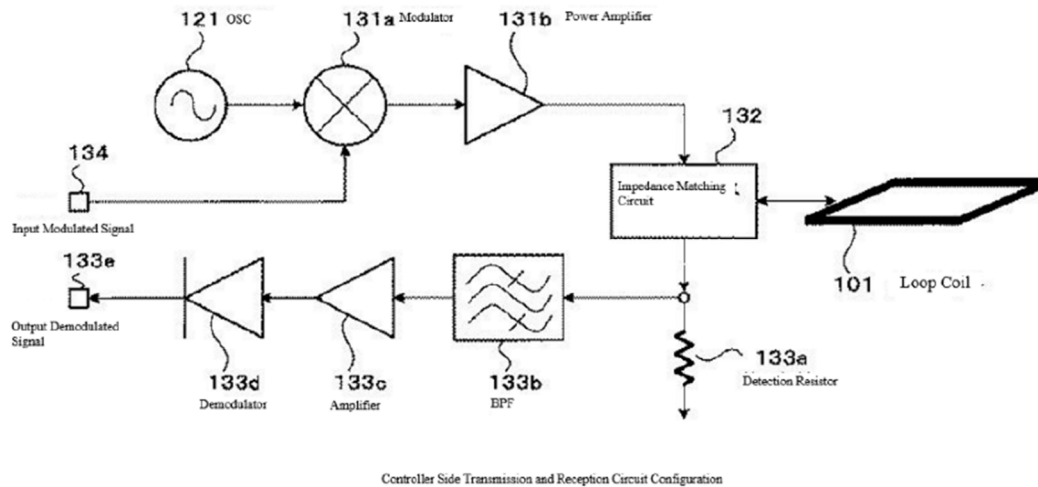


Figure 4 of Kaneko (Ex. 1005)

The stylus of Kaneko transmits the second signal to the device in response to the first signal—that is, the second signal is provided by processing the signal received from the device. Ex. 1003, Appx. A1, limitation 1[c4]. The sensor data is obtainable on the panel side by demodulating the second signal. *Id.* Kaneko, therefore, discloses limitation 1[c4].

3. Claim 2

Kaneko discloses the limitations of claim 2 for the reasons discussed above with reference to limitations 1[a], 1[c2] and 1[c3]. Ex. 1003, Appx. A1, claim 2. The electric field sensor at the stylus tip detects the strength of the electric field generated around the matrix pattern, and after converting this detected signal to digital form, the intensity data is sent to the modulation circuit. Ex. 1005, ¶[0024]. The modulation circuit of Kaneko receives a signal obtained by dividing the carrier

frequency detected by the LC resonant circuit 310 using a frequency divider 321. *Id.* at ¶[0041]. Moreover, Kaneko discloses that an excitation frequency provided from the panel side serves as a carrier. *Id.* at ¶[0037]. The modulation circuit of Kaneko modulates the LC resonance circuit to change electric current flow through a loop coil on the panel side to transmit data. *Id.* at ¶[0041]. Kaneko, therefore, discloses that the first signal is the carrier signal modulated to generate the second signal, as in claim 2. Ex. 1003, Appx. A1, claim 2.

4. **Claim 3**

In relation to the generated signal, Kaneko discloses that the modulation circuit amplitude modulates the LC resonant circuit. Ex. 1005, ¶[0041]. Kaneko, therefore, discloses wherein the second signal is generated using amplitude modulation. Ex. 1003, Appx. A1, claim 3. Kaneko further discloses that the disclosed technology can use various modulation techniques, such as “frequency, phase, and amplitude modulation.” Ex. 1005, ¶[0049]. While the discussion of frequency and phase modulation is in the context of sending data from the controller side to the stylus, it would be appreciated that these modulation techniques can likewise be implemented at the stylus, especially because a POSITA would appreciate that amplitude modulation, frequency modulation, and phase modulation are the three fundamental ways to perform modulation. Ex. 1003, Appx. A1, claim

3; Ex. 1016, p. 480; Ex. 1018, pp. 34-35. Accordingly, the additional limitations of claim 3 are obvious in view of the explicit disclosure of Kaneko and the knowledge of a POSITA.

5. **Claim 4**

As discussed above with reference to limitation 1[a], the stylus of Kaneko includes a pressure detection mechanism, which is or includes a pressure sensor, and the stylus of Kaneko includes switches for assigned functions, such as for clicking. Ex. 1005, ¶[0024]. Kaneko, therefore, discloses one or more sensors comprising “a pressure sensor and a button,” as in claim 4.

As discussed above with reference to limitations 1[c1], 1[c2], 1[c3], and 1[c4], it would be obvious to a POSITA that data transmitted by the stylus would include data collected using the pressure detection mechanism—that is, “pressure data,” as in claim 4. Ex. 1003, Appx. A1, claim 4. Additionally, the disclosure in Kaneko regarding functions of the switches relates to, for example, “clicking”—that is, detecting whether a switch has been actuated to register a “click.” *Id.* A POSITA would appreciate that the switches of Kaneko may be buttons, and that the registering of a “click” would involve transmitting data regarding a state of the button to enable a feature associated with “clicking.” *Id.* While Kaneko does not explicitly state that the pressure and clicking data are transferred using the

modulation circuit discussed above, a POSITA would appreciate that disclosed embodiments are used to capture and transmit pressure data and button state data because the stylus of Kaneko captures this data, and it would be wasteful to include redundant circuitry to perform this function. *Id.* Claim 4 is, therefore, inherent in Kaneko and obvious to a POSITA in view of Kaneko. *Id.*

6. Claim 5

Kaneko discloses “wherein the sensor data is digital,” as in claim 5. Ex. 1003, Appx. A1, claim 5. For example, Kaneko discloses digitizing at the stylus using an analog-to-digital converter 323, and Kaneko discloses that a digital processing configuration is preferred to reduce the effects of noise. Ex. 1005, ¶¶[0024], [0045]&[0047]. And Kaneko describes that the electric field sensor of the stylus detects a signal and converts it “to digital form.” *Id.*

7. Claim 7

Claim 7 is obvious over Kaneko in view of Vuppu for the reasons discussed below. All limitations of claim 7 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 7[pre]

Limitation 7[pre] is obvious for the reasons discussed with reference to limitation 1[c] above.

b. Limitation 7[a]

Limitation 7[a] is obvious for the reasons discussed with reference to limitations 1[b] and 1[c1] above.

c. Limitation 7[b]

Limitation 7[b] is obvious for the reasons discussed with reference to limitation 1[c2] above.

d. Limitation 7[c]

Limitation 7[c] is obvious for the reasons discussed with reference to limitation 1[c3] above.

e. Limitation 7[d]

Limitation 7[d] is obvious for the reasons discussed with reference to limitation 1[c4] above.

8. Claim 8

Claim 8 is obvious for the reasons discussed with reference to claim 2 above.

9. Claim 9

Claim 9 is obvious for the reasons discussed with reference to claim 3 above.

10. Claim 10

Claim 10 is obvious for the reasons discussed with reference to claim 4 above.

11. Claim 11

Claim 11 is obvious for the reasons discussed with reference to claim 7 above.

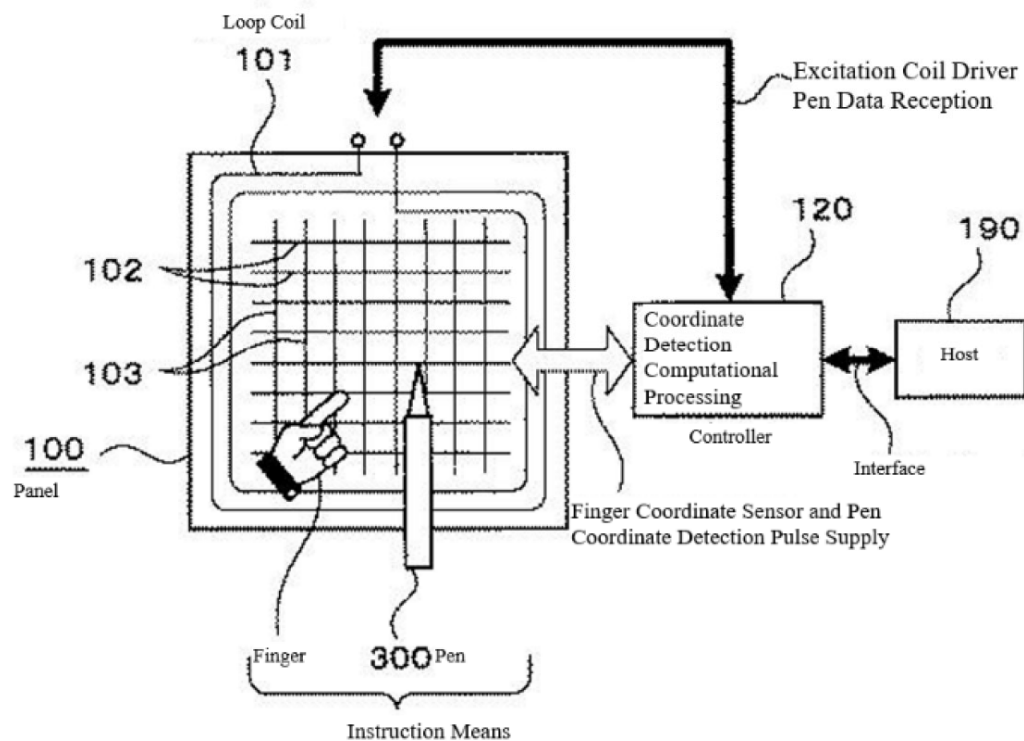
12. Claim 13

Claim 13 is obvious over Kaneko in view of Vuppu for the reasons discussed below. All limitations of claim 13 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 13[pre]

Kaneko discloses a system. Ex. 1003, Appx. A1, limitation 13[pre]. Kaneko discloses an electronic pen 300 (i.e., stylus) used as an input means to a panel 100. Ex. 1005, FIG. 1 & ¶¶[0020], [0024]&[0040]. The panel 100 uses a controller unit 120 to detect inputs and provide coordinate information to a host 190. *Id.* at ¶¶[0031]&[0037].

[Fig. 1]

**FIG. 1 of Kaneko (Ex. 1005)****b. Limitation 13[a]**

The panel 100 of Kaneko includes an input detection part that detects a coordinate position touched on the panel. Ex. 1005, ¶[0020]. The panel 100 of Kaneko would be understood as comprising a touch sensor included in a device. Ex. 1003, Appx. A1, limitation 13[a].

c. Limitation 13[b]

Limitation 13[b] is obvious for the same reasons discussed above with reference to limitation 1[pre].

d. Limitation 13[b1]

Limitation 13[b1] is obvious for the same reasons discussed above with reference to limitation 1[a].

e. Limitation 13[b2]

Limitation 13[b2] is obvious for the same reasons discussed above with reference to limitation 1[b].

f. Limitation 13[b3]

Limitation 13[b3] is obvious for the same reasons discussed above with reference to limitation 1[c].

g. Limitation 13[b3A]

Limitation 13[b3A] is obvious for the same reasons discussed above with reference to limitation 1[c1].

h. Limitation 13[b3B]

Limitation 13[b3B] is obvious for the same reasons discussed above with reference to limitation 1[c2].

i. Limitation 13[b3C]

Limitation 13[b3C] is obvious for the same reasons discussed above with reference to limitation 1[c3].

j. Limitation 13[b3D]

Limitation 13[b3D] is obvious for the same reasons discussed above with reference to limitation 1[c4].

13. Claim 14

Claim 14 is obvious for the same reasons discussed above with reference to claim 2.

14. Claim 15

Claim 15 is obvious for the same reasons discussed above with reference to claim 3.

15. Claim 16

Claim 16 is obvious for the same reasons discussed above with reference to claim 4.

16. Claim 17

Claim 17 is obvious for the same reasons discussed above with reference to claim 5.

B. Ground 2: The Challenged Claims are further obvious over Kaneko in view of Vuppu, Cao, and/or King-Smith.

The Challenged Claims are further obvious over Kaneko in view of Vuppu, Cao, and/or King-Smith. *See* Ex. 1003, ¶94. Petitioner demonstrates obviousness of the Challenged Claims by adopting the claim mapping set forth *supra* at pages i-iii and in the Declaration of Nabil J. Sarhan, Ph.D. *See* Ex. 1003. Petitioner cites and

incorporates Dr. Sarhan's more fulsome analysis of the Challenged Claims found at Appendix A2 of Ex. 1003, portions of which are excerpted and summarized below. For the sake of efficiency, discussion of the disclosure of Kaneko and Vuppu will not be duplicated below, and the Board can refer to Section VII(A) above regarding the disclosure of Kaneko and Vuppu.

1. Motivation to Combine Kaneko, Vuppu, Cao, and/or King-Smith

A POSITA would be motivated to modify Kaneko in view of Vuppu for the reasons discussed at Section VII(A)(1) above.

As discussed in Dr. Sarhan's more fulsome analysis at Appendix A2 of Exhibit 1003, Kaneko and Cao describe similar technologies and address similar problems. Both describe devices in the form of a stylus (alternatively referred to as an "electronic pen" or a "digital pen" in some examples) used to provide inputs to a touch sensor of a device, and both describe styluses that include sensors. Ex. 1003, Appx. A2. A POSITA would have been motivated to modify the technology Kaneko based on Cao for the obvious benefit of capturing richer sensor data, which can be used to determine orientation of the stylus to enable different functions of the stylus. *See, e.g.*, Ex. 1007, 1:20-51.

The stylus of Kaneko uses an LC resonant circuit to communicate via a loop coil of a device, while finger detection is performed using a matrix of electrodes.

See, e.g., Ex. 1005, ¶¶[0020]-[0024]. The stylus of Kaneko includes a “pressure detection mechanism” to detect a pressure and a modulation circuit that performs amplitude modulation to generate a counter magnetic field for communication back to the host device. *Id.* The stylus of Cao can be detected using a proximity sensor and according to different detection techniques or combinations of detection techniques, including “electromagnetic induction sensing” or capacitive touch sensing, among other techniques. *See, e.g.*, Ex. 1007, 3:61-66 & 6:6-15. The stylus of Cao includes various sensors, such as a compass, a gyroscope, and one or more accelerometers included in an inertial measurement unit, which can be used to detect and report orientation and movement. *Id.* at 4:30-52. A POSITA implementing the stylus of Kaneko would benefit from the disclosure of Cao, for example, because Cao discloses a range of detection techniques, including both inductive and capacitive techniques for detecting and communicating with a stylus, and the stylus of Cao can be used to capture richer sensor data. Ex. 1003, Appx. A2. It would be well within the capabilities of a POSITA to modify the stylus of Kaneko based on Cao. *Id.*

Kaneko and King-Smith also describe similar technologies and address similar problems. *Id.* Similar to Kaneko, King-Smith describes a stylus used to provide inputs to a touch sensor of a device, and it describes that the stylus transmits

digital data, including pen pressure data and switch status data. *See, e.g.*, Ex. 1008, Abstract. According to the technology of King-Smith, a “combination touch and transducer input system” is provided such that user input can be provided using a finger, a stylus, or both. *Id.* The technology of King-Smith provides both a “touch mode” and a “transducer mode,” which may both use capacitive techniques. *See, e.g., Id.* at ¶¶[0007]&[0020]. A POSITA implementing the stylus of Kaneko would benefit from the disclosure of King-Smith, for example, because King-Smith discloses additional techniques (e.g., capacitive techniques) for detecting both a stylus and a user’s touch, and King-Smith discloses additional modulation techniques for encoding digital data. *See, e.g., Id.* at ¶¶[0020]&[0112]. A POSITA would have been motivated to modify the technology of Kaneko based on King-Smith for the obvious benefit of improved communication of data using different kinds of modulation of the signal. Ex. 1008, ¶[0010].

2. Claim 1

Claim 1 is obvious over Kaneko in view of Vuppu, Cao, and/or King-Smith for the reasons discussed below. All limitations of claim 1 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 1[a]

Even if limitation 1[a] were not disclosed in Kaneko, a person of ordinary skill in the art could modify Kaneko in view of Cao to meet this limitation. Ex. 1003, Appx. A2, limitation 1[a]. The stylus of Cao includes an inertial measurement unit 114, which may comprise a compass, a gyroscope, and one or more accelerometers, which are sensors. Ex. 1007, 3:59-4:35.

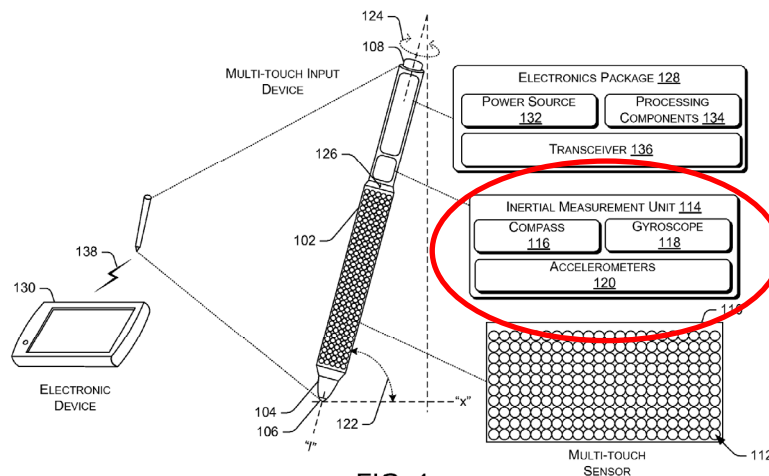


FIG. 1

FIG. 1 of Cao (annotated) (Ex. 1007)**b. Limitation 1[c]**

Even if limitation 1[c] were not disclosed in Kaneko, a POSITA could modify Kaneko in view of Cao to meet this limitation. Ex. 1003, Appx. A2, limitation 1[c]. For example, Cao discloses that software included in processing components of an input device may be stored in a memory, which may comprise computer-readable media. Ex. 1007, 5:12-15.

c. Limitation 1[c1]

Even if limitation 1[c1] were not disclosed in Kaneko, a POSITA could modify Kaneko in view of Cao to meet this limitation. Ex. 1003, Appx. A2, limitation 1[c1]. The input device of Cao includes the inertial measurement unit, which may comprise a compass, a gyroscope, and one or more accelerometers, which are sensors. Ex. 1007, 3:59-4:35. The inertial measurement unit is used to measure and output a pitch or tilt angle of the input device. *Id.* at 4:35-37. The data collected using the inertial measurement unit is, therefore, sensor data that is received by a component in the stylus of Cao. Ex. 1003, Appx. A2, limitation 1[c1].

d. Limitation 1[c3]

Even if limitation 1[c3] were not disclosed in Kaneko, a POSITA could modify Kaneko in view of Cao to meet this limitation. Ex. 1003, Appx. A2, limitation 1[c3]. Cao discloses passing output data of the inertial measurement unit to the electronic device. Ex. 1007, 4:55-57.

e. Limitation 1[c4]

Even if limitation 1[c4] were not disclosed in Kaneko, a POSITA could modify Kaneko in view of Cao to meet this limitation. Ex. 1003, Appx. A2, limitation 1[c4]. Cao discloses passing output data of the inertial measurement unit to the electronic device. Ex. 1007, 4:55-57.

3. **Claim 3**

Even if claim 3 were not obvious in view of Kaneko and/or Vuppu, claim 3 would be obvious to a POSITA in further view of King-Smith. Ex. 1003, Appx. A2, claim 3. King-Smith discloses a transducer (e.g., a stylus) that selectively generates an electric field at multiple frequencies and encodes digital data in frequency shifts of the electric field. Ex. 1008, ¶[0010]. King-Smith further describes that “any other digital modulation technique may be used to encode digital data, including Amplitude-Shift Keying (ASK) technique, Phase-Shift Keying (PSK) technique, and Quadrature Amplitude Modulation (QAM) technique.” *Id.* Therefore, King-Smith discloses generating a signal using amplitude modulation, frequency modulation, and phase modulation. Ex. 1003, Appx. A2, claim 3.

4. **Claim 4**

Even if claim 4 were not obvious in view of Kaneko and/or Vuppu, claim 4 is obvious in further view of Cao. Ex. 1003, Appx. A2, claim 4. Cao discloses that the input device may include a retractable tip that activates a pressure switch housed in the input device. Ex. 1007, 3:64-66. The pressure switch outputs a signal when sufficient pressure actuates the switch. *Id.* at 3:66-67. Cao further discloses that the body of the input device can have at least one button, which may be a clickable button to activate a pressure switch. *Id.* at 4:1-4. Cao, therefore, discloses a pressure

sensor and a button, as well as sensor data comprising pressure data and button state data. Ex. 1003, Appx. A2, claim 4.

5. Claim 5

Even if claim 5 were not obvious in view of Kaneko and/or Vuppu, claim 5 is obvious in further view of Cao. Ex. 1003, Appx. A2, claim 5. Cao discloses “digital data” in relation to data outputted by the inertial measurement unit. Ex. 1007, 5:1-9. Cao, therefore, also discloses “wherein the sensor data is digital,” as in claim 5. Ex. 1003, Appx. A2, claim 5.

6. Claim 7

Claim 7 is obvious over Kaneko in view of Vuppu, Cao, and/or King-Smith for the reasons discussed below. All limitations of claim 7 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 7[pre]

Limitation 7[pre] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c].

b. Limitation 7[a]

Features of limitation 7[a] are disclosed in Cao for the reasons discussed above with reference to limitation 1[c1].

c. Limitation 7[c]

Limitation 7[c] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c3].

d. Limitation 7[d]

Limitation 7[d] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c4].

7. Claim 9

Claim 9 is obvious in view of Kaneko, Vuppu, Cao, and/or King-Smith for the reasons discussed above with reference to claim 3.

8. Claim 10

Claim 10 is obvious in view of Kaneko, Vuppu, and/or Cao for the reasons discussed above with reference to claim 4.

9. Claim 11

Claim 11 is obvious in view of Kaneko, Vuppu, and/or Cao for the reasons discussed above with reference to claim 5.

10. Claim 13

Claim 13 is obvious over Kaneko, Vuppu, Cao, and/or King-Smith for the reasons discussed below. All limitations of claim 13 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 13[b1]

Limitation 13[b1] is disclosed in Cao for the reasons discussed above with reference to limitation 1[a].

b. Limitation 13[b3]

Limitation 13[b3] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c].

c. Limitation 13[b3A]

Limitation 13[b3A] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c1].

d. Limitation 13[b3C]

Limitation 13[b3C] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c3].

e. Limitation 13[b3D]

Limitation 13[b3D] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c4].

11. Claim 15

Claim 15 is obvious in view of Kaneko, Vuppu, Cao, and/or King-Smith for the reasons discussed above with reference to claim 3.

12. **Claim 16**

Claim 16 is obvious in view of Kaneko, Vuppu, and/or Cao for the reasons discussed above with reference to claim 4.

13. **Claim 17**

Claim 11 is obvious in view of Kaneko, Vuppu, and/or Cao for the reasons discussed above with reference to claim 5.

C. Ground 3: The Challenged Claims are further obvious over Kaneko in view of Harley.

The Challenged Claims are further obvious over Kaneko in view of Harley. *See* Ex. 1003, ¶95. Petitioner demonstrates obviousness of the Challenged Claims by adopting the claim mapping set forth *supra* at pages i-iii and in the Declaration of Nabil J. Sarhan, Ph.D. *See* Ex. 1003. Petitioner cites and incorporates Dr. Sarhan's more fulsome analysis of the Challenged Claims found at Appendix A3 of Ex. 1003, portions of which are excerpted and summarized below. For the sake of efficiency, discussion of the disclosure of Kaneko will not be duplicated below, and the Board can refer to Section VII(A) above regarding the disclosure of Kaneko.

1. **Motivation to Combine Kaneko and Harley**

As discussed in Dr. Sarhan's more fulsome analysis at Appendix A3 of Exhibit 1003, Kaneko and Harley describe similar technologies and address similar problems. Both describe communication between a stylus and a touch sensor of a

device through capacitive coupling, and both describe synchronization and modulation/demodulation of data. Ex. 1003, Appx. A3. Kaneko describes that the stylus includes an electric field sensor at the pen tip to detect the strength of an electric field received from the touchscreen device. Ex. 1005, ¶[0024]. Similarly, Harley discloses an electrode at the tip of the stylus. Ex. 1021 at Abstract. The stylus of Harley includes powered circuitry coupled to the electrode, and the stylus is configured for capacitively coupling with a touch sensor panel via the electrode. *Id.* The powered circuitry may include drive circuitry to output a drive voltage at the electrode and/or sense circuitry to sense a voltage received at the electrode. *Id.* In other words, the electrode of Kaneko is used for receiving a signal via capacitive coupling, whereas the electrode of Harley is used for both transmitting and receiving a signal. Ex. 1003, Appx. A3.

A POSITA would have been motivated to modify the technology of Kaneko based on Harley for one or more obvious benefits, such as simplifying the stylus design and/or reducing costs. Ex. 1003, Appx. A3. For example, while Kaneko uses capacitive coupling to receive data from the touch sensor and induction for other types of communication, a POSITA would have been motivated to modify the stylus of Kaneko to use capacitive coupling for **both** transmitting and receiving, as in Harley. *Id.* This modification would result in a simpler and less costly design

because fewer components would be needed to achieve similar functionality. *Id.*

2. Claim 1

Claim 1 is obvious over Kaneko in view of Harley. All limitations of claim 1 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 1[b]

Even if limitation 1[b] were not disclosed in Kaneko, a POSITA could modify Kaneko in view of Harley to meet this limitation. Ex. 1003, Appx. A3, limitation 1[b]. Harley describes that the disclosed stylus acts may use a drive electrode to create an electric field to communicate to a touch sensor panel, a sense electrode to sense capacitively coupled signals from the touch sensor panel, or both. Ex. 1021 at Abstract, Claim 15, 1:55-2:5, 2:55-65, and FIGs. 2 & 3. The electrode of Harley, therefore, is also a “configured to communicate with a device by receiving signals from and transmitting signals to a touch sensor of the device,” as in limitation 1[b].

3. Claim 7

Claim 7 is obvious over Kaneko in view of Harley for the reasons discussed below. All limitations of claim 7 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 7[a]

Features of limitation 7[a] are disclosed in Harley for the reasons discussed above with reference to limitation 1[b].

4. Claim 13

Claim 13 is obvious over Kaneko in view of Harley for the reasons discussed below. All limitations of claim 13 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 13[b2]

Limitation 13[b2] is disclosed in Harley for the reasons discussed above with reference to limitation 1[b].

D. Ground 4: The Challenged Claims are further obvious over Kaneko in view of Harley, Cao, and/or King-Smith.

The Challenged Claims are further obvious over Kaneko in view of Harley, Cao, and/or King-Smith. *See* Ex. 1003, ¶96. Petitioner demonstrates obviousness of the Challenged Claims by adopting the claim mapping set forth *supra* at pages i-iii and in the Declaration of Nabil J. Sarhan, Ph.D. *See* Ex. 1003. Petitioner cites and incorporates Dr. Sarhan's more fulsome analysis of the Challenged Claims found at Appendix A4 of Ex. 1003, portions of which are excerpted and summarized below. For the sake of efficiency, discussion of the disclosure of the respective references will not be duplicated below except to note where respective claim limitations can

be found in the foregoing discussion. Generally speaking, Section VII(A) discusses the disclosure of Kaneko, Section VII(B) discusses the disclosure of Cao and King-Smith, and Section VII(C) discusses the disclosure of Harley.

1. Motivation to Combine Kaneko, Harley, Cao, and/or King-Smith

A POSITA would be motivated to modify Kaneko in view of Harley for the reasons discussed at Section VII(C)(1) above. A POSITA would be motivated to modify Kaneko in view of Cao and/or King-Smith for the reasons discussed at Section VII(B)(1) above. *See also* Ex. 1003, Appx. A4.

2. Claim 1

Claim 1 is obvious over Kaneko in view of Vuppu, Cao, and/or King-Smith for the reasons discussed below. All limitations of claim 1 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 1[a]

Even if limitation 1[a] were not disclosed in Kaneko, this limitation is also disclosed in Cao, and a POSITA would be motivated to modify Kaneko in view of Cao, for the reasons discussed in Section VII(B) above.

b. Limitation 1[c]

Even if limitation 1[c] were not disclosed in Kaneko, this limitation is also disclosed in Cao, and a POSITA would be motivated to modify Kaneko in view of Cao, for the reasons discussed in Section VII(B) above.

c. Limitation 1[c1]

Even if limitation 1[c1] were not disclosed in Kaneko, this limitation is also disclosed in Cao, and a POSITA would be motivated to modify Kaneko in view of Cao, for the reasons discussed in Section VII(B) above.

d. Limitation 1[c3]

Even if limitation 1[c3] were not disclosed in Kaneko, this limitation is also disclosed in Cao, and a POSITA would be motivated to modify Kaneko in view of Cao, for the reasons discussed in Section VII(B) above.

e. Limitation 1[c4]

Even if limitation 1[c4] were not disclosed in Kaneko, this limitation is also disclosed in Cao, and a POSITA would be motivated to modify Kaneko in view of Cao, for the reasons discussed in Section VII(B) above.

3. Claim 3

Even if claim 3 were not obvious in view of Kaneko and/or Harley, claim 3 would be obvious to a POSITA in further view of King-Smith for the reasons discussed in Section VII(B) above.

4. Claim 4

Even if claim 4 were not obvious in view of Kaneko and/or Harley, claim 4 is obvious in further view of Cao for the reasons discussed in Section VII(B) above.

5. Claim 5

Even if claim 5 were not obvious in view of Kaneko and/or Harley, claim 5 is obvious in further view of Cao for the reasons discussed in Section VII(B) above.

6. Claim 7

Claim 7 is obvious over Kaneko in view of Harley, Cao, and/or King-Smith for the reasons discussed below. All limitations of claim 7 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 7[pre]

Limitation 7[pre] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c].

b. Limitation 7[a]

Features of limitation 7[a] are disclosed in Cao for the reasons discussed above with reference to limitation 1[c1].

c. Limitation 7[c]

Limitation 7[c] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c3].

d. Limitation 7[d]

Limitation 7[d] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c4].

7. Claim 9

Claim 9 is obvious in view of Kaneko, Harley, Cao, and/or King-Smith for the reasons discussed above with reference to claim 3.

8. Claim 10

Claim 10 is obvious in view of Kaneko, Harley, and/or Cao for the reasons discussed above with reference to claim 4.

9. Claim 11

Claim 11 is obvious in view of Kaneko, Harley, and/or Cao for the reasons discussed above with reference to claim 5.

10. Claim 13

Claim 13 is obvious over Kaneko, Harley, Cao, and/or King-Smith for the reasons discussed below. All limitations of claim 13 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 13[b1]

Limitation 13[b1] is disclosed in Cao for the reasons discussed above with reference to limitation 1[a].

b. Limitation 13[b3]

Limitation 13[b3] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c].

c. Limitation 13[b3A]

Limitation 13[b3A] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c1].

d. Limitation 13[b3C]

Limitation 13[b3C] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c3].

e. Limitation 13[b3D]

Limitation 13[b3D] is disclosed in Cao for the reasons discussed above with reference to limitation 1[c4].

11. Claim 15

Claim 15 is obvious in view of Kaneko, Harley, Cao, and/or King-Smith for the reasons discussed above with reference to claim 3.

12. Claim 16

Claim 16 is obvious in view of Kaneko, Harley, and/or Cao for the reasons discussed above with reference to claim 4.

13. **Claim 17**

Claim 11 is obvious in view of Kaneko, Harley, and/or Cao for the reasons discussed above with reference to claim 5.

E. Ground 5: The Challenged Claims are anticipated and obvious over Kremin.

The Challenged Claims are anticipated and obvious over Kremin *See* Ex. 1003, ¶¶97. Petitioner demonstrates anticipation and obviousness of the Challenged Claims by adopting the claim mapping set forth *supra* at pages i-iii and in the Declaration of Nabil J. Sarhan, Ph.D. *See* Ex. 1003. Petitioner cites and incorporates Dr. Sarhan's more fulsome analysis of the Challenged Claims found at Appendix B1 of Ex. 1003, portions of which are excerpted and summarized below.

1. **Claim 1**

Claim 1 is anticipated and obvious over Kremin for the reasons discussed below. All limitations of claim 1 are disclosed in the prior art and/or obvious to a POSITA

a. Limitation 1[pre]

Kremin discloses a stylus. Ex. 1009, ¶¶[0051]-[0052].

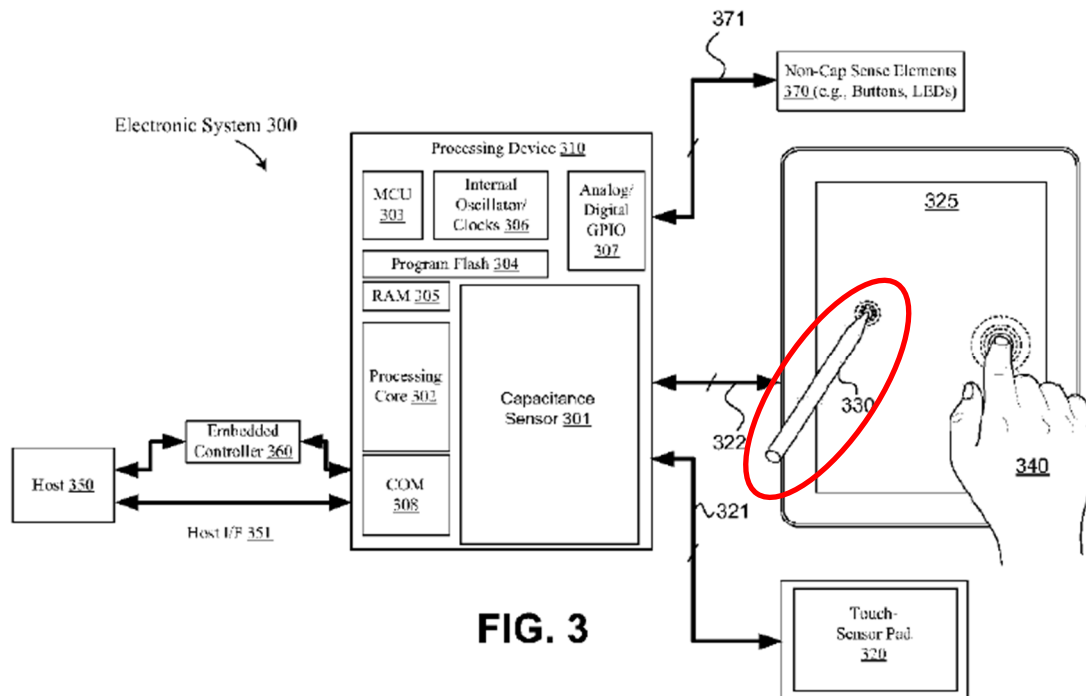


FIG. 3 of Kremin (annotated) (Ex. 1009)

b. Limitation 1[a]

Kremin discloses various sensors in a stylus, including sensors to capture force sense data, battery data, acceleration data, and button status data. Ex. 1009, Claims 1-4 & ¶¶[0105] & [0108]. Kremin also describes a passive or active force sensor and a motion sensor to detect motion of the stylus. *Id.* at claims 2-3, 11-13 & ¶[0109]. Kremin further discloses buttons from which pushes are detected, adding additional functionality, such as a “left click” and “right click” function. *Id.* at ¶¶[0105], [0108]. A POSITA would appreciate that a button (e.g., a capacitive button) is a kind of a sensor, which can output a value, such as a binary value. Ex. 1003, Appx. B1, limitation 1[a]. Kremin also discloses an embodiment wherein the

orientation or acceleration of the stylus may be detected by an accelerometer, which is a sensor. *Id.* at ¶[0109]. Kremin, therefore, discloses limitation 1[a]. Ex. 1003, Appx. B1, limitation 1[a].

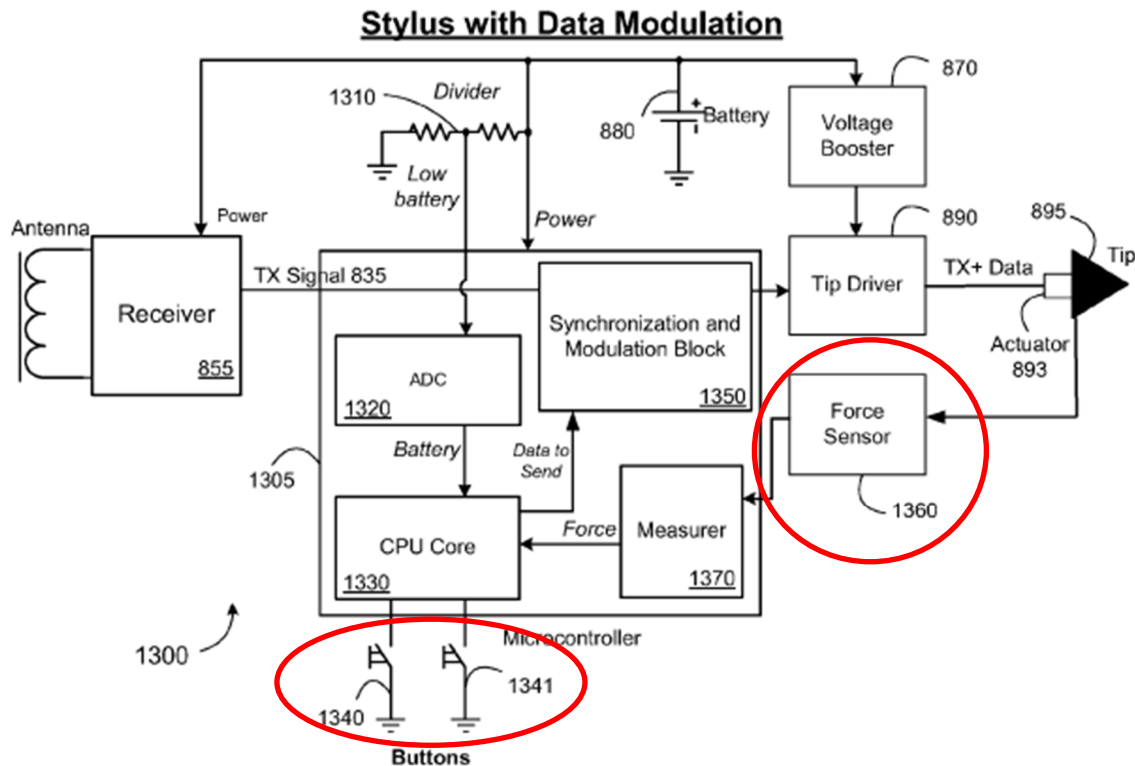


FIG. 13 of Kremin (annotated) (Ex. 1009)

c. Limitation 1[b]

The stylus of Kremin includes an electrode configured to communicate with a device by receiving signals from and transmitting signals to a touch sensor of the device, as in limitation 1[b]. Ex. 1003, Appx. B1, limitation 1[b]. The stylus of Kremin contains a stylus tip by which the stylus transmit signal is capacitively coupled to the capacitive sense array. Ex. 1009, claim 6, FIGs. 6B & 8, and

¶¶[0073]&[0085]. Capacitive coupling is a transfer of electric signals that inherently requires a pairing of electrodes. Ex. 1003, Appx. B1, limitation 1[b]; Ex. 1016, pp. 96 & 239; Ex. 1020. An electrode, as in limitation 1[b] is, therefore, at least inherently disclosed in Kremin. Additionally, electrodes had been known for decades before the '220 Patent, and it would have been obvious to a POSITA to include an electrode, as in limitation 1[b], in the stylus of Kremin to perform the capacitive coupling function, especially because this was the conventional way to provide this function. Ex. 1003, Appx. B1, limitation 1[b].

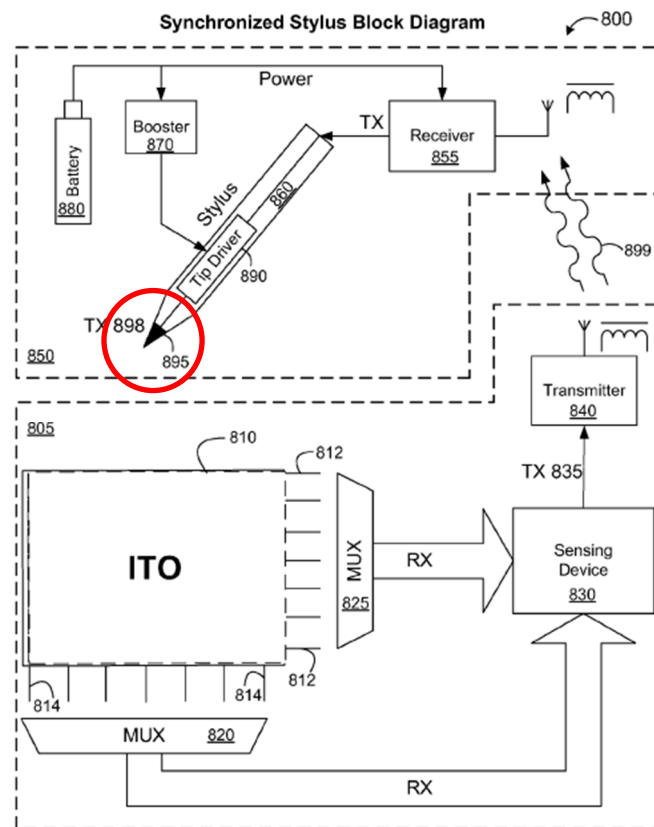


FIG. 8 of Kremin (annotated) (Ex. 1009)

Kremin further discloses that the stylus communicates with the device through an initial signal that goes through a transmitter and is sent to the stylus receiver; the tip driver of the stylus drives or amplifies the transmit signal, and the stylus tip capacitively couples the amplified stylus transmit signal to the device's touch sense array. Ex. 1009, ¶¶[0082]-[0085]. A POSITA would appreciate that the disclosed transmitter and receiver require the use of electrodes to transmit and receive electrical signals by nature. Ex. 1003, Appx. B1, limitation 1[b]. The below discussion of limitations 1[c2] and 1[c3] further illustrates that the stylus of Kremin includes an electrode for both transmitting and receiving signals. *Id.*

Kremin, therefore, discloses limitation 1[b]. *Id.*

d. Limitation 1[c]

Kremin discloses limitation 1[c]. Ex. 1003, Appx. B1, limitation 1[c]. Kremin discloses that embodiments can be implemented using instructions stored on a computer-readable medium. Ex. 1009, ¶[0140]. Additionally, components in the disclosed stylus would be understood as including or requiring computer-readable media, such as a microcontroller with a CPU. *Id.* at ¶¶[0104], [0107]-[0109]&[0139]; Ex. 1016, pp. 107 & 470. The CPU includes logic circuitry to execute programs and control the operation of the stylus, which includes processing input data from various sources (such as battery level, force, buttons, acceleration,

etc.) and transferring this data, as disclosed in Kremin. Ex. 1009, ¶¶[0111], [0105], [0106], [0108]&[0109].

e. Limitation 1[c1]

The CPU core of the stylus of Kremin is coupled with the force sensor and measurer, which processes the force signal or other signal to send it to the synch mod block to be converted to a signal. Ex. 1009, ¶[0109]. Kremin, therefore, discloses receiving sensor data from the force sensor. Ex. 1003, Appx. B1, limitation 1[c1]. The CPU core may also be coupled to the buttons (which may be capacitive sensors by definition as discussed above with reference to limitation 1[a]), and it processes the button input data. *Id.* As discussed with reference to limitation 1[a] above, Kremin discloses and claims multiple types of sensors in multiple embodiments, including the use of sensors to capture force sense data, battery data, acceleration data, and button status data. Ex. 1009, claims 1-4 and ¶¶[0105]&[0108].

f. Limitation 1[c2]

The stylus of Kremin is used to generate a high-voltage signal by amplifying a signal originating from the sensing device. Ex. 1003, Appx. B1, limitation 1[c2]. For example, Figure 8 of Kremin illustrates that the sensing device 830 generates a transmit signal 835, which is sent 899 to the stylus receiver 855 and amplified to a higher voltage signal 898 by the tip driver 890 via the voltage booster 870. Ex.

1009, ¶¶[0082]-[0085]. The high voltage signal is then capacitively coupled with the sensing device through the tip 895. *Id.* at ¶[0085]. The embodiment illustrated in Figure 11 similarly receives a signal generated by the sensing device. *Id.* at ¶[0098]; *see also id.* at ¶[0099]. The embodiment of Figure 13 also illustrates implementation of limitation 1[c2]. Ex. 1009, ¶¶[0103]-[0106] The stylus of Kremin, therefore, receives a first signal generated by the device. Ex. 1003, Appx. B1, limitation 1[c2].

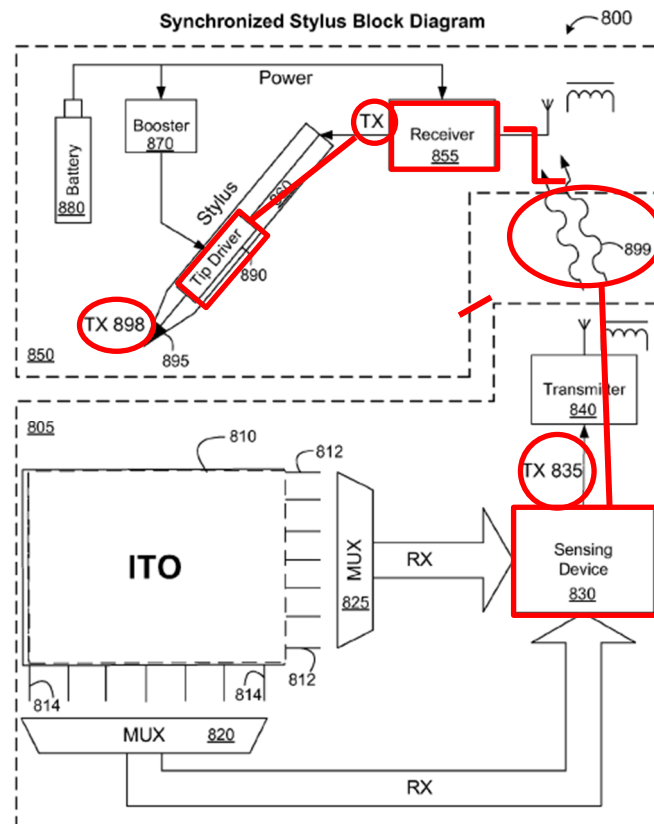
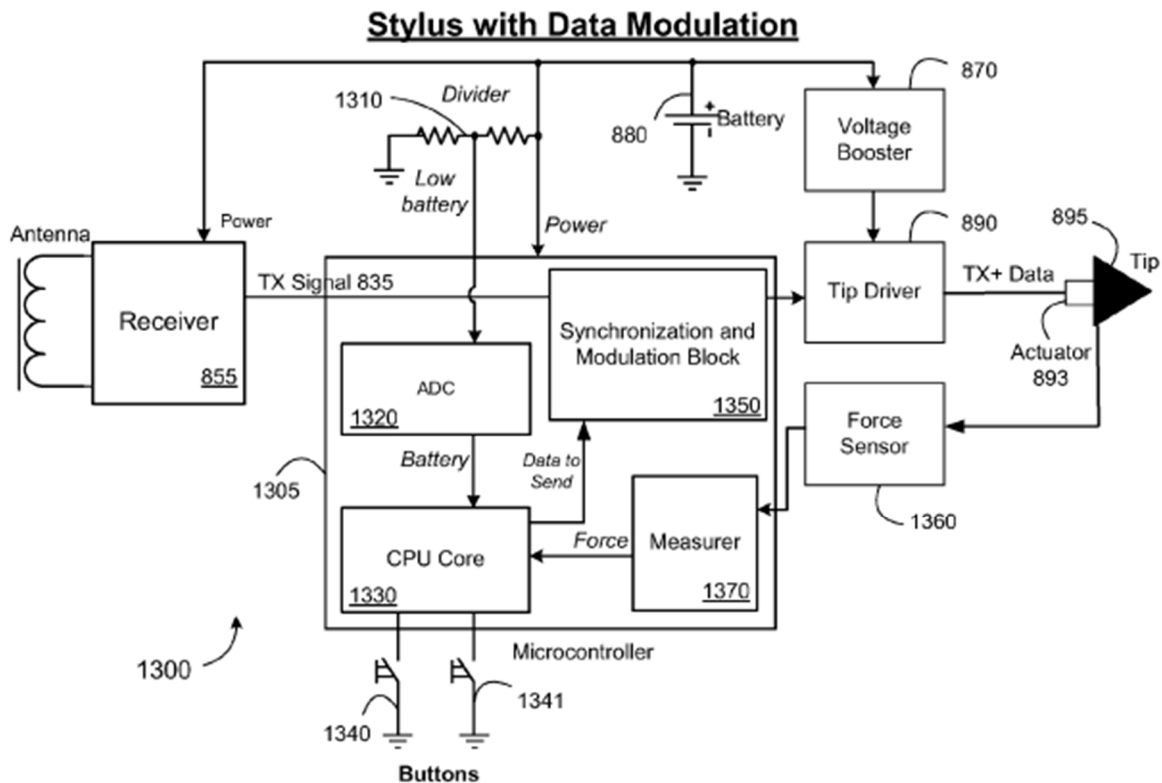


FIG. 8 of Kremin (annotated) (Ex. 1009)

g. Limitation 1[c3]

Kremin discloses limitation 1[c3]. Ex. 1003, Appx. B1, limitation 1[c3]. For example, FIG. 13 of Kremin illustrates an embodiment in which the stylus receives a signal from the sense device, and then it modulates data into the signal and transmits it to the sense device. *Id.* Specifically, this figure “is a block diagram illustrating one embodiment of a stylus 1300 for synchronizing and modulating additional data into a stylus transmit signal 898”. Ex. 1009, ¶[0104]; *see also id.* at ¶[0105]. While the description of Figure 13 does not explicitly use the term “carrier signal”, modulation by necessity involves the use of a carrier signal. Ex. 1003, Appx. B1, limitation 1[c3]. Other embodiments of Kremin similarly generate a signal by modulating a carrier signal based on sensor data. Ex. 1003, Appx. B1, limitation 1[c3]. Ex. 1009, ¶[0112]-[0114].



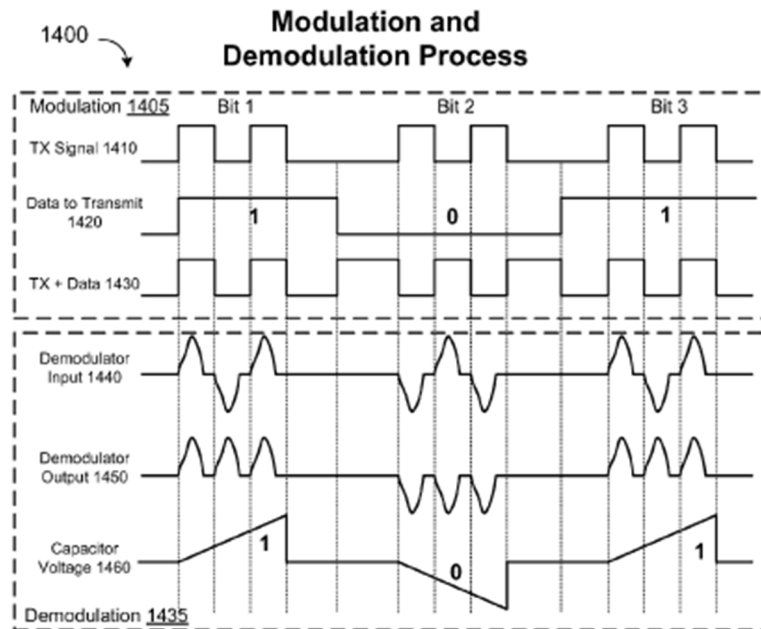
Additionally, Kremin further shows that limitation 1[c3] was already known in the prior art. Ex. 1003, Appx. B1, limitation 1[c3]. For example, Figures 1A and 1B and paragraphs [0008]-[0009] of Kremin illustrate modulation of a carrier signal, as does a provisional application incorporated by reference into Kremin. Ex. 1003, Appx. B1, limitation 1[c3]; Ex. 1017, p. 4.

h. Limitation 1[c4]

Kremin discloses limitation 1[c4]. Ex. 1003, Appx. B1, limitation 1[c4]. The stylus in Kremin receives a signal generated from the sensing device 830, and a synch mod block in the stylus is configured to modulate data into the carrier's TX

signal, which may include the sensor data. Ex. 1009, ¶¶[0085]&[0105]. The stylus then transmits the signal through the stylus tip to the capacitive sense array. *Id.* at claim 6 & ¶[0085]. This constitutes transmitting to the device, in response to the first signal, the second signal, as in limitation 1[c4].

Additionally, Figure 14 of Kremin illustrates a modulation and demodulation process on a data stream. *Id.* at ¶[0112]. The modulation process 1405 includes TX data signal 1410, data-to-transmit signal 1420, and TX+Data signal 1430. *Id.* The demodulation process 1435 includes demodulator input signal 1440, demodulator output signal 1450, and capacitor voltage 1460. *Id.* A modulated transmit signal 1430 is sent from the stylus, incorporating the transmit data signal 1410 embodied as the stylus's transmit data signal and additional data 1420 embodied as force, button, and other data from the stylus. *Id.* at ¶[0113]. The modulated signal 1430 combining the transmit signal and data signal is transmitted from the stylus to the device, either via capacitive coupling between the tip 895 and the device's sense array or through other wireless means from the stylus 850 to the sensing device 830. *Id.* The signal 1430 arrives at a demodulator block 1435. *Id.* ¶[0114]. The received signal may arrive to the device as current spikes 1440, which are demodulated into a signal 1450 that is further processed into decoded data corresponding to the additional data 1420 (e.g., sensor data). *Id.*

**FIG. 14 of Kremin (Ex. 1009)**

Kremin, therefore, discloses all of limitation 1[c4].

2. Claim 2

The stylus of Kremin implements the limitation “wherein the first signal is the carrier signal modulated to generate the second signal,” as in claim 2. Ex. 1003, Appx. B1, claim 2. FIG. 13 of Kremin illustrates that the stylus receives a signal from the sense device and modulates data into the signal and transmits the modulated signal to the sense device. *Id.*; Ex. 1009 ¶¶[0104]-[0105]; *see also* Ex. 1009, ¶¶[0112]-[0114]. A POSITA would appreciate that the disclosed modulation of Kremin is achieved by modifying the characteristic of the carrier signal received from

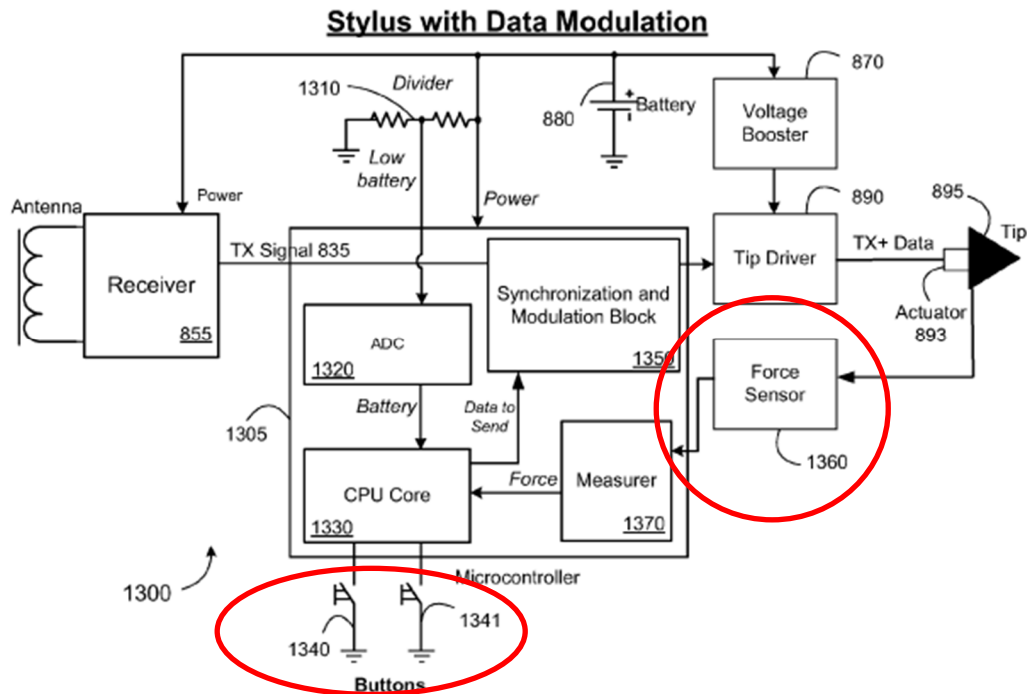
the sense device so that it varies with the instantaneous value of the data to be transmitted by the stylus. Ex. 1003, Appx. B1, claim 2; Ex. 1016, pp. 479-480.

3. **Claim 3**

The stylus of Kremin implements the limitations of claim 3. Ex. 1003, Appx. B1, claim 3. The synch mod block included in the stylus of Kremin performs a non-exhaustive list of modulation schemes, including frequency modulation, frequency-shift keying, amplitude modulation, amplitude-shift keying, on-off keying, pulse position modulation, phase modulation, Manchester encoding, direct sequence spread spectrum, or other modulation schemes that would be appreciated by a POSITA. Ex. 1009, ¶[0110]; *see also* Ex. 1016, p. 480 & Ex. 1018, p. 35. This covers all modulation schemes recited in claim 3.

4. **Claim 4**

The sensors disclosed in Kremin include a force sensor (which can be used to detect a pressure applied to the stylus) and buttons used to register “clicks.” Ex. 1003, Appx. B1, claim 4; Ex. 1009, ¶¶[0044]-[0045], [0105]&[0108]-[0109] and claims 1-4 & 11-13. Kremin, therefore, discloses “the one or more sensors comprise a pressure sensor and a button” and “the sensor data comprises pressure data and button state data,” as in claim 4.



5. Claim 5

Claim 5 recites “wherein the sensor data is digital,” and Kremin discloses multiple kinds of digital sensor data. Ex. 1003, Appx. B1, claim 5. For example, Kremin discloses operations to “quantitatively determine and digitize a force applied to the stylus tip” using a sensor. Ex. 1009, ¶[0109] & Claims 1-4. Furthermore, Kremin describes that the force sensor and the buttons are coupled to a CPU core (e.g., 1330 of FIG. 13 above), and a POSITA would appreciate that the CPU core must process data that is digital. *Id.* at ¶[0108]-[0109]; Ex. 1003, Appx. B1, claim 5.

6. Claim 7

Claim 1 is anticipated and obvious over Kremin for the reasons discussed below. All limitations of claim 1 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 7[pre]

Limitation 7[pre] is anticipated and obvious for the reasons discussed with reference to limitation 1[c] above.

b. Limitation 7[a]

Limitation 7[a] is anticipated and obvious for the reasons discussed with reference to limitations 1[b] and 1[c1] above.

c. Limitation 7[b]

Limitation 7[b] is anticipated and obvious for the reasons discussed with reference to limitation 1[c2] above.

d. Limitation 7[c]

Limitation 7[c] is anticipated and obvious for the reasons discussed with reference to limitation 1[c3] above.

e. Limitation 7[d]

Limitation 7[d] is anticipated and obvious for the reasons discussed with reference to limitation 1[c4] above.

7. **Claim 8**

Claim 8 is anticipated and obvious for the reasons discussed with reference to claim 2 above.

8. **Claim 9**

Claim 9 is anticipated and obvious for the reasons discussed with reference to claim 3 above.

9. **Claim 10**

Claim 10 is anticipated and obvious for the reasons discussed with reference to claim 4 above.

10. **Claim 11**

Claim 11 is anticipated and obvious for the reasons discussed with reference to claim 7 above.

11. **Claim 13**

Claim 13 is anticipated and obvious over Kremin for the reasons discussed below. All limitations of claim 13 are disclosed in the prior art and/or obvious to a POSITA.

a. **Limitation 13[pre]**

Kremin discloses a system. Ex. 1003, Appx. B1, limitation 13[pre]. For example, Figure 3 of Kremin illustrates an electronic system 300 having a processing

device 310, touch screen 325, and touch sensor pad 320 for detecting the presence of a touch object 340 and a stylus 330. Ex. 1009, ¶[0051].

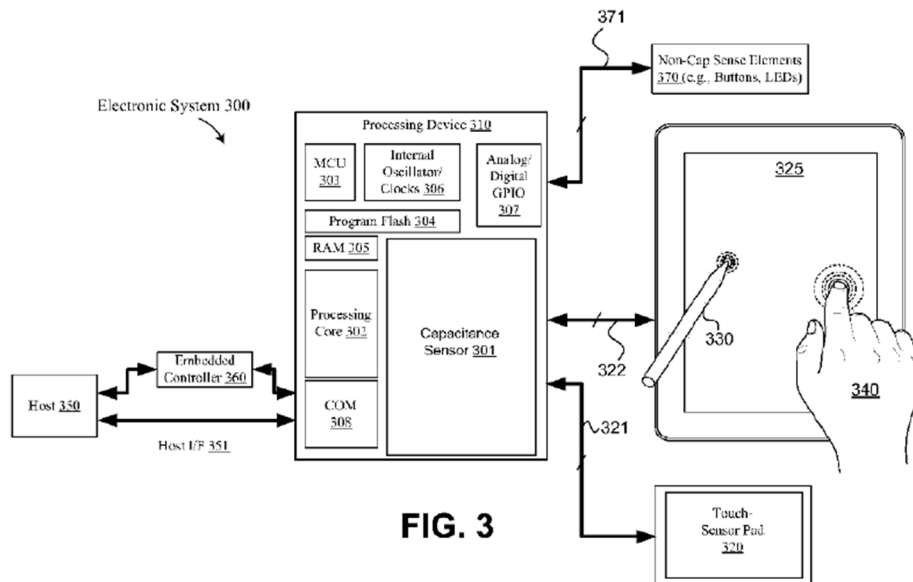


FIG. 3

FIG. 3 of Kremin (Ex. 1009)

b. Limitation 13[a]

Ex. 1003, Appx. B1, limitation 13[a].

c. Limitation 13[b]

Limitation 13[b] is anticipated and obvious for the same reasons discussed above with reference to limitation 1[pre].

d. Limitation 13[b1]

Limitation 13[b1] is anticipated and obvious for the same reasons discussed above with reference to limitation 1[a].

e. Limitation 13[b2]

Limitation 13[b2] is anticipated and obvious for the same reasons discussed above with reference to limitation 1[b].

f. Limitation 13[b3]

Limitation 13[b3] is anticipated and obvious for the same reasons discussed above with reference to limitation 1[c].

g. Limitation 13[b3A]

Limitation 13[b3A] is anticipated and obvious for the same reasons discussed above with reference to limitation 1[c1].

h. Limitation 13[b3B]

Limitation 13[b3B] is anticipated and obvious for the same reasons discussed above with reference to limitation 1[c2].

i. Limitation 13[b3C]

Limitation 13[b3C] is anticipated and obvious for the same reasons discussed above with reference to limitation 1[c3].

j. Limitation 13[b3D]

Limitation 13[b3D] is anticipated and obvious for the same reasons discussed above with reference to limitation 1[c4].

12. **Claim 14**

Claim 14 is anticipated and obvious for the same reasons discussed above with reference to claim 2.

13. **Claim 15**

Claim 15 is anticipated and obvious for the same reasons discussed above with reference to claim 3.

14. **Claim 16**

Claim 16 is anticipated and obvious for the same reasons discussed above with reference to claim 4.

15. **Claim 17**

Claim 17 is anticipated and obvious for the same reasons discussed above with reference to claim 5.

F. Ground 6: The Challenged Claims are anticipated and obvious over Kremin in view of Harley.

The Challenged Claims are further obvious over Kremin in view of Harley. *See* Ex. 1003, ¶98. Petitioner demonstrates obviousness of the Challenged Claims by adopting the claim mapping set forth *supra* at pages i-iii and in the Declaration of Nabil J. Sarhan, Ph.D. *See* Ex. 1003. Petitioner cites and incorporates Dr. Sarhan's more fulsome analysis of the Challenged Claims found at Appendix B2 of Ex. 1003, portions of which are excerpted and summarized below. For the sake of efficiency,

discussion of the disclosure of Kremin will not be duplicated below, and the Board can refer to Section VII(E) above regarding the disclosure of Kremin. Additionally, the relevant disclosure regarding Harley can be found at Section VII(C) above.

1. **Motivation to Combine Kremin and Kaneko**

As discussed in Dr. Sarhan's more fulsome analysis at Appendix B2 of Exhibit 1003, Kremin and Harley describe similar technologies and address similar problems. Both describe styluses used to communicate with a touch sensor of a device, and both use capacitive coupling, synchronization, and modulation/demodulation. Ex. 1003, Appx. B2. Kremin discloses a stylus for synchronizing and modulating data into a stylus transmit signal. Ex. 1009, ¶[0104]. The data to be modulated and transmitted may include, for example, data received from a force sensor. *Id.* at ¶¶[0104]&[0109]. A synch mod block modulates the data using various modulation techniques. *Id.* at ¶[0110].

Similarly, Harley describes a stylus that can act as a drive and/or sense element in a capacitive touch system. Ex. 1021 at 1:5-7. The stylus of Harley includes an electrode at its tip and powered circuitry coupled to the electrode and configured for capacitively coupling the electrode with a capacitive touch sensor panel. Ex. 1021 at Abstract. The powered circuitry can include drive circuitry configured to output a drive voltage at the electrode and/or sense circuitry configured

to sense a voltage received at the electrode. *Id.*

A POSITA would have been motivated to modify the technology of Kremin based on Harley for one or more obvious benefits, such as implementing a simplified design and saving costs. Ex. 1003, Appx. B2. While the stylus of Kremin uses capacitive coupling for sending data to the touch sensor/host, Kremin discloses inductive coupling to send data from the touch sensor/host to the stylus. *Id.* By contrast, Harley uses capacitive coupling for both sending and receiving data. *Id.* A POSITA would modify the stylus of Kremin to use capacitive coupling for both sending and receiving signals, and this modification would result in a simpler and less costly implementation. *Id.*

2. **Claim 1**

Claim 1 is obvious over Kremin in view of Harley for the reasons discussed below. All limitations of claim 1 are disclosed in the prior art and/or obvious to a POSITA.

a. **Limitation 1[b]**

Even if limitation 1[b] were not disclosed in Kremin, this limitation is further disclosed in Harley for the reasons discussed in Section VII(C) above. This limitation is therefore obvious in view of Kremin and Harley. Ex. 1003, Appx. B2, limitation 1[b].

3. Claim 7

Claim 7 is obvious over Kremin and Harley for the reasons discussed below.

All limitations of claim 7 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 7[a]

Features of limitation 7[a] are disclosed in Harley for the reasons discussed above with reference to limitation 1[b].

4. Claim 13

Claim 13 is obvious over Kremin in view of Harley for the reasons discussed below. All limitations of claim 13 are disclosed in the prior art and/or obvious to a POSITA.

a. Limitation 13[b2]

Limitation 13[b2] is disclosed in Harley for the reasons discussed above with reference to limitation 1[b].

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 '220 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 '220 Patent.

Dated: September 17, 2025

Respectfully submitted,

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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. 9,280,220 totals 13,156 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: September 17, 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 September 17, 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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