

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. 9,977,519

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Inventors: Jeff Lukanc et al.

Title: ACTIVE PEN WITH BIDIRECTIONAL COMMUNICATION

Inter Partes Review No. IPR2025-01533

PETITION FOR *INTER PARTES* REVIEW OF U.S. PAT. NO. 9,977,519

LISTING OF CHALLENGED CLAIMS

Limitation¹	Claim 1
1[pre]	A processing system for an input device, the processing system comprising:
1[a]	a sensor module coupled to sensor circuitry and configured to:
1[b]	initiate a current beacon period comprising a plurality of timeslots by broadcasting, to a plurality of active pens comprising a first active pen, a current beacon signal comprising an upstream packet for the first active pen and specifying a pen identification (ID) associated with the first active pen;
1[c]	receive, during a first timeslot, a first downstream packet from a first active pen transceiver of the first active pen; and
1[d]	receive, during a second timeslot, a second downstream packet from a second active pen transceiver; and
1[e]	a determination module configured to:
1[f]	generate the upstream packet for the first active pen specifying the pen ID; and
1[g]	determine an attribute of the first active pen comprising the first active pen transceiver from at least the first downstream packet.
Limitation	Claim 2
2[pre]	The processing system of claim 1,
2[a]	wherein the first active pen further comprises the second active pen transceiver, and
2[b]	wherein the attribute of the first active pen is further determined from the second downstream packet.
Limitation	Claim 3
3[pre]	The processing system of claim 1,
3[a]	wherein the attribute is at least one selected from a group consisting of pen tilt, color, and erasure mode.

¹ Petitioner refers to claim limitations throughout this petition in the manner shown here (*e.g.*, 1[a] will always refer to “a sensor module coupled to sensor circuitry and configured to” as recited in claim 1.)

Limitation	Claim 4
4[pre]	The processing system of claim 1, wherein the determination module is further configured to:
4[a]	determine an attribute of a second active pen comprising the second active pen transceiver from the second downstream packet.
Limitation	Claim 6
6[pre]	The processing system of claim 4, wherein the determination module is further configured to:
6[a]	detect a collision between the first active pen and the second active pen; and
6[b]	generate a collision packet for the first active pen and the second active pen,
6[c]	wherein the sensor module is further configured to send the collision packet, and
6[d]	wherein each of the first active pen and the second active pen wait a random time interval before reattempting to pair in response to the collision packet.
Limitation	Claim 7
7[pre]	The processing system of claim 1,
7[a]	wherein the attribute of the first active pen is at least one selected from a group consisting of a force measurement at a tip of the first active pen
7[b]	and a button status of a button on the first active pen.
Limitation	Claim 9
9[pre]	The processing system of claim 1,
9[a]	wherein the first downstream packet is transmitted using a first frequency
9[b]	and the second downstream packet is transmitted using a second frequency.
Limitation	Claim 10
10[pre]	The processing system of claim 9, wherein:
10[a]	the sensor module is further configured to:
10[b]	initiate a prior beacon period by broadcasting a prior beacon; and
10[c]	receive, during a timeslot of the prior beacon period, an acknowledgement from the first active pen in response to the prior beacon,

10[d]	wherein the first active pen is unpaired during a portion of the prior beacon period,
10[e]	wherein the upstream packet is generated in response to the acknowledgement, and
10[f]	wherein the upstream packet further specifies the first timeslot and the first frequency.
Limitation	Claim 12
12[pre]	A method for operating a processing system of an input device, comprising:
12[a]	generating an upstream packet for a first active pen specifying a pen identification (ID) associated with the first active pen;
12[b]	initiating a current beacon period comprising a plurality of timeslots by broadcasting, to a plurality of active pens comprising the first active pen, a current beacon signal comprising the upstream packet;
12[c]	receiving, during a first timeslot, a first downstream packet from a first active pen transceiver over a first frequency;
12[d]	receiving, during a second timeslot, a second downstream packet from a second active pen transceiver over a second frequency; and
12[e]	determining an attribute of the first active pen comprising the first active pen transceiver from at least the first downstream packet.
Limitation	Claim 13
13[pre]	The method of claim 12,
13[a]	wherein the first active pen further comprises the second active pen transceiver, and
13[b]	wherein the attribute of the first active pen is further determined from the second downstream packet.
Limitation	Claim 14
14[pre]	The method of claim 12, further comprising:
14[a]	determining an attribute of a second active pen comprising the second active pen transceiver from the second downstream packet.
Limitation	Claim 16
16[pre]	The method claim 14, further comprising:
16[a]	detecting a collision between the first active pen and the second active pen; and
16[b]	sending a collision packet for the first active pen and the second active pen,

16[c]	wherein each of the first active pen and the second active pen wait a random time interval before reattempting to pair in response to the collision packet.
Limitation	Claim 17
17[pre]	The method of claim 12,
17[a]	wherein the attribute of the first active pen is at least one selected from a group consisting of a force measurement at a tip of the first active pen and a button status of a button on the first active pen.
Limitation	Claim 19
19[pre]	The method of claim 12, further comprising:
19[a]	initiating, before initiating the current beacon period, a prior beacon period by broadcasting a prior beacon signal;
19[b]	receiving, during a timeslot of the prior beacon period, an acknowledgement from the first active pen in response to the prior beacon,
19[c]	wherein the first active pen is unpaired during at least a portion of the prior beacon period,
19[d]	wherein the upstream packet is generated in response to the acknowledgment, and
19[e]	wherein the upstream packet further specifies the first timeslot and the first frequency.
Limitation	Claim 20
20[pre]	An active pen, comprising:
20[a]	an identification (ID) register storing a pen identification (ID);
20[b]	a button; and
20[c]	a transceiver configured to:
20[d]	receive, from a first input device, a current beacon signal comprising an upstream packet specifying the pen ID, a timeslot, and a frequency,
20[e]	wherein the current beacon signal initiates a current beacon period comprising a plurality of timeslots; and
20[f]	transmit, to the first input device and during the timeslot specified in the upstream packet, a downstream packet comprising a status of the button using the frequency specified in the upstream packet.

Limitation	Claim 21
21[pre]	The active pen of claim 20, wherein the transceiver is further configured to:
21[a]	receive, before receiving the current beacon signal, a prior beacon from the first input device,
21[b]	wherein the prior beacon signal initiates a prior beacon period, and
21[c]	wherein the active pen is unpaired for at least a portion of the prior beacon period; and
21[d]	send, in response to the prior beacon, an acknowledgment to trigger pairing with the first input device.
Limitation	Claim 22
22[pre]	The active pen of claim 21, wherein the transceiver is further configured to:
22[a]	receive, from the first input device, a collision packet;
22[b]	wait a random time interval in response to the collision packet; and
22[c]	re-attempt pairing with the first input device after the random time interval.
Limitation	Claim 23
23[pre]	The active pen, of claim 21, further comprising:
23[a]	a determination module configured to:
23[b]	detect a missing beacon from the first input device; and
23[c]	set the ID register to zero in response to the missing beacon to unpair the active pen.
Limitation	Claim 24
24[pre]	The active pen of claim 20, wherein the transceiver is further configured to:
24[a]	receive, from the first input device, a user ID of a user;
24[b]	send the user ID to a second input device during a pairing of the second input device.

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EXHIBITS

Exhibit	Reference
1001	U.S. Patent No. 9,977,519 (“’519 Patent”)
1002	Prosecution History of ’519 Patent
1003	Declaration of Ricardo Valerdi, Ph.D.
1004	Curriculum Vitae of Ricardo Valerdi, Ph.D.
1005	U.S. Patent No. 9,606,680 (“Sundara-Rajan”)
1006	U.S. Patent Application Publication 2013/0207926 (“Kremin’926”)
1007	U.S. Patent Application Publication 2012/0105361 (“Kremin’361”)
1008	U.S. Patent Application Publication 2013/0157690 (“Lefevre”)
1009	U.S. Patent No. 9,703,433 (“Chandran”)
1010	From touch displays to the Surface: A brief history of touchscreen technology, <i>Ars Technica</i> , April 4, 2013, https://arstechnica.com/gadgets/2013/04/from-touch-displays-to-the-surface-a-brief-history-of-touchscreen-technology/
1011	Johnson, E.A., <i>Touch display—a novel input/output device for computers</i> . <i>Electronics Letters</i> , 1(8), 219-220 (1965).
1012	HTC Flyer review, first look, https://web.archive.org/web/20110216170350/http://www.pcpro.co.uk/blogs/2011/02/15/htc-flyer-review-first-look/
1013	HTC Scribe will change the way you use tablets, https://www.techradar.com/news/mobile-computing/htc-scribe-will-change-the-way-you-use-tablets-955427
1014	IEEE Standard 802.1D dated June 2004
1015	IEEE Standard 802.1ag dated December 2007
1016	IEEE 802.3ah Standard dated September 2004
1017	Excerpted copy of IEEE 100 The Authoritative Dictionary of IEEE Standards Terms, Seventh Edition, published December 2000
1018	Appendix A to the Declaration of Ricardo Valerdi, Ph.D.
1019	Appendix B to the Declaration of Ricardo Valerdi, Ph.D.
1020	Appendix C to the Declaration of Ricardo Valerdi, Ph.D.

I. INTRODUCTION

Shenzhen Qianfenyi Intelligent Technology Co., Ltd. (“Petitioner”) petitions for IPR of claims 1-4, 6, 7, 9, 10, 12-14, 16, 17, and 19-24 (“Challenged Claims”) of the ’519 Patent issued to Synaptics Incorporated and later assigned to Wacom Co. Ltd. (“Patent Owner”). Ex. 1001.

II. REQUIREMENTS FOR IPR

A. Standing

The ’519 Patent is available for IPR. Petitioner is not barred or estopped from requesting IPR of the Challenged Claims.

B. Fee for IPR

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

C. Relief Requested

Petitioner requests IPR of the Challenged Claims on the grounds below:

Ground	Challenged Claims	Basis for Rejection
1	1-4, 7, 9, 10, 12-14, 17, 19-21, 23, and 24	35 U.S.C. §102/103: Sundara-Rajan
2	1, 2, 4, 7, 12-14, 17, 19, 21, and 24	35 U.S.C. §103: Sundara-Rajan/Kremin’926
3	1, 4, 6, 12, 14, 16, and 20-22	35 U.S.C. §103: Kremin’361/Sundara-Rajan
4	1-4, 6, 7, 9, 10, 12-14, 16, 17, and 19-24	35 U.S.C. §103: Lefevre/Chandran

The '519 Patent claims the benefit of U.S. Provisional Application No. 62/120,856 (filed February 25, 2015). Ex. 1001.

Sundara-Rajan (filed June 12, 2014; issued March 28, 2017) (Ex. 1005) and Chandran (filed August 18, 2014; issued July 11, 2017) (Ex. 1009) are prior art, specifically, patents issued under 35 U.S.C. §151 naming another inventor and effectively filed before the '519 Patent's effective filing date. 35 U.S.C. §102(a)(2).

Kremin'926 (published August 15, 2013) (Ex. 1006), Kremin'361 (published May 3, 2012) (Ex. 1007), and Lefevre (published June 20, 2013) (Ex. 1008) are prior art printed publications, specifically patent applications published before the '519 Patent's effective filing date. 35 U.S.C. §102(a)(1).

None of these references were cited during prosecution of the '519 Patent. *See* Ex. 1002.

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 '519 Patent, among others. That action is Case No. 2:24-cv-702

in the United States District Court for the Eastern District of Texas, Marshall Division. The complaint in that action was served on October 17, 2024. Dkt. 10. This petition is filed less than one year from the date of service. 35 U.S.C. §315(b).

III. BACKGROUND AND OVERVIEW OF THE '519 PATENT

A. Prior Art Background

The '519 Patent Background explains, “[i]nput devices including proximity sensor devices (also commonly called touchpads or touch sensor devices) are widely used in a variety of electronic systems” and thus were known in the prior art. Ex. 1001, 1:25-27. A “proximity sensor device determines the presence, location and/or motion of one or more input objects” such as “styli or pens.” *Id.* 1:27-31, 39. The Background further explains proximity sensor devices were “often used in smaller computing systems (such as touch screens integrated in cellular phones)” before the '519 Patent. *Id.* 1:32-38; Ex. 1003, ¶71.

B. Description

The '519 Patent describes a purported invention in the field of input objects (such as styluses, pens, or fingers) used with an input or touch sensor device. The '519 Patent is specifically directed to a processing system for an input device, which facilitates communication with a plurality of active pens through bidirectional communication. Ex. 1003, ¶27; Ex. 1001, 7:12-23, 8:25-9:6, 10:21-36, 10:52-11:10. The touch sensor device utilizes any known sensor technology (such as capacitive) to detect user input. Ex. 1001, 3:48-54.

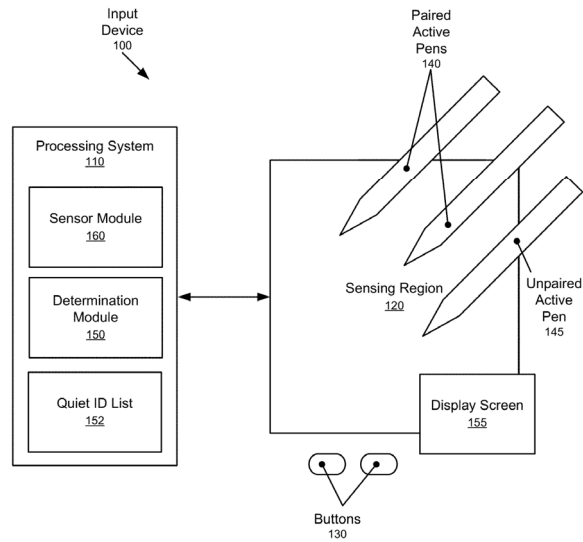


FIG. 1

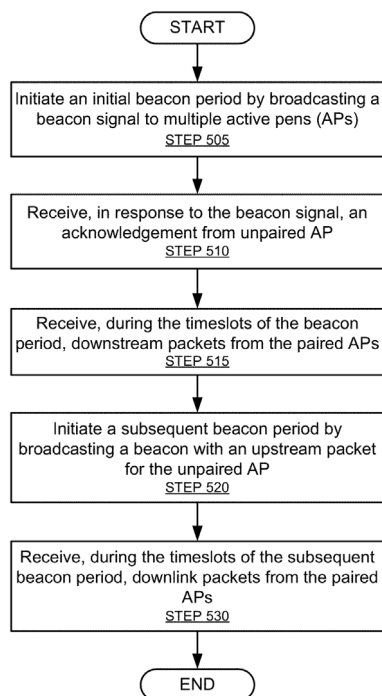


FIG. 5 (pairing a pen to the input device)

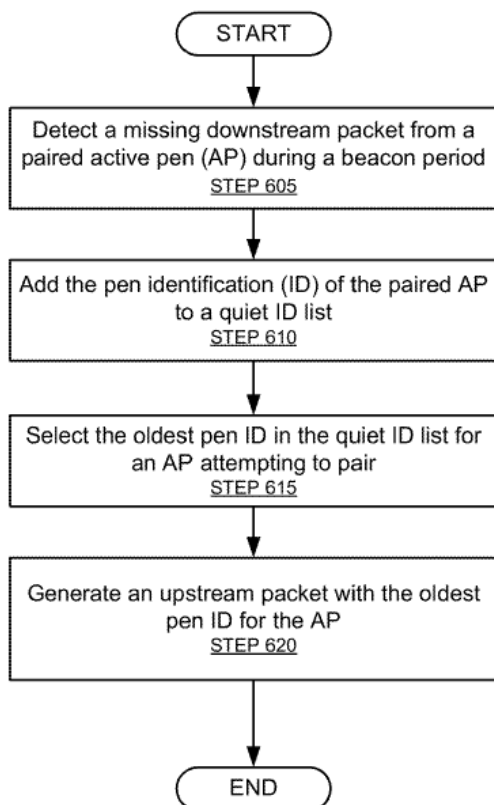


FIG. 6 (process for input device to manage pen IDs)

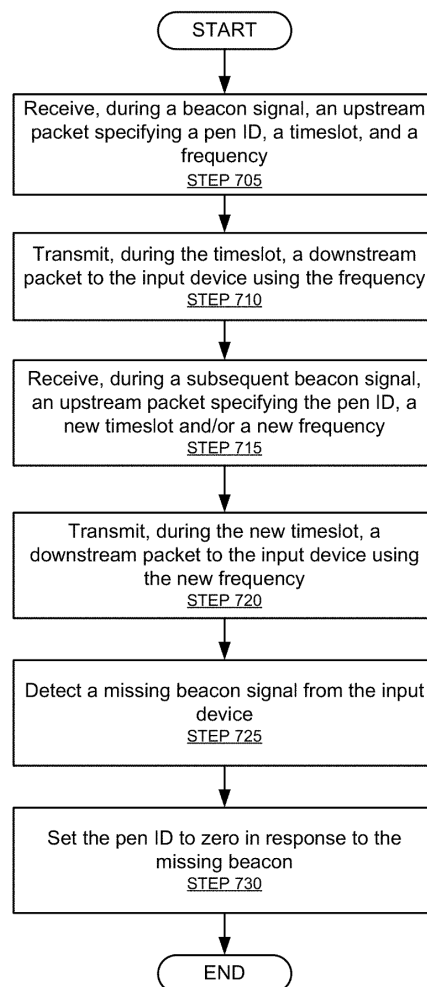


FIG. 7 (process for operating a pen)

In the context of the '519 Patent, “upstream” communication refers to signals originating from the processing system to the pen (“upstream packet”), while “downstream” refers to responses sent from the pen (“downstream packet”). *Id.* 8:3-6.

C. Prosecution History Summary

The patent application that issued as the '519 Patent was filed on February 19, 2016. Ex. 1001. The Examiner issued one Non-Final Office Action (“NFOA”). The

NFOA rejected or objected to all claims. Claims 1, 3-5, 8, 13, 15-16 and 22 were rejected as being anticipated. Ex. 1002, 60-63. The remaining claims “would be allowable if rewritten [to include] the limitations of the base claim and any intervening claims.” *Id.* 63. The applicant cancelled claims 6 and 17 and independent claims 1 and 13 were amended to include the subject matter of these cancelled claims. *Id.* 39-47. Claims 7, 9, and 19 were also amended. *Id.* Claims 1-5, 7-16 and 18-26 were thereafter allowed as amended. *Id.* 12.

IV. PERSON HAVING ORDINARY SKILL IN THE ART (“POSITA”)

As of February 25, 2015, a POSITA relevant to the ’519 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. Ex. 1003, ¶40.

V. CLAIM CONSTRUCTION

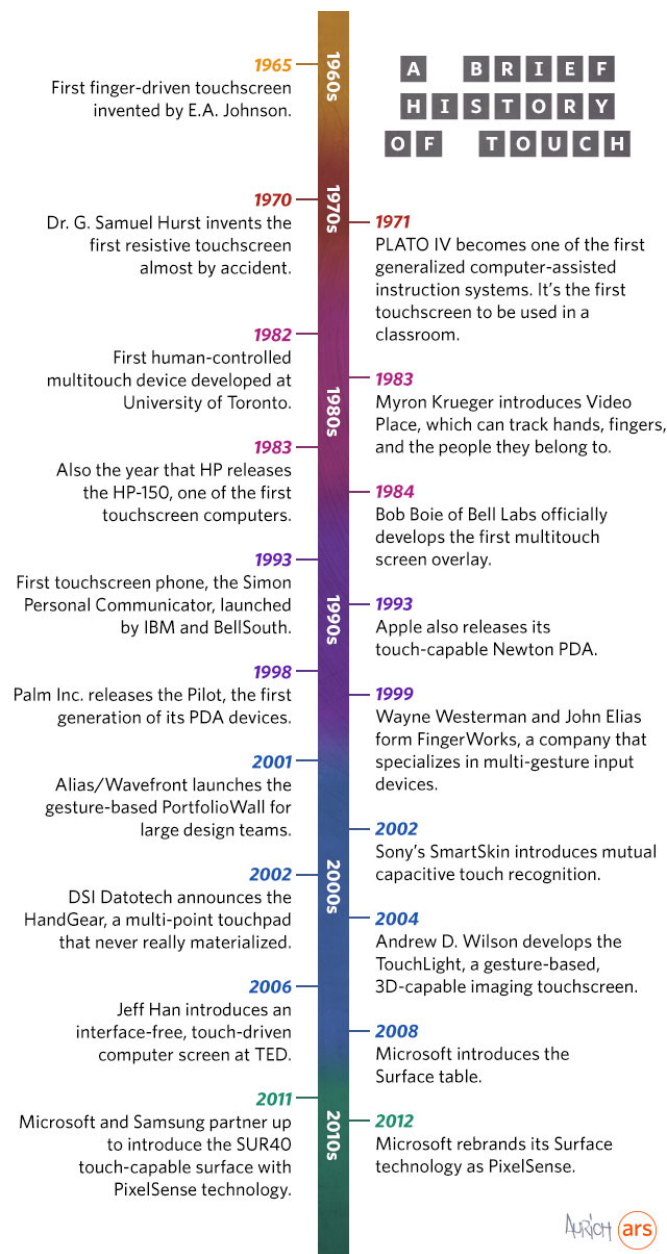
Petitioner submits that no formal claim constructions are necessary. Petitioner reserves the right to respond to any constructions offered by Patent Owner or adopted by the Board. Petitioner is not conceding that each Challenged Claim satisfies all statutory requirements, nor is Petitioner waiving any arguments concerning claim scope or grounds that can only be raised in district court.

VI. CHALLENGED CLAIMS ARE UNPATENTABLE

All Challenged Claims of the '519 Patent are unpatentable; they merely recite limitations known in the art as of the priority date of the '519 Patent.

A. Conventional Knowledge of a POSITA

As of the priority date of the '519 Patent (February 2015), a POSITA knew a wide variety of techniques and components for implementing a stylus for use with a touch-sensitive device, including capacitive and resistive technologies. Ex. 1003, ¶¶69; Ex. 1010; Ex. 1011 (1965 “Touch Display” study). Many companies made advances in touchscreen technology before the filing of the '519 Patent:



Ex. 1010, 1-2; Ex. 1003, ¶70.

Moreover, as of February 2015, a POSITA would have been familiar with active styluses that have their own power source and communicate richer information to a touchscreen device, such as switch data, pressure data, and orientation information. Ex. 1003, ¶71; Ex. 1010, 5. A contemporaneous example is the HTC

Scribe, a pressure-sensitive stylus that offered highlighting and erasing functionality using buttons. Ex. 1012, 1-2; Ex. 1013, 1-2; Ex. 1003, ¶71. Other examples include active styluses disclosed in the prior art references discussed herein.

In electronic device communications, standards have been established to ensure interoperability so that different devices are able to effectively communicate with each other. Ex. 1003, ¶73. For example, IETF and IEEE have standards for communications between electronic devices, and ITU-T and ISO have also developed international telecommunications standards. *Id.* ¶74. A POSITA would be familiar with those standards through university coursework in electrical or computer engineering, research endeavors in communications technology, and/or other work in industry. *Id.*

Technical standards in device communications are relevant background knowledge for a POSITA because the scope of the claims in the '519 Patent include, for example, “sending data,” Ex. 1001, 3:20, transmission of “downstream packets,” *Id.*, 11:58, a “beacon signal” using “(CDMA) (DSSS) format,” *Id.* 8:31-32, and pens that “send an ACK” *Id.* 12:21. Ex. 1003, ¶75. In considering the state of the art, the following standards are particularly relevant. Ex. 1003, ¶76.

IEEE 802.1D-Media Access Control (MAC) (2004) defines how network bridges operate to interconnect multiple local area networks (LANs). *Id.* ¶77. A key

function is maintaining a Forwarding Database or Filtering Database, which is a table of MAC addresses. Ex. 1014, 5. This is the same concept as the “identification register” in Claim 20[a] of the ’519 Patent. Ex. 1003, ¶77. In the IEEE 802.1D standard, a MAC address is defined as a unique identifier assigned to electronic devices for communication within a network. *Id.*; Ex. 1014, 49. This is the same concept as the “pen identification” in Claim 20[a]. Ex. 1003, ¶77.

IEEE 802.1ag, Connectivity Fault Management (CFM) (2007), employs Continuity Check Messages (“CCMs”) for connectivity monitoring. *Id.* ¶78. CCMs are periodic messages sent to ensure that the network path between endpoints remains operational. *Id.* CCMs are sent at regular intervals for continuous monitoring of electronics devices. *Id.*; Ex. 1015, 5. This is the same concept as the “current beacon signal” in Claim 20[d]. Ex. 1003, ¶78.

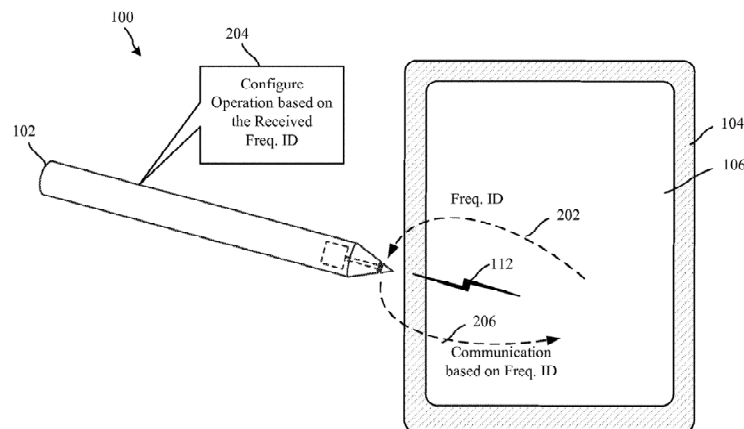
IEEE 802.3ah, collision detection, (2004) describes packet transmission in networks. *Id.* ¶79. This standard ensures reliable and efficient data transmission across wired networks using technologies like CSMA/CD (Carrier Sense Multiple Access with Collision Detection) to manage data flow and avoid collisions. *Id.* Specifically, “to avoid data collisions and increase the efficiency of the subscriber access network, ONU’s transmissions are arbitrated.” *Id.*; Ex. 1016, 421. This is the same concept as the “receive, from the first input device, a collision packet” in Claim 22[a]. Ex. 1003, ¶79.

B. Summary of Prior Art

1. Sundara-Rajan (Ex. 1005)

Sundara-Rajan teaches an active capacitive stylus that communicates with a computing device through a capacitive link. Ex. 1005, 3:33-36. The stylus detects changes in the electric field generated by the computing device and adjusts frequency and encoding scheme based on received signals. *Id.* 3:33-4:36, Fig. 2:

FIG. 2



Sundara-Rajan discloses the stylus “may create an output sequence to be transmitted to the computing device based on the encoding scheme (i.e., FSK, BPSK or ASK), output pressure levels of the pressure sensor, buttons, and other components of the stylus device.” *Id.* 17:36-17:44.

2. Kremin’926 (Ex. 1006)

Kremin’926 teaches a system for synchronizing a stylus with a capacitive sense array. Ex. 1006, ¶0018, Fig. 1:

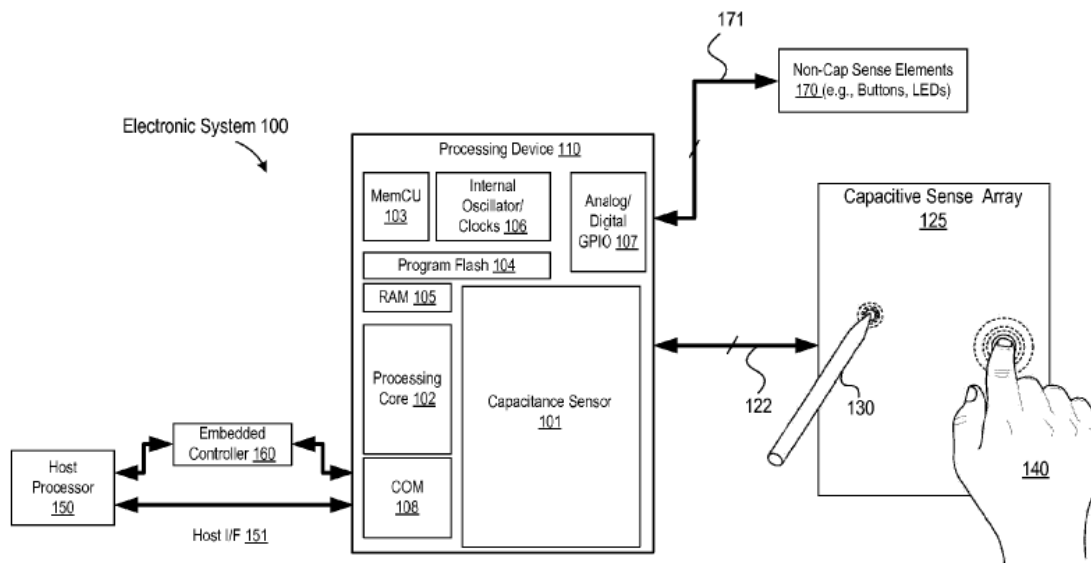
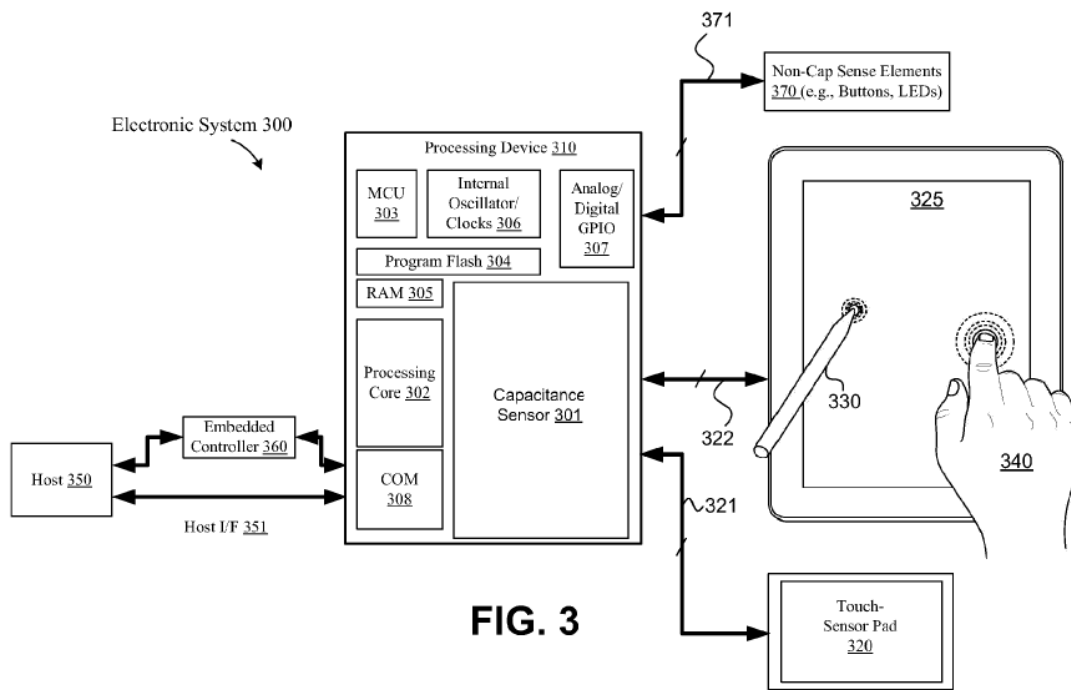


FIG. 1

The system transmits a synchronization signal from the capacitive sense array to the stylus using capacitive coupling, allowing the stylus to adjust its timing based on the received signal. *Id.* ¶0062. The synchronization signal and a host transmit (TX) signal may be transmitted at different frequencies or simultaneously, enabling accurate stylus tracking and reduced interference. *Id.* ¶0035. This approach improves communication accuracy and enables simultaneous use of stylus and touch inputs on the same capacitive sense array. *Id.*

3. Kremin'361 (Ex. 1007)

Kremin'361 describes a capacitive stylus system that communicates wirelessly with a capacitive touch sensor array to enable precise stylus tracking. Ex. 1007, ¶¶0052.



The stylus transmits a signal via capacitive coupling, which is received by the touch sensor array and processed to determine the stylus location. *Id.* ¶¶0099. The stylus also modulates additional data (e.g., force, button status, battery level, acceleration) into its transmit signal using amplitude shift keying (ASK), enhancing interaction capabilities. *Id.* ¶¶0007, 0048, 0089, 0105, 0107. A synchronization mechanism aligns the stylus and touch array timing, ensuring accurate position detection without

interfering with finger input. *Id.* ¶¶0009, 0067, 0071, 0078. This system supports simultaneous stylus and finger use and enables features like hover detection while lowering cost and complexity by removing separate inductive hardware. *Id.* ¶¶0078, 0099.

4. Lefevre (Ex. 1008)

Lefevre discloses a system and method for interfacing multiple mobile elements with a computer system in real time by tracking their position and orientation using electromagnetic fields. Each mobile element includes at least one localization module that can be sequentially activated to emit a signal detectable by a detection surface, enabling precise position determination. Ex. 1008, ¶¶0010-0014, 0050-0055. The system supports position and orientation tracking by equipping mobile elements with multiple localization modules, and it can manage the activation of these modules based on their presence on the detection surface. *Id.* ¶¶0022-0023, 0150-0153. The localization modules are wirelessly activated and powered through internal batteries or inductive power, ensuring low latency and scalability. *Id.* ¶¶0027-0035, 0129-0131. The system can use analog or digital identification techniques for module activation, allowing for flexible and efficient interaction with the computer system *Id.* ¶¶0147-¶0148.

5. Chandran (Ex. 1009)

Chandran describes a bidirectional communication system between a capacitive touchscreen and an active stylus. Ex. 1009, Fig. 1:

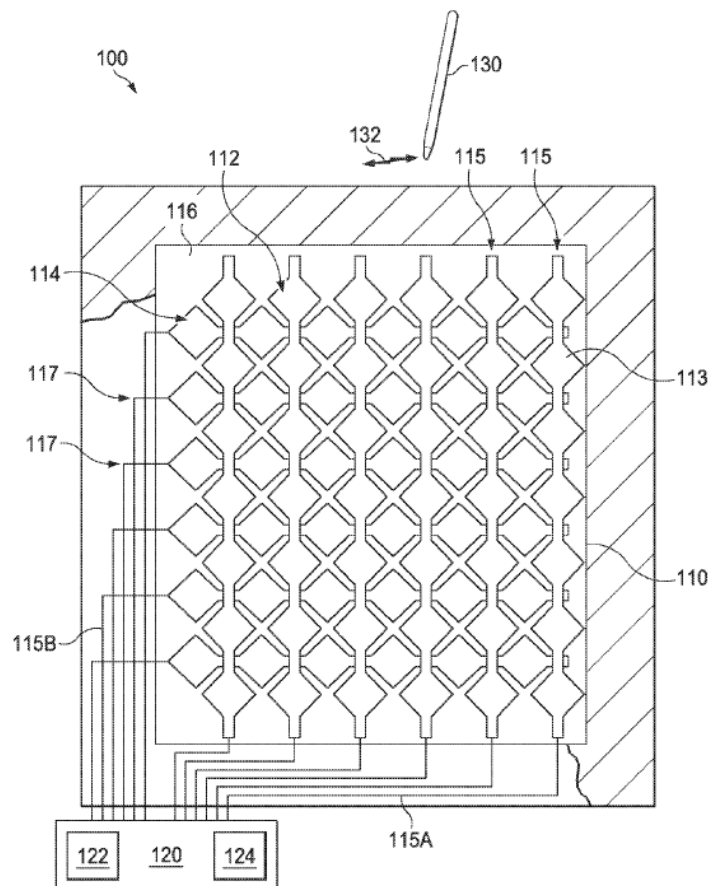


FIG. 1

The system uses a time-division multiplexed communication protocol that alternates between panel transmission periods and stylus transmission periods, enabling both the panel and stylus to send signals that include data like position or stylus-specific information. *Id.* 4:6-22, 5:8-33. The capacitive panel supports both mu-

tual-capacitance and self-capacitance modes, with communication during self-capacitance scan periods. *Id.* 4:23-67. The stylus synchronizes with the panel's communication frame after detecting a wake-up signal and transmits separate signals for column and row data to allow precise location tracking while minimizing circuit complexity. *Id.* 7:7-28, 8:10-34. Multiple styluses can be associated with the same panel using a stylus identification process. *Id.* 9:5-67; Fig. 10 (“FIG. 10 illustrates a timing diagram for the protocol of FIG. 7 where multiple styluses are present.”).

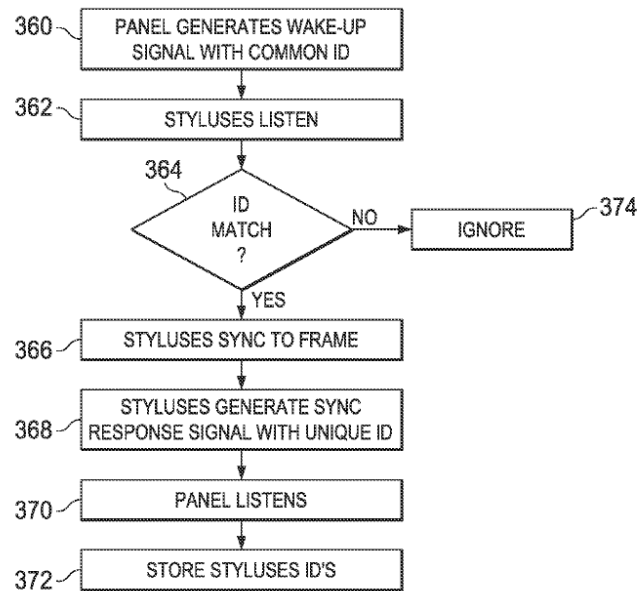
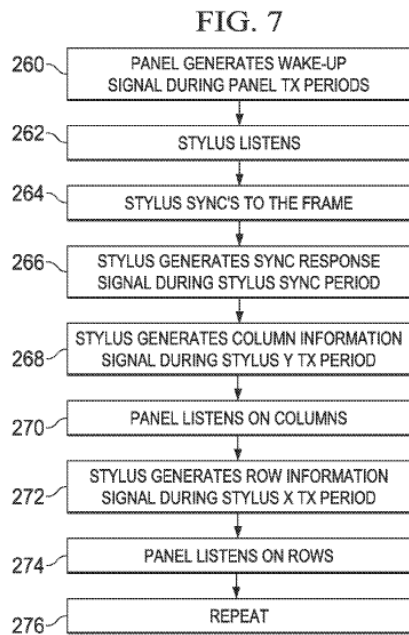


FIG. 9

VII. GROUNDS OF UNPATENTABILITY

Under 37 C.F.R. §42.104(b)(4)-(5), the following sections (as confirmed in the Declaration of Ricardo Valerdi Ph.D., Exs. 1003, 1018 (Appendix A), 1019 (Appendix B), 1020 (Appendix C)) detail the grounds of unpatentability, the limitations of the Challenged Claims, and how these claims are anticipated and/or obvious in view of the prior art.

A. Ground 1: Claims 1-4, 7, 9, 10, 12-14, 17, 19-21, 23, and 24 are anticipated by, or rendered obvious over, Sundara-Rajan.

These claims are anticipated by, or rendered obvious over, Sundara-Rajan, alone or in view of the knowledge of a POSITA. Ex. 1003, ¶86.

1. Claim 1

a. 1[pre]

Sundara-Rajan Figure 20 discloses a computing device 104 that has a touchscreen module 2026 and touch screen controller 2028, and a display 2012 with touch surface 106 which are understood to be input devices. Ex. 1005, 18:11-63. The computing device 104 also has controller(s)/processor(s) 2004 that may each include a CPU for processing data and computer-readable instructions. *Id.*, Figs. 1, 20:

FIG. 1

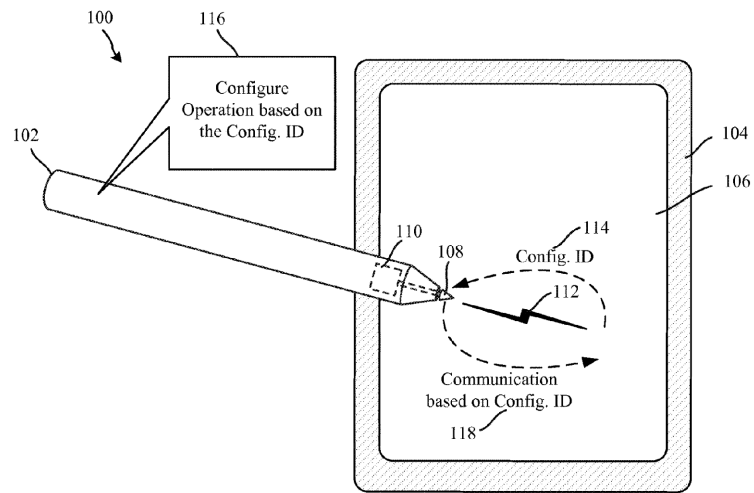
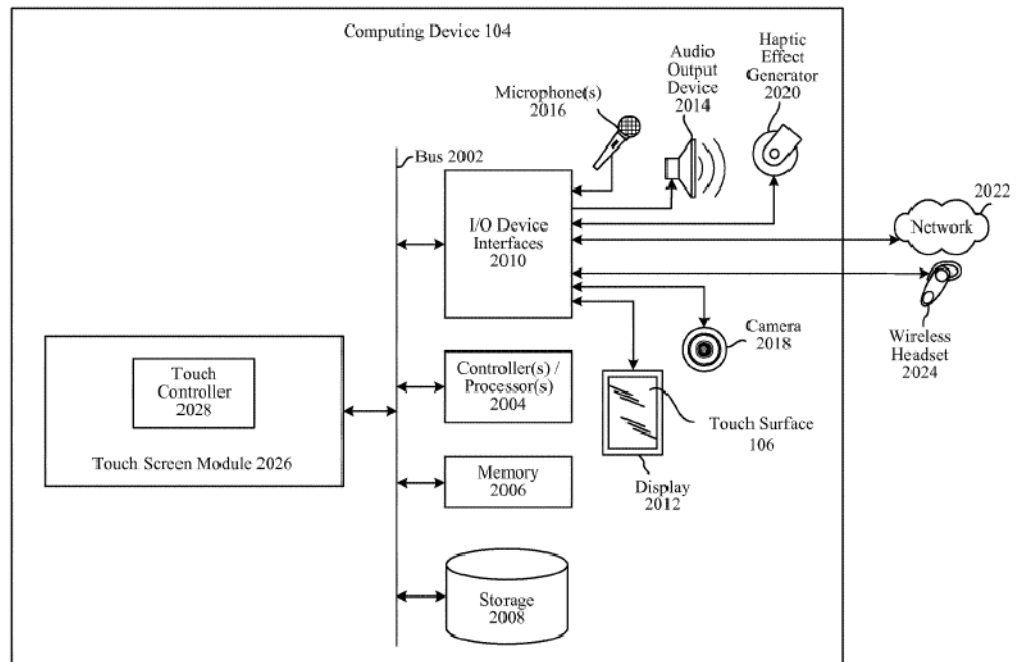


FIG. 20



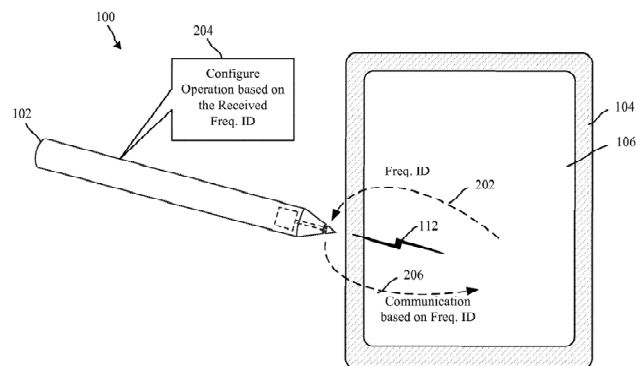
b. 1[a]

Sundara-Rajan discloses a touch controller in a touch screen module, which a POSITA would understand functions as a sensor module with sensor circuitry. Ex. 1005, 2:26-2:31 (“enables the computing device to communicate to the active stylus, for example, via a touch controller, using an electromagnetic communication channel”); Ex. 1018, 1[a].

c. 1[b]

Sundara-Rajan discloses a frequency ID, which a POSITA would understand to be a plurality of timeslots. Ex. 1018, 1[b]. Sundara-Rajan discloses, “the device 104 may transmit a frequency ID [202]...to the stylus device 102 via the carrier frequency...The stylus device 102 configures its operation according to the frequency corresponding to the frequency ID, illustrated as 204. The stylus device 102 then communicates with the computing device 104 using the frequency, illustrated as 206.” Ex. 1005, 4:37-4:50, Fig. 2:

FIG. 2



“[T]he computing device 104 may transmit a configuration ID, illustrated as 114, to the stylus device 102 via the carrier frequency.” *Id.* 4:24-4:26. “The configuration ID may correspond to a type of touch controller...and/or may include other information.” *Id.* 4:26-4:28. A POSITA would reasonably expect that “other information” could include a pen ID. Ex. 1018, 1[b].

d. 1[c]

Sundara-Rajan’s stylus can “function as an electrode(s) to transmit and receive information over the capacitive communication channel.” Ex. 1005, 4:55-4:62. Because it can receive and transmit information and signals, a POSITA would understand it has a transceiver (a device that can both transmit and receive (Ex. 1017, at 1198)). Ex. 1018, 1[c].

The stylus creates “an output sequence to be transmitted to the computing device....The output sequence may be the data the stylus device is to transmit to the computing device encoded with the appropriate encoding scheme...” *Id.* 17:36-17:44. A POSITA would understand “output sequence” to be a downstream packet. Ex. 1018, 1[c].

e. 1[d]

A POSITA would understand Sundara-Rajan’s disclosures described in 1[c] could apply to a second active pen because Sundara-Rajan states “the term ‘a’ or

‘one’ may include one or more items.” Ex. 1005, 20:8-20:9. A POSITA would interpret the features of the “stylus device” to apply to multiple pens. Ex. 1018, 1[d]. Furthermore, a POSITA would understand Sundara-Rajan teaches the ability to handle multiple pens based on the disclosure of input/output device interfaces that communicate with a plurality of devices (interfaces connect to a “variety of components”). Ex. 1005, 18:51-18:53; Ex. 1018, 1[d].

f. 1[e]

Sundara-Rajan discloses the use of a Configuration ID passed from the touch controller to the stylus during synchronization. Ex. 1005, 11:11-11:20 (“The frequency synch may be followed by...a 3 bit identifier or identification code (also referred to herein as a configuration ID)...This handshake packet may be transmitted by the touch controller...”). The Configuration ID is “an identifier or identification code of the computing device 104, an identifier or identification code corresponding to an encoding scheme and/or an operating frequency stored on the stylus device 102, or other information for communicating a mode of operation to the stylus device 102.” *Id.* 10:55-10:61. In response to receiving the Configuration ID, “[t]he stylus device 102 then communicates with the computing device 104 using the frequency.” *Id.* 4:34-4:36.

The stylus device is configured with “various modes of operation/encoding/frequency schemes that correspond to different computing devices.” *Id.* 14:23-

14:26. “The modes of operation/encoding schemes may be identified by an identifier or identification code, such as a device identifier or configuration ID.” *Id.* 14:28-14:31. The computing device “transmit[s] a device identifier to the stylus device 102” which “may access or pull the corresponding firmware from memory and configure itself in the mode of operation/encoding scheme corresponding to the received device identifier.” *Id.* 14:32-14:41. A POSITA would understand such a device contains a determination module. Ex. 1018, 1[e].

g. 1[f]

As discussed in 1[e], Sundara-Rajan discloses the computing device “may transmit a device identifier to the stylus device” which then pulls “the corresponding firmware from memory and configure[s] itself in the mode of operation/encoding scheme corresponding to the received device identifier.” Ex. 1005, 14:34-14:40. Additionally, “the touch controller may transmit configuration information to the stylus device 102 to request the stylus device 104 to operate in a certain mode....The configuration information may include an identifier or identification code of the computing device 104, an identifier or identification code corresponding to an encoding scheme and/or an operating frequency stored on the stylus device 102, or other information for communicating a mode of operation to the stylus device 102.” *Id.* 10:51-10:61. A POSITA would understand the transmitted information could include a pen ID. Ex. 1018, 1[f].

Sundara-Rajan, with POSITA knowledge, discloses 1[f]. *Id.*

h. 1[g]

As discussed in 1[c], Sundara-Rajan discloses a determination module that can determine an attribute of the first active pen comprising the first active pen transceiver from at least the first downstream packet. Ex. 1005, 17:36-17:44 (stylus can transmit “based on the encoding scheme (i.e., FSK, BPSK or ASK), output pressure levels of the pressure sensor, buttons, and other components of the stylus device”); Ex. 1018, 1[g].

2. Claim 2

a. 2[pre]

See 1[pre]-1[g].

b. 2[a]

Sundara-Rajan discloses an active pen with a transceiver. *See* 1[c]. A POSITA would understand the embodiments disclosed in Sundara-Rajan could apply to a second active pen. *See* 1[d]; Ex. 1018, 2[a].

Sundara-Rajan, with POSITA knowledge, discloses 2[a]. *See* Ex. 1018, 2[a].

c. 2[b]

Sundara-Rajan discloses that the stylus creates an output sequence to be transmitted to the computing device based on the encoding scheme, output pressure levels of the pressure sensor, buttons, and other components of the stylus device. The out-

put sequence may be the data the stylus is to transmit to the computing device encoded with the appropriate encoding scheme. Ex. 1005, 17:36-17:44. A POSITA would understand that, from this information transmitted from the second downstream packet from the second active pen, the processing system would determine an attribute of the first active pen, in that it would determine that the first active pen is different than the second active pen. *See* Ex. 1018, 2[b].

Sundara-Rajan, with POSITA knowledge, discloses 2[b]. *Id.*

3. Claim 3

a. 3[pre]

See 1[pre]-1[g].

b. 3[a]

Sundara-Rajan discloses attributes communicated from button data may include switches “between an eraser mode and a write mode, or...other functions.” Ex. 1005, 5:67-6:2, 6:53-6:55. A POSITA would understand other write modes or other functions could include pen tilt and color. Ex. 1018, 3[a].

Sundara-Rajan, with POSITA knowledge, discloses 3[a]. *Id.*

4. Claim 4

a. Claim 4[pre]

See 1[pre]-1[g].

b. Claim 4[a]

A POSITA would understand Sundara-Rajan's disclosures described in 1[g] could apply to a second active pen. *See* 1[d]; Ex. 1018, 4[a].

Sundara-Rajan, with POSITA knowledge, discloses 4[a]. *Id.*

5. Claim 7

a. 7[pre]

See 1[pre]-1[g].

b. 7[a]

Sundara-Rajan discloses the claimed pen may include “a force/pressure sensor.” Ex. 1005, 5:15-5:20. Sundara-Rajan discloses that force/pressure detected in the pen can be transmitted to the computing device. *Id.* 5:33-5:45 (discussing pressure measurement at the tip and a transmission path for carrying a signal from stylus device to the computing device).

c. 7[b]

Sundara-Rajan discloses the stylus “may create an output sequence to be transmitted to the computing device based on...buttons, and other components of the stylus device.” Ex. 1005, 17:36-17:44. Sundara-Rajan thus discloses an attribute of the first active pen communicated to the processing system can be a button status of a button on the first active pen. Ex. 1018, 7[b].

6. Claim 9

a. 9[pre]

See 1[pre]-1[g].

b. 9[a]

Sundara-Rajan discloses the stylus “may create an output sequence to be transmitted to the computing device based on the encoding scheme...The output sequence may be the data the stylus device is to transmit to the computing device encoded with the appropriate encoding scheme (i.e. the output bit patterns the stylus device is to transmit to the computing device).” Ex. 1005, 17:36-17:44; *see* 1[b].

c. 9[b]

Sundara-Rajan discloses if there is noise at the frequency the stylus is operating on, the stylus will switch to a different frequency. Ex. 1005, 12:24-12:32, 13:24-13:39. A POSITA would understand a second downstream packet could be transmitted at that different frequency. Ex. 1018, 9[b].

Sundara-Rajan, with POSITA knowledge, discloses 9[b]. *Id.*

7. Claim 10

a. 10[pre]

See 9[pre]-9[b].

b. 10[a]

See 1[c].

c. 10[b]

Sundara-Rajan discloses the “prior beacon” when discussing the connection with a new host device. “[T]he stylus device may receive a communication or message including data from the host computing device identifying the encoding scheme...and update the encoding scheme of the stylus device...based on the communication from the host computing device.” *Id.* 16:44-17:26.

d. 10[c]

Sundara-Rajan discloses a handshake packet periodically “transmitted by the touch controller.” In the time between transmissions, the touch controller listens for a stylus transmission that matches or acknowledges the requested operation. Once the correct stylus operation is detected, the touch controller may cease transmitting the handshake signals...” Ex. 1005, 10:62-11:30; Ex. 1018, 10[c].

e. 10[d]

The active pen in Sundara-Rajan is unpaired prior to connection with a new host device. Ex. 1005, 16:44-17:26; Fig. 18; Ex. 1018, 10[d].

f. 10[e]

The upstream packet is generated in response to the acknowledgment (the stylus may set and pull a timer T1 and “obtain a new output operating frequency” if T1 is expired). Ex. 1005, 16:44-17:26; 4:24-4:28; Ex. 1018, 10[e].

g. 10[f]

See 1[b], 10[b]-[c], [e] (discussing the generation of an upstream packet). Furthermore, Sundara-Rajan discloses “the computing device 104 may transmit a configuration ID [114] to the stylus device 102 via the carrier frequency.” Ex. 1005, 4:24-4:26. “The configuration ID may correspond to a type of touch controller of the computing device 104 and/or may include other information.” *Id.* 4:26-4:28. A POSITA would reasonably expect that such “other information” could include a timeslot and a frequency. Ex. 1018, 10[f].

8. Claim 12

a. 12[pre]

See 1[pre].

b. 12[a]

See 1[b].

c. 12[b]

See 1[b].

d. 12[c]

See 1[c].

e. 12[d]

See 1[c], 9[b].

f. 12[e]

See 1[g].

9. Claim 13

a. 13[pre]

See 12[pre]-[e].

b. 13[a]

See 2[a].

c. 13[b]

See 2[b].

10. Claim 14

a. 14[pre]

See 12[pre]-[e].

b. 14[a]

See 2[a], 13[b]. A POSITA would understand Sundara-Rajan's disclosures described in 2[a] and 13[b] could apply to a second active pen. *See* 1[d]; Ex. 1018, 14[a].

Sundara-Rajan, with POSITA knowledge, discloses 14[a]. Ex. 1018, 14[a].

11. Claim 17

a. 17[pre]

See 12[pre]-[e].

b. 17[a]

See 7[a]-[b].

12. Claim 19

a. 19[pre]

See 12[pre]-[e].

b. 19[a]

See 10[b].

c. 19[b]

See 10[c].

d. 19[c]

See 10[d].

e. 19[d]

See 10[e].

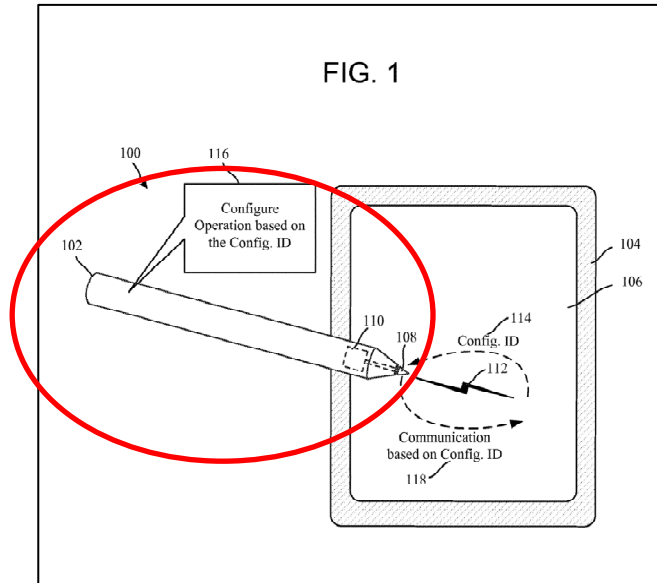
f. 19[e]

See 10[e].

13. Claim 20

a. 20[pre]

Sundara-Rajan discloses an active pen. Ex. 1005, Fig. 1:



The stylus device 102 is an active capacitive stylus including an active tip 108 and a pressure sensor 110. *Id.* Figs. 2-5, 3:33-35.

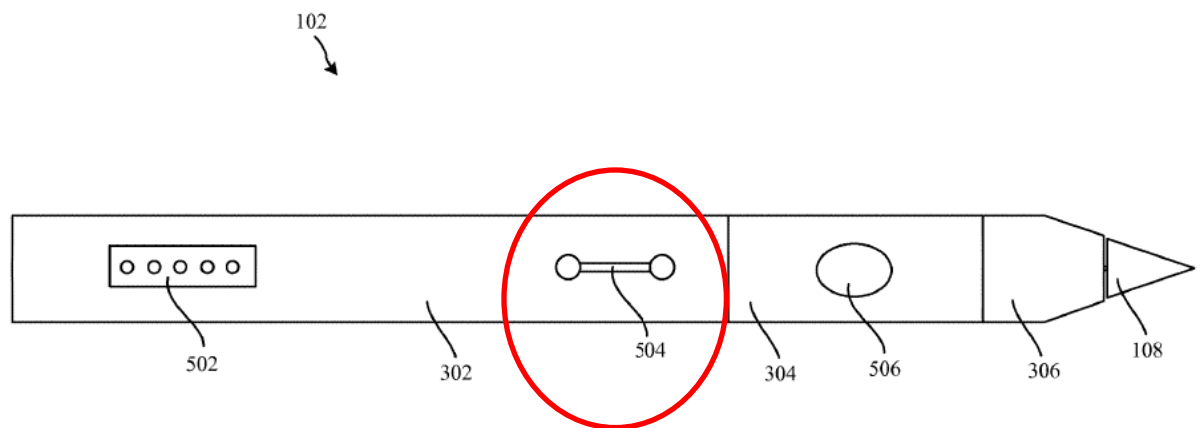
b. 20[a]

The Sundara-Rajan stylus device contains “any type of microcontroller” with “memory sufficient to store the encoding schemes.” Ex. 1005, 6:19-6:42. The stylus also receives a “configuration ID” from a computing device that may include information. *Id.* 4:24-4:28. “Configuration information may be stored in a memory of the stylus device and retrieved based on the received configuration ID.” *Id.* 13:5-13:23. A POSITA would understand the stylus contains an identification (ID) register capable of storing data such as a pen identification (ID) or configuration ID. Ex. 1018, 20[a].

c. 20[b]

Sundara-Rajan discloses an active pen with a button “504”. Ex. 1005, 5:46-5:49.

FIG. 5



d. 20[c]

See 1[c] (discussing the transceiver disclosed in the active pen).

e. 20[d]

See 1[b], 1[f], 12[a] (discussing the transmission of a penID in the upstream packet sent during the current beacon signal); 10[f], 19[e] (discussing the transmission of a timeslot and a frequency in the upstream packet during the current beacon signal).

f. 20[e]

See 1[b].

g. 20[f]

See 7[a]-7[b].

14. Claim 21

a. 21[pre]

See 20[pre]-20[f].

b. 21[a]

See 10[b].

c. 21[b]

See 10[b].

d. 21[c]

See 10[b]-[d].

e. 21[d]

See 10[c].

15. Claim 23

a. 23[pre]

See 21[pre]-21[d].

b. 23[a]

Sundara-Rajan discloses the use of a Configuration ID that is passed from the touch controller to the stylus during synchronization. Ex. 1005, 11:11-11:20. The Configuration ID is “an identifier or identification code of the computing device 104, an identifier or identification code corresponding to an encoding scheme and/or an

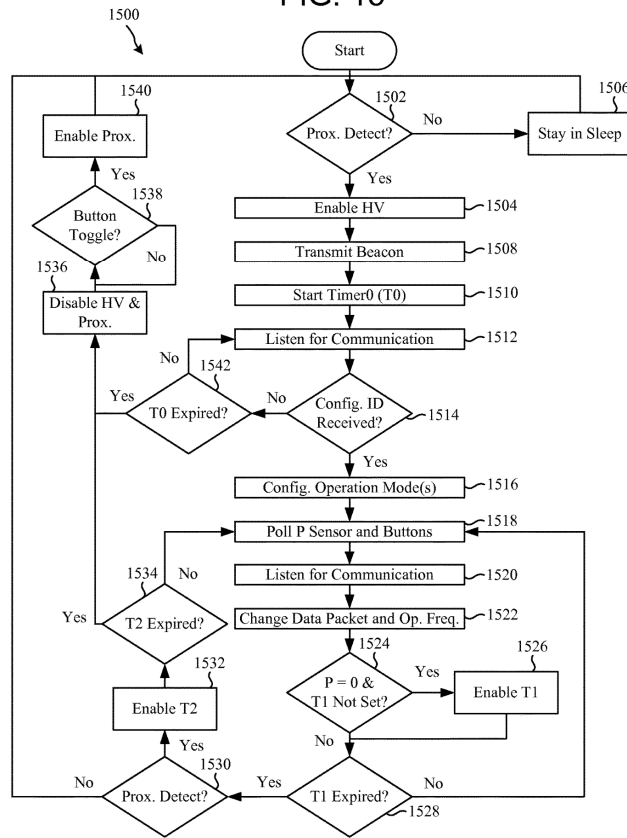
operating frequency stored on the stylus device 102, or other information for communicating a mode of operation to the stylus device 102.” *Id.* 10:55-10:61. The stylus’s ability to detect the configuration ID would inform a POSITA that the stylus has a determination module. *Id.* 12:34-12:55; Ex. 1018, 23[a].

Sundara-Rajan, with POSITA knowledge, discloses 23[a]. *Id.*

c. 23[b]

Sundara-Rajan’s Figure 15 “illustrates a method 1500 to determine when the stylus is being used and should remain in active mode and when the stylus is not being used and should enter a sleep mode.” Ex. 1005, 12:36-12:39. One situation where the stylus would unpair from the input device is “in response to the configuration ID failing to be received.” *Id.* 14:13-14:14. Then, “the stylus device determines whether T0 (a listening timeout timer...) has expired...[I]n response to T0 being expired, the stylus device proceeds to block 1536 to disable the HV and the proximity sensor(s), and follows the path of blocks 1538-1540...” *Id.* 14:14-14:22.

FIG. 15



A POSITA would understand this discloses the stylus detecting a missing beacon from the input device. Ex. 1018, 23[b].

Sundara-Rajan, with POSITA knowledge, discloses 23[b]. *Id.*

d. 23[c]

When Sundara-Rajan’s stylus does not receive a configuration ID, it may enter sleep mode. *See* 23[b]. A POSITA would reasonably assume the memory (or “register”) that stores the Configuration ID will also get reset (i.e., the value being “set to zero”) when the stylus enters sleep mode. Ex. 1018, 23[c]. When the stylus gets activated again, it will listen for a new Configuration ID after which the memory

will be overwritten by the newly received Configuration ID. *Id.* A POSITA would reasonably assume that the “pen ID” will also get reset when the pen unpairs. *Id.*

Sundara-Rajan, with POSITA knowledge, discloses 23[c]. *Id.*

16. Claim 24

a. 24[pre]

See 20[pre]-[f].

b. 24[a]

Sundara-Rajan discloses an active pen with a transceiver configured to receive information from the host device. Sundara-Rajan discloses “the computing device 104 may transmit a configuration ID[114]...to the stylus device 102.” Ex. 1005, 4:24-4:26. “The configuration ID may correspond to a type of touch controller of the computing device 104 and/or may include other information.” *Id.* 4:26-4:28. A POSITA would reasonably expect that such “other information” could include a user ID. Ex. 1018, 24[a].

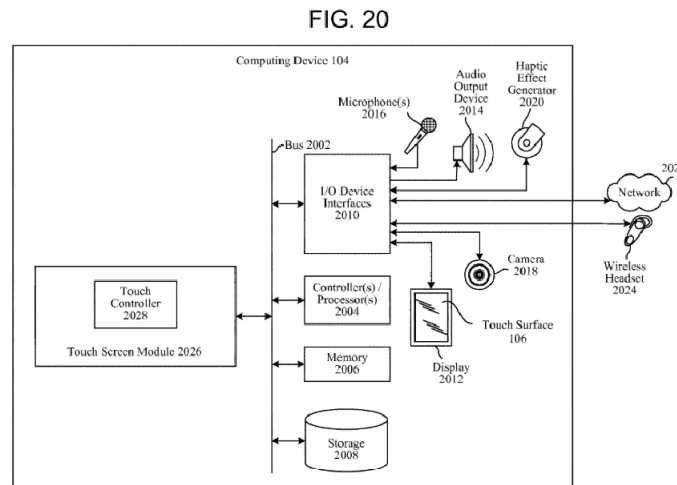
Additionally, Sundara-Rajan discloses the touch controller of the host device transmitting “a handshake packet to the stylus device using the capacitive link.” *Id.* 10:34-10:36. “As part of the handshake, or in a different communication...the touch controller may transmit configuration information to the stylus device 102 to request the stylus device 104 to operate in a certain mode...The configuration information may include an identifier or identification code of the computing device 104, an

identifier or identification code corresponding to an encoding scheme and/or an operating frequency stored on the stylus device 102, or other information for communicating a mode of operation to the stylus device 102.” *Id.* 10:50-10:61. A POSITA would understand the information communicated could include a user ID. Ex. 1018, 24[a].

Sundara-Rajan, with POSITA knowledge, discloses 24[a]. *Id.*

c. 24[b]

Sundara-Rajan discloses other input devices can be connected to the host device:



Ex. 1005, Fig. 20. A POSITA would understand the active pen could transmit information, such as the user ID, to these other input devices. Ex. 1018, 24[b].

Sundara-Rajan, with POSITA knowledge, discloses 24[b]. *Id.*

B. Ground 2: Claims 1, 2, 4, 7, 12-14, 17, 19, 21, and 24 are further obvious over Sundara-Rajan in view of Kremin’926

Sundara-Rajan anticipates and/or renders obvious these claims for the reasons discussed above in §VII(A). To the extent one or more limitations are not disclosed in Sundara-Rajan, the below analysis further illustrates these limitations are disclosed in Kremin’926 and the claims are obvious in view of Sundara-Rajan and Kremin’926. Ex. 1003, ¶87.

Sundara-Rajan and Kremin’926 are both directed to improving bi-directional communication between active styluses and capacitive touchscreens. Ex. 1005, Abstract; Ex. 1006, Abstract. The references cited on the face of Sundara-Rajan include patent applications to Ryshtun and Wright, both named inventors on Kremin’926. Ex. 1005, 1. A POSITA would be motivated to combine Sundara-Rajan’s disclosure of an active stylus that configures itself to work with different touchscreens and the synchronization and simultaneous detection methods disclosed in Kremin’926 (for synchronizing an active stylus to a capacitive array and concurrently detecting the presence of multiple objects). Ex. 1003, ¶88.

1. Claim 1

a. 1[pre]

Kremin’926 discloses “an electronic system having a processing device for detecting a presence of a touch object and a stylus.” Ex. 1006, ¶0006, Fig. 1:

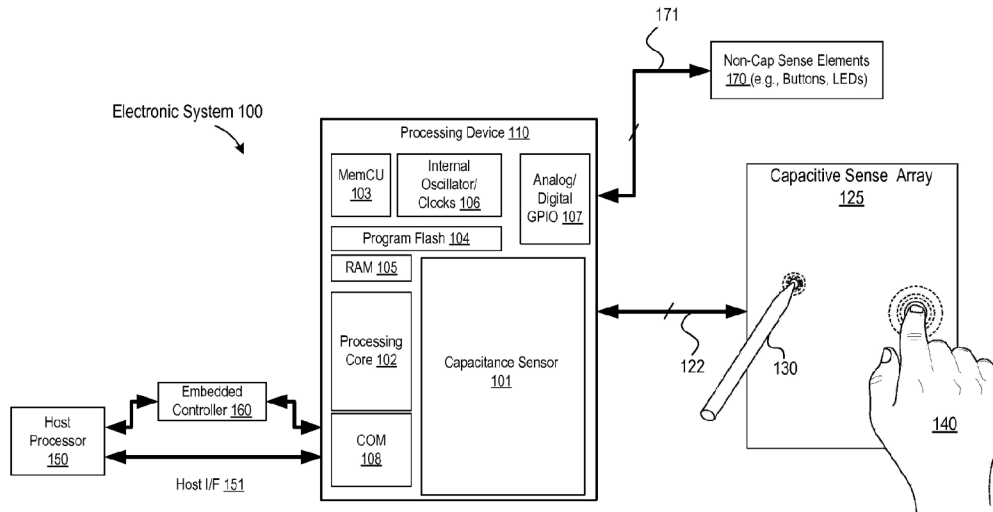


FIG. 1

Sundara-Rajan and Kremin’926 each disclose 1[pre]. §VII(A)(1)(a); Ex. 1018, 1[pre].

b. 1[a]

Kremin’926 discloses a “capacitance sensor” which “may be integrated into processing device.” Ex. 1006, ¶0023. It includes “analog I/O for coupling to an external component, such as capacitive sense array...and/or other devices. The capacitance sensor...may be configured to measure capacitance...” *Id.* ¶0023. It is “integrated into the IC of the processing device.” *Id.* ¶0028, Fig. 1:

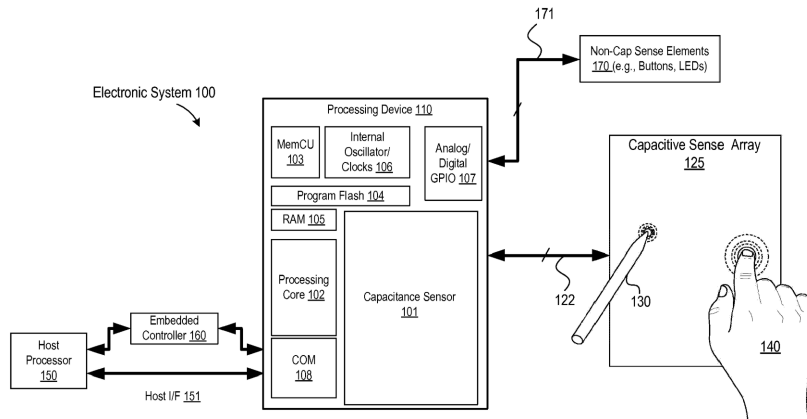


FIG. 1

Sundara-Rajan and Kremin'926 disclose 1[a]. §VII(A)(1)(b); Ex. 1018, 1[a].

c. 1[b]

Kremin'926 discloses the active pen “may listen or detect the host TX signal to determine the time intervals...of the host TX signal. After determining the time intervals...of the host TX signal, the stylus may synchronize” to them and transmit only in the gaps between time intervals. Ex. 1006, ¶0067, Fig. 9:

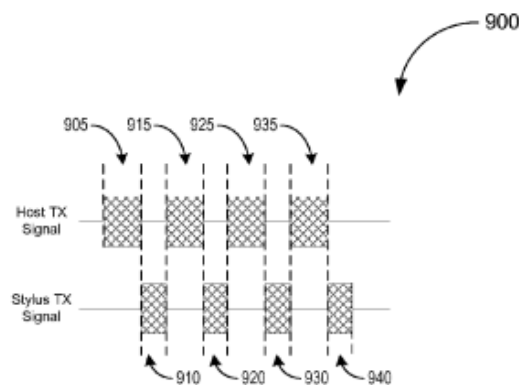


FIG. 9

Kremin’926 discloses a synchronization signal from the ITO panel (which a POSITA would understand is an upstream packet) to the stylus, which then demodulates the signal to determine when the stylus should transmit a TX signal (which a POSITA would understand is a downstream packet). *Id.* ¶0050; Ex. 1018, 1[b]. The synchronization burst (i.e., beacon signal) from the processing device (i.e., host) encodes timing and frequency information. Ex. 1018, 1[b].

The timing and phase of the TX signal from the host device may be calculated from the encoded data the active pen receives. Ex. 1006, ¶0061. The sense array of the host “transmit[s] a synchronization signal 230 to the active stylus 130. The active stylus 130 may detect (e.g., sense) and demodulate the synchronization signal 230 using receiver 226. The MCU 224 may process the synchronization signal 230 to synchronize the timing of the sensing performed by the processing core 210 and the transmission of the TX signal 227 by the active stylus 130.” *Id.* ¶0036. A POSITA would understand “synchronize...the transmission of the TX signal by the active stylus” could mean that the demodulated synchronization contains information regarding the TX signal transmission such as timing and frequency. Ex. 1018, 1[b].

A POSITA would combine Sundara-Rajan’s teaching of the host device transmitting a configuration ID with other information (including, reasonably, a pen ID) with Kremin’926’s disclosures. Sundara-Rajan is directed to an active stylus that is capable with communicating with “a multitude of touch controllers” but provides

minimal detail on how to use more than one active stylus simultaneously. Ex. 1005, 3:2-3:9. A POSITA would thus look to Kremin'926's specific disclosure of simultaneous use of multiple touch objects (such as multiple active styluses) with a single touchscreen. Ex. 1018, 1[b].

d. 1[c]

1[b] above discusses the disclosed synchronization signal from the ITO panel in Kremin'926. Because the active pen receives and transmits information and signals, a POSITA would understand it has a transceiver. Ex. 1018, 1[c].

Sundara-Rajan and Kremin'926 each disclose 1[c]. *Id.*; §VII(A)(1)(d).

e. 1[d]

A POSITA would understand Kremin'926's disclosures described in 1[c] could apply to a second active pen. Ex. 1018, 1[d]. Kremin'926 discloses the processing device of the touchscreen "is configured to detect a presence" of both an active stylus and a touch object individually or concurrently. Ex. 1006, ¶¶0020, 0017 (using electrodes to track the position of multiple touch objects). Furthermore, Kremin'926 explicitly mentions two types of styluses: "In contrast to passive styluses, an active stylus 130 provides the transmit signal." *Id.* ¶0041.

A POSITA would also understand Kremin'926 teaches the possibility of handling multiple pens by disclosing "the interconnection between circuit components or blocks may be shown as buses [for bi-directional communication] or as single

signal lines. Each of the buses may alternatively be one or more single signal lines” and vice-versa. Ex. 1006, ¶0075; Ex. 1018, 1[d].

A POSITA would be motivated to use Kremin’926’s disclosure of multiple touch objects with Sundara-Rajan’s disclosure. *See* §VII(A)(1)(e). Sundara-Rajan is directed to an active stylus that is capable of communicating with “a multitude of touch controllers” but provides minimal detail on how to use more than one active stylus simultaneously. Ex. 1005, 3:2-3:9. A POSITA would thus look to Kremin’926’s specific disclosure of simultaneous use of multiple touch objects (such as multiple active styluses) with a single touchscreen. Ex. 1018, 1[d].

f. 1[e]

Sundara-Rajan discloses 1[e]. §VII(A)(1)(f).

g. 1[f]

Sundara-Rajan, with POSITA knowledge, discloses 1[f]. §VII(A)(1)(g).

h. 1[g]

Kremin’926 discloses the stylus transmits a TX signal (i.e., a downstream packet). Ex. 1006, ¶0061. The stylus TX signal may include button data. *Id.* ¶0063 (TX signal from the stylus could “include[] additional data (e.g.,...button data, etc.)”). Kremin’926 thus discloses a determination module that can determine an attribute of the first active pen comprising the first active pen transceiver from at least the first downstream packet. Ex. 1018, 1[g].

Sundara-Rajan and Kremin’926 each disclose 1[g]. *Id.*; §VII(A)(1)(h).

2. Claim 2

a. 2[pre]

See 1[pre]-[g].

b. 2[a]

See 1[b]-[c] (discussing the transceiver); Ex. 1006, ¶0067. A POSITA would understand these embodiments disclosed in Kremin'926 could apply to a second active pen. *See* 1[d]; Ex. 1018, 2[a].

A POSITA would be motivated to use Kremin'926's disclosure of multiple touch objects with Sundara-Rajan's disclosure. *See* 1[d].

c. 2[b]

Kremin'926 discloses the stylus transmits a TX signal (i.e., a downstream packet). Ex. 1006, ¶0061. A POSITA would understand that, from this information transmitted from the second downstream packet from the second active pen, the processing system would determine an attribute of the first active pen, in that it would determine that the first active pen is different than the second active pen. Ex. 1018, 2[b].

Sundara-Rajan and Kremin'926 each disclose 2[b]. *Id.*; §VII(A)(2)(c).

3. Claim 4

a. Claim 4[pre]

See 1[pre]-[g].

b. Claim 4[a]

A POSITA would understand Kremin'926's disclosures described in 1[g] could apply to a second active pen. *See* 1[d]; Ex. 1018, 4[a].

A POSITA would be motivated to use Kremin'926's disclosure of multiple touch objects with Sundara-Rajan's disclosure. *See* 1[d].

4. Claim 7

a. 7[pre]

See 1[pre]-[g].

b. 7[a]

Kremin'926 discloses force measurement at the tip of the active pen may be transmitted to the processing system. Ex. 1006, ¶0063 (disclosing that the TX signal from the stylus could “include[] additional data (e.g.,...button data, etc.)”).

Sundara-Rajan and Kremin'926 each disclose 7[a]. Ex. 1018, 7[a]; §VII(A)(5)(b).

c. 7[b]

Kremin'926 discloses the active pen can transmit button data. Ex. 1006, ¶0063.

Sundara-Rajan and Kremin'926 each disclose 7[b]. Ex. 1018, 7[b]; §VII(A)(5)(c).

5. Claim 12

a. 12[pre]

See 1[pre].

b. 12[a]

See 1[b].

c. 12[b]

See 1[b].

d. 12[c]

See 1[c].

e. 12[d]

See 1[d].

f. 12[e]

See 1[g].

6. Claim 13

a. 13[pre]

See 12[pre]-[e].

b. 13[a]

See 2[a].

c. 13[b]

See 2[b].

7. Claim 14

a. 14[pre]

See 12[pre]-[e].

b. 14[a]

See 2[a], 13[b]. A POSITA would understand Kremin'926's disclosures described in 2[a] and 13[b] apply to a second active pen. *See* 1[d]; Ex. 1018, 14[a].

A POSITA would be motivated to use Kremin'926's disclosure of multiple touch objects with Sundara-Rajan's disclosure. *See* 1[d].

8. Claim 17

a. 17[pre]

See 12[pre]-[e].

b. 17[a]

See 7[a]-[b].

9. Claim 19

a. 19[pre]

See 12[pre]-[e].

b. 19[a]

Kremin'926 discloses the ITO panel or touch screen of the host device may send a synchronization signal to the active pen, which may be different from the frequency of the host TX signal, which a POSITA would understand to be a prior beacon from the first input device. Ex. 1006, ¶0056; Ex. 1018, 19[a].

Sundara-Rajan and Kremin'926 each disclose 19[a]. Ex. 1018, 19[a]; §VII(A)(12)(b).

c. 19[b]

Kremin'926 discloses that the stylus transmits a TX signal that is received by the host device. Ex. 1006, ¶¶0062-64. The TX signal may “include[] additional data (e.g.,...button data, etc.),” *id.*, which a POSITA would also understand could include an acknowledgment. Ex. 1018, 19[b]. The stylus includes a phase-locked loop (PLL) circuit 870, which “may synchronize the operation of the stylus 850 to the host 805 on a cycle-by-cycle basis.” Ex. 1006, ¶¶0062-64. “The stylus may detect the synchronization burst transmitted at time interval 1005 and synchronize the operation of the stylus to the host using the synchronization burst (e.g., using the PLL...).” *Id.* ¶0069.

Sundara-Rajan and Kremin'926 disclose 19[b]. Ex. 1018, 19[b]; §VII(A)(12)(c).

d. 19[c]

The stylus disclosed in Kremin'926 is unpaired during at least a portion of the prior beacon period, as discussed in 19[a]-[b] and shown in Figures 9 and 10:

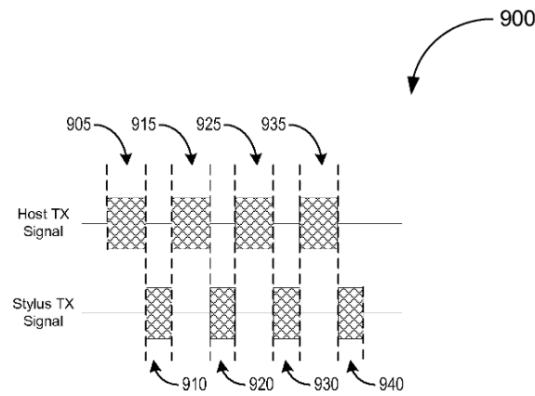


FIG. 9

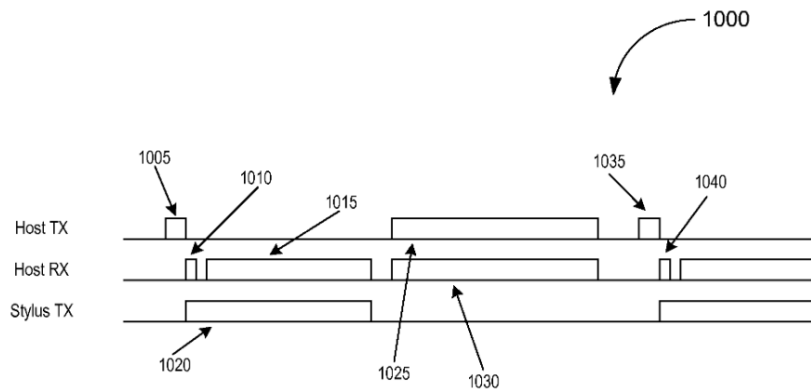


FIG. 10

Ex. 1006.

Sundara-Rajan and Kremin'926 each disclose 19[c]. Ex. 1018, 19[c]; §VII(A)(12)(d).

e. 19[d]

Kremin'926 discloses in Fig. 10 that the host transmits a synchronization burst at time interval 1005. Ex. 1006, ¶0069. The stylus may also transmit a stylus TX signal after the synchronization burst ends at time interval 1020. *Id.* “[T]he host may

transmit a host TX signal on a first set of electrodes at time interval 1025 and may receive or detect the host TX signal on a second set of electrodes at time interval 1030.” *Id.* ¶0070, Fig. 10. Thus, Kremin’926 discloses that the upstream packet (the host TX signal) is generated in response to the stylus TX signal (acknowledgment). *See also id.* Fig. 11, ¶¶0068-0072.

Sundara-Rajan and Kremin’926 each disclose 19[d]. Ex. 1018, 19[d]; §VII(A)(12)(e).

f. 19[e]

Claims 9-10 of Kremin’926 disclose that the stylus is synchronized based on a frequency and a phase (*i.e.*, timeslot) of the host device’s synchronization signal. Ex. 1006, claims 9-10, ¶0018; *see* 19[a]-[d].

Sundara-Rajan and Kremin’926 each disclose 19[e]. Ex. 1018, 19[e]; §VII(A)(12)(f).

10. Claim 20

a. 20[pre]

Kremin’926 discloses an active pen. Ex. 1006, ¶0020, Fig. 1:

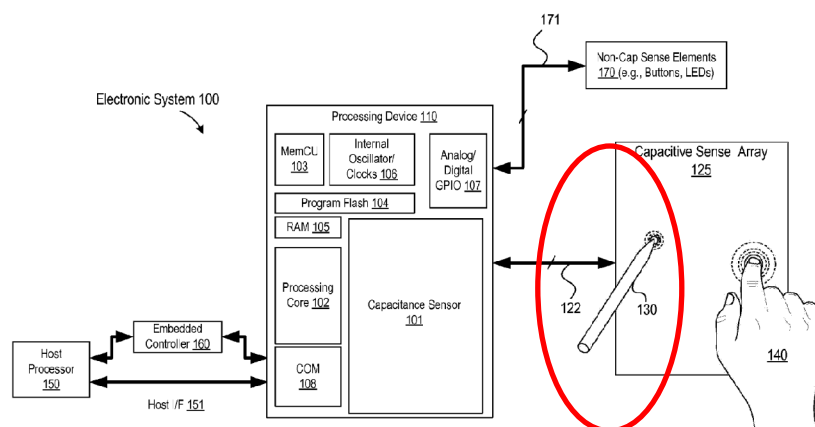


FIG. 1

Sundara-Rajan and Kremin’926 each disclose 20[pre]. Ex. 1018, 20[pre]; §VII(A)(13)(a).

b. 20[a]

Sundara-Rajan discloses 20[a]. *See* §VII(A)(13)(b).

c. 20[b]

Kremin’926 discloses an active pen with a button. Ex. 1006, ¶0063 (the TX signal from the stylus may include “button data”).

Sundara-Rajan and Kremin’926 each disclose 20[b]. Ex. 1018, 20[b]; §VII(A)(13)(c).

d. 20[c]

See 1[c] (discussing the transceiver in the active pen disclosed in Kremin’926).

Sundara-Rajan and Kremin'926 each disclose 20[c]. Ex. 1018, 20[c];
§VII(A)(13)(d).

e. 20[d]

See 1[b], 1[f], 12[a] (discussing transmission of a penID in the upstream packet sent during the current beacon signal); 19[e] (discussing transmission of a timeslot and a frequency in the upstream packet during the current beacon signal).

f. 20[e]

See 1[b], 12[a].

g. 20[f]

See 7[b], 17[a].

11. Claim 21

a. 21[pre]

See 20[pre]-[f].

b. 21[a]

See 19[a].

c. 21[b]

See 19[a].

d. 21[c]

See 19[a]-[c].

e. 21[d]

See 19[b].

12. Claim 24

a. 24[pre]

See 20[pre]-[f].

b. 24[a]

Kremin'926 discloses the timing and phase of the TX signal from the host device may be calculated from the encoded data the active pen receives. Ex. 1006, ¶0061. Kremin'926 also discloses “this synchronization may be performed using one or more of the electrodes of the sense array 201 to transmit a synchronization signal 230 to the active stylus 130. The active stylus 130 may detect (e.g., sense) and demodulate the synchronization signal 230 using receiver 226. The MCU 224 may process the synchronization signal 230 to synchronize the timing of the sensing performed by the processing core 210 and the transmission of the TX signal 227 by the active stylus 130.” *Id.* ¶0036. A POSITA would understand the synchronization of the TX signal transmission by the active stylus could mean that the demodulated synchronization contains information regarding the TX signal transmission such as a user ID. Ex. 1018, 24[a].

Sundara-Rajan and Kremin'926 each disclose 24[a]. *Id.*; §VII(A)(16)(b).

c. 24[b]

Sundara-Rajan, with the knowledge of a POSITA, discloses 24[b]. Ex. 1018, 24[b]; §VII(A)(16)(c).

C. Ground 3: Claims 1, 4, 6, 12, 14, 16, and 20-22 are obvious over Kremin’361 in view of Sundara-Rajan

These claims are obvious in view of Kremin’361 and Sundara-Rajan. Ex. 1003, ¶89.

Kremin’361 and Sundara-Rajan both disclose bi-directional communication between active stylus devices and capacitive touchscreens. Ex. 1005, Abstract; Ex. 1007, Abstract. The references cited on the face of Sundara-Rajan include a patent application to Ryshtun, a named inventor on Kremin’361. Ex. 1005, 1. A POSITA would be motivated to combine the synchronization and simultaneous detection methods disclosed in Kremin’361 (for synchronizing an active stylus to a capacitive array and concurrently detecting the presence of an active stylus and a passive touch object) with Sundara-Rajan’s disclosure of an active stylus that configures itself to work with different touchscreens. Ex. 1003, ¶90.

1. Claim 1

a. 1[pre]

Kremin’361 discloses an input device with a processing system. Kremin’361 discloses “an electronic system 300 having a processing device 310 for detecting a presence of a touch object 340 and a stylus 330.” The electronic system includes a processing device, touch screen, touch sensor pad, stylus, host processor, embedded controller, and non-capacitance sense elements. Ex. 1007, ¶0051, Fig. 3:

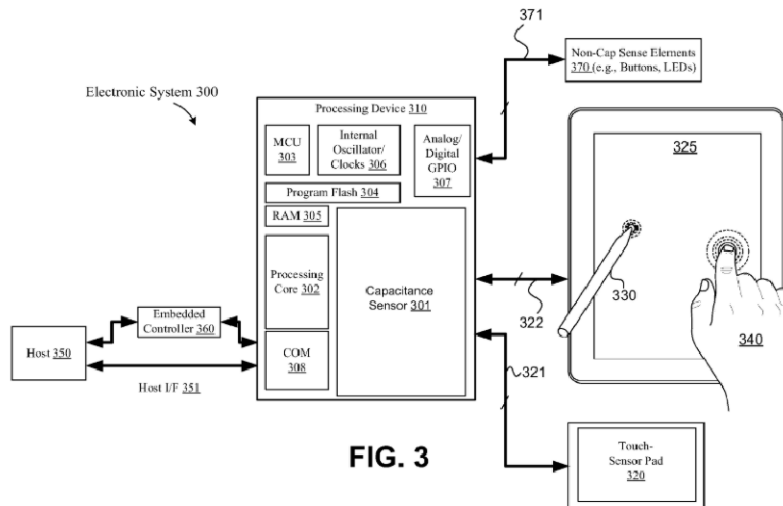


FIG. 3

Kremin’361 and Sundara-Rajan each disclose 1[pre]. Ex. 1019, 1[a]; §VII(A)(1)(a).

b. 1[a]

Kremin’361 discloses a “capacitance sensor 301” “integrated into processing device 310.” Ex. 1007, ¶0055. It includes “analog I/O for coupling to an external component” such as a touch-sensor pad, touch screen, touch-sensor slider, touch-sensor buttons, and/or other devices. *Id.*, Fig. 3:

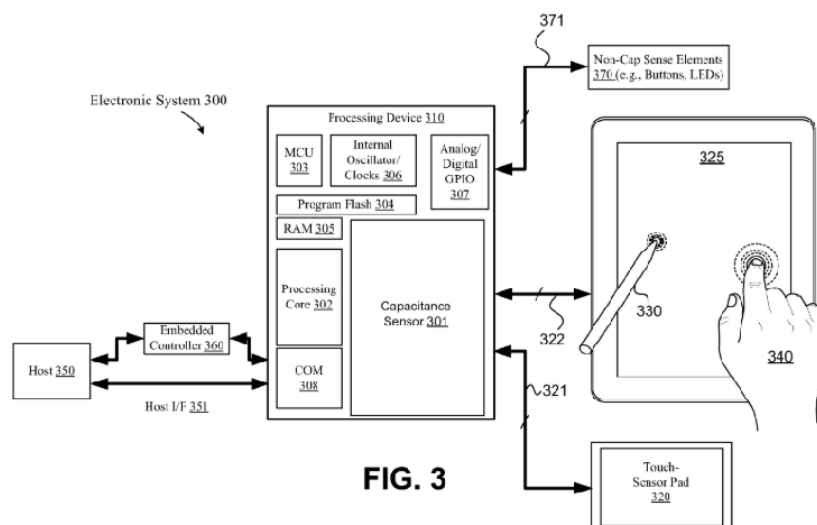


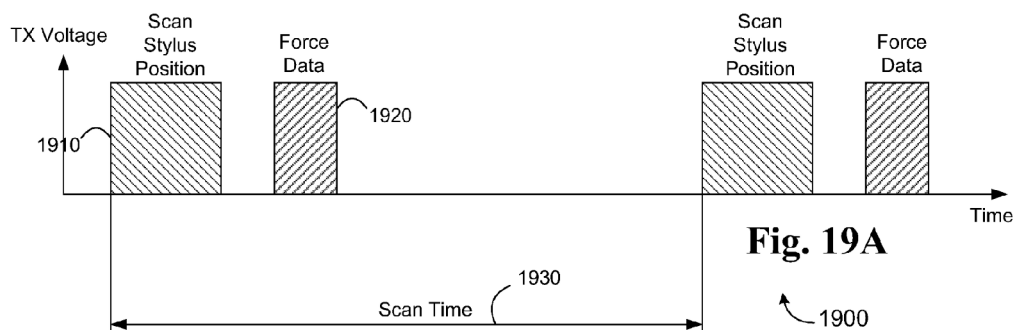
FIG. 3

Kremin'361 and Sundara-Rajan each disclose 1[a]. Ex. 1019, 1[a]; §VII(A)(1)(b).

c. 1[b]

Kremin'361 discloses a time division multiplexing (“TDM”) scheme, whereby “the stylus 1300 transmits the stylus TX signal 898 in one time slot, and transmits the additional data (e.g., force data, acceleration data) in another time slot...Similarly, code division multiplying (CDM) may be used...The stylus 1300 may transmit the stylus TX signal 898 using one code, and may transmit the additional data using another code...the stylus TX signal 898 and additional data may utilize the same frequency or different frequencies.” Ex. 1007, ¶0111, Fig. 19.

Kremin'361 discloses “a timing diagram 1900 for a host device configured to transmit stylus position data and force data during separate intervals.” *Id.* ¶¶0124-0125, Fig. 19A. “[T]he host utilizes the interval between the end of one stylus position scan to the beginning of the next stylus position scan to synchronize the host and stylus to provide robust data transfer and error-free stylus position tracking.” *Id.*



An “active stylus receives synchronization or timing data from the touch screen controller.” *Id.* ¶¶0079, ¶¶0083; Fig. 8:

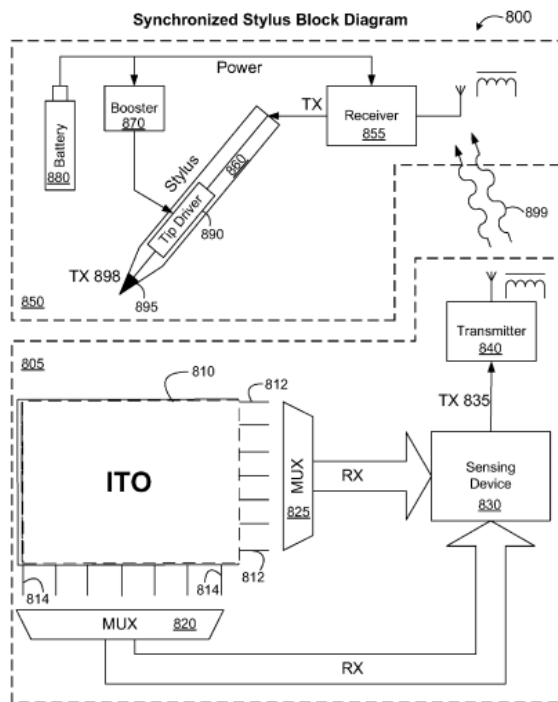


Fig. 8

Kremin’361 also includes a “stylus scan count” (*id.* Fig. 20, ¶¶0129) which a POSITA would understand as a pen ID. Ex. 1019, 1[b]. If the number of styluses is counted by the processor, then each stylus must be assigned a numerical identification. *Id.* The stylus and the host communicate “bi-directionally” (Ex. 1007, ¶¶0093), so a POSITA would understand the “stylus scan count” would be known by both the stylus and the host. Ex. 1019, 1[b]. There are also both “active” and “passive” styluses. Ex. 1007, ¶¶0075. A POSITA would understand each stylus requires a unique identification to prevent transmission interference with the host. Ex. 1019, 1[b].

Kremin’361 and Sundara-Rajan each disclose 1[b]. *Id.*; §VII(A)(1)(c).

d. 1[c]

See 1[b] (detailing Kremin’361’s disclosure of a TDM scheme, stylus TX signal, and timing diagram in Figure 19A). Because the active pen receives and transmits information and signals, a POSITA would understand it includes a transceiver. Ex. 1019, 1[c].

Kremin’361 and Sundara-Rajan disclose 1[c]. *Id.*; §VII(A)(1)(d).

e. 1[d]

A POSITA would understand Kremin’361’s disclosures described in 1[c] apply to a second active pen. Ex. 1019, 1[d]. Kremin’361 discloses the processing device of the touchscreen “is configured to detect a presence” of both an active stylus and a touch object individually or concurrently. Ex. 1007, ¶¶0052, 0048 (disclosing using electrodes to track the position of multiple touch objects).

A POSITA would understand Kremin’361 teaches the ability to have a second pen by examining Figs. 3, 6B, 8 and: “Additionally, the interconnection between circuit components or blocks may be shown as buses [for bi-directional communication] or as single signal lines. Each of the buses may alternatively be one or more single signal lines” and vice-versa. Ex. 1007 ¶[00139]; Ex. 1019, 1[d].

A POSITA would be motivated to use Kremin’361’s disclosure of multiple touch objects with Sundara-Rajan’s disclosure. *See* §VII(A)(1)(e). Sundara-Rajan is directed to an active stylus that is capable of communicating with “a multitude of

touch controllers” but provides minimal detail on how to use more than one active stylus simultaneously. Ex. 1005, 3:2-3:9. A POSITA would thus look to Kremin’361’s specific disclosure of simultaneous use of multiple touch objects (such as multiple active styluses) with a single touchscreen. Ex. 1019, 1[d].

f. 1[e]

Sundara-Rajan discloses 1[e]. §VII(A)(1)(f).

A POSITA would be motivated to use Kremin’361’s disclosure of stylus scan counts maintained by the “processing logic” in Fig. 20 (“the processing logic initializes and sets the APA scan count and the stylus scan count to zero.” ¶0128) to serve the same purpose as a determination module with Sundara-Rajan’s disclosure. Ex. 1019, 1[e]. Sundara-Rajan discloses communication methods between a stylus and a computing device. Ex. 1005, Abstract. A POSITA would thus look to Sundara-Rajan’s specific disclosure of what is communicated between the stylus and the computing device (i.e., the contents of the upstream and downstream packets). Ex. 1019, 1[e]. A POSITA would understand the “processing logic” that maintains the “stylus scan count” (Fig. 20, method 2000) serves the same purpose as the “determination module” in the ’519 Patent. *Id.*

g. 1[f]

Sundara-Rajan discloses 1[f]. §VII(A)(1)(g).

A POSITA would be motivated to use Kremin’361’s disclosure of “stylus scan count” with Sundara-Rajan’s disclosure. *See* §VII(A)(1)(g) (if the number of styluses is counted by the processor, then each must be assigned a numerical identification). Sundara-Rajan discloses communication methods between a stylus and a computing device. Ex. 1005, Abstract. A POSITA would thus look to Sundara-Rajan’s specific disclosure of what is communicated between the stylus and the computing device (i.e., the contents of the upstream and downstream packets). Ex. 1019, 1[e].

h. 1[g]

Kremin’361 discloses a stylus that “receives synchronization or timing data from the touch screen controller.” Ex. 1007, ¶0079, ¶0093 (“communication data may include synchronization information...as well as additional data, such as force data, button data, or the like.”). In Kremin’361, “other data” is prescribed for synchronization. *Id.* ¶0105 (the stylus TX signal data can “include...button data, force data, and other data as would be appreciated by one of ordinary skill in the art having the benefit of this disclosure.”); ¶0108. Kremin’361 thus discloses a determination module that can determine an attribute of the first active pen comprising the first active pen transceiver from at least the first downstream packet. *See* Ex. 1019, 1[g].

Kremin’361 and Sundara-Rajan each disclose 1[g]. *Id.*; §VII(A)(1)(h).

2. Claim 4

a. Claim 4[pre]

See 1[pre]-[g].

b. Claim 4[a]

A POSITA would understand Kremin'361's disclosures described in 1[g] could apply to a second active pen. Ex. 1019, 4[a]; *see* 1[d].

A POSITA would be motivated to use Kremin'926's disclosure of multiple touch objects with Sundara-Rajan's disclosure. *See* 1[d].

3. Claim 6

a. 6[pre]

See 4[pre]-[a].

b. 6[a]

Kremin'361 discloses use of "code division multiplexing," Ex. 1007, ¶0111, which a POSITA would understand utilizes "collision packets" to detect collisions. Ex. 1019, 6[a]; Ex. 1016, p. 4 ("The interface between the MAC sublayer and the Physical Layer includes signals for framing...and contention resolution (collision detect), facilities for passing a pair of serial bit streams (transmit, receive) between the two layers, and a wait function for timing."); *id.* 47 ("In the event of a collision, the transmitting station's Physical Layer...enforces the collision by transmitting a bit sequence called jam.").

c. 6[b]

Ex. 1007, ¶0111 (“code division multiplexing”); Ex. 1016, pp. 4, 47 (“jam” bit sequence); Ex. 1019, 6[b].

d. 6[c]

Ex. 1007, ¶0111 (“code division multiplexing”); Ex. 1016, pp. 4, 47 (“enforces the collision by transmitting”); Ex. 1019, 6[c].

e. 6[d]

Ex. 1007, ¶0111 (“code division multiplexing”), Fig. 19; Ex. 1016, pp. 4 (“wait function for timing”), 47; Ex. 1019, 6[d].

4. Claim 12

a. 12[pre]

See 1[pre]-[g].

b. 12[a]

See 1[b].

c. 12[b]

See 1[b].

d. 12[c]

See 1[c].

e. 12[d]

See 1[d].

f. 12[e]

See 1[g].

5. Claim 14

a. 14[pre]

See 12[pre]-[e].

b. 14[a]

See 12[c]-[e]. A POSITA would understand Kremin'361's and Sundara-Rajan's disclosures described in 12[c] and 12[e] could apply to a second active pen. Ex. 1019, 14[a]; *see* 1[d].

A POSITA would be motivated to use Kremin'926's disclosure of multiple touch objects with Sundara-Rajan's disclosure. *See* 1[d].

6. Claim 16

a. 16[pre]

See 14[pre]-[a].

b. 16[a]

See 6[a].

c. 16[b]

See 6[b]-[c].

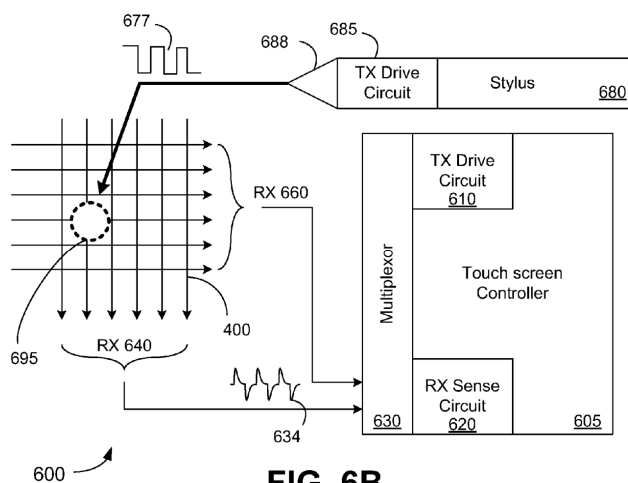
d. 16[c]

See 6[b]-[d].

7. Claim 20

a. 20[pre]

Kremin'361 discloses an active pen. Ex. 1007, ¶0073, Fig. 6B:



Kremin'361 and Sundara-Rajan each disclose 20[pre]. *See* Ex. 1019, 20[pre]; §VII(A)(13)(a).

b. 20[a]

Kremin'361 discloses a stylus that “receives synchronization or timing data from the touch screen controller.” Ex. 1007, ¶0079, ¶0093. In Kremin'361, “other data” is prescribed for synchronization. *Id.* ¶0105. A POSITA would understand this synchronization data or other data could be a pen identification and/or act as a pen identification. Ex. 1019, 20[a].

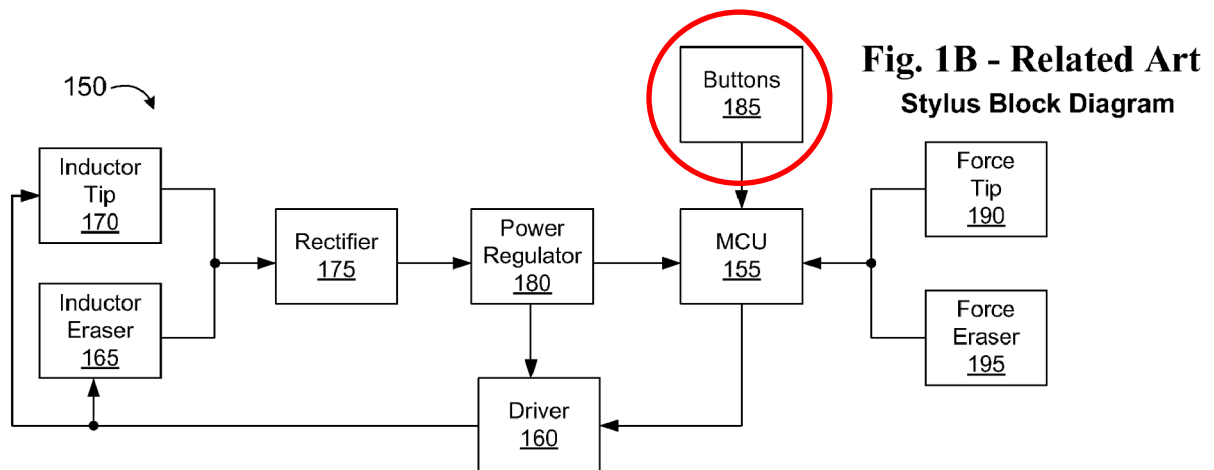
Kremin'361 also discloses a “stylus count” which a POSITA would understand to be a pen identification. Ex. 1007, ¶0055. A POSITA would understand there

is capacity to add more sensing components because there is a “system bus” in the processing device. *Id.* ¶¶0053-0054, ¶0057, ¶0063, ¶0067, ¶0071, ¶0075; Ex. 1019, 20[a]. To handle these multiple inputs, Kremin’361 discloses a “stylus count” which a POSITA would understand is, or acts as, a pen identification. Ex. 1007, ¶0129, ¶0137; Ex. 1019, 20[a].

Kremin’361 and Sundara-Rajan each disclose 20[a]. *Id.*; §VII(A)(13)(b).

c. 20[b]

Kremin’361 discloses an active pen with a button. Ex. 1007, ¶0006, ¶0108.



Kremin’361 and Sundara-Rajan each disclose 20[b]. Ex. 1019, 20[b]; §VII(A)(13)(c).

d. 20[c]

See 1[c] (discussing the transceivers disclosed in the active pens of Kremin’361 and Sundara-Rajan).

e. 20[d]

See 1[b], 1[f] (discussing the transmission of a penID in the upstream packet sent during the current beacon signal).

Kremin’361 also discloses the active stylus “receives synchronization or timing data from the touch screen controller.” Ex. 1007, ¶0079, ¶0083. A POSITA would look to combine Sundara-Rajan’s disclosure of frequency information in the upstream packet (*see* §VII(A)(7)(g)). Sundara-Rajan discloses communication methods between a stylus and a computing device. Ex. 1005, Abstract. A POSITA would thus look to Sundara-Rajan’s specific disclosure of what is communicated between the stylus and the computing device (i.e., the contents of the upstream and downstream packets). Ex. 1019, 20[d].

f. 20[e]

See 1[b].

g. 20[f]

The stylus TX signal disclosed in Kremin’361 includes button data. Ex. 1007, ¶0048 (“the stylus is configured to modulate additional data into the stylus TX signal, including...stylus button data”).

Kremin’361 and Sundara-Rajan each disclose 20[f]. Ex. 1019, 20[f]; §VII(A)(13)(g).

8. Claim 21

a. 21[pre]

See 20[pre]-[f].

b. 21[a]

See 10[b]. Kremin'361 discloses in Fig. 11 “a method 1100 of synchronizing a stylus to a host device.” *Id.* ¶0098. “The method 1100 begins with the host device starting the scanning process (block 1105),” and at block 1150, a modulated TX signal is transmitted to the stylus. *Id.* A POSITA would understand this to be a prior beacon.

Kremin'361 and Sundara-Rajan each disclose 21[a]. Ex. 1019, 21[a]; §VII(A)(14)(b).

c. 21[b]

Kremin'361 discloses a TX pulse sequence generated by the host device, which is modulated by the host device and then transmitted to the stylus. Kremin'361, ¶¶0098-0099. This initiates a prior beacon period.

d. 21[c]

A POSITA would understand the stylus is unpaired during the prior beacon period at the beginning of the method disclosed in Kremin'361's Figure 11. Ex. 1019, 21[c].

e. 21[d]

A POSITA would be motivated to combine Kremin’361 with Sundara-Rajan’s disclosure of an acknowledgment transmitted by the stylus to the host device for pairing (*see* §VII(A)(7)(d)). Sundara-Rajan discloses communication methods between a stylus and a computing device. Ex. 1005, Abstract. A POSITA would thus look to Sundara-Rajan’s specific disclosure of what is communicated between the stylus and the computing device (i.e., the contents of the upstream and downstream packets). Ex. 1019, 21[d].

9. Claim 22

a. 22[pre]

See 21[pre]-21[d].

b. 22[a]

See 6[b]-[c].

c. 22[b]

See 6[c]-[d].

d. 22[c]

See 6[c]-[d].

D. Ground 4: All Challenged Claims are obvious over Lefevre in view of Chandran.

All Challenged Claims are obvious over Lefevre in view of Chandran. Ex. 1003, ¶91.

A POSITA would be motivated to combine Chandran’s specific disclosure of bidirectional communication between a capacitive touch screen and an active stylus with Lefevre’s disclosure of a more general method for a computer system to determine the location of multiple module elements interacting with the computer system. *Id.* ¶92. Lefevre discloses “solutions for detecting the position and/or orientation of real objects on a game board, making it possible to use these objects as an interface for a computer system” and “it is also possible to use touch screens of the capacitive type.” Ex. 1008, ¶¶0003, 0005. Lefevre explains that “solutions based on touch screens or touch film only support a limited number of simultaneous or quasi-simultaneous contacts and do not allow for the determination of a large number of objects.” *Id.* ¶0006. Lefevre states that “the object of the invention is thus a method for interfacing in real time a plurality of mobile elements with a computer system.” *Id.* ¶0010. Lefevre, however, does not describe how to apply its method to capacitive touch screens. A POSITA looking at Lefevre’s objective would have looked to Chandran’s more specific disclosure of a protocol for simultaneous multi-stylus and non-stylus operations in a capacitive system, and vice versa. Ex. 1003, ¶92.

Chandran, in turn, discloses “the control circuitry [of the capacitive touch screen] and active stylus 130 to engage in a bidirectional communication.” Ex. 1009, 2:49-50. Chandran explains “establishing a protocol governing such a bidirectional communication is critical.” *Id.* 2:51-53. Chandran further explains that it is “also

important that the protocol support operation of the capacitive sensing panel 100 in non-stylus operations, such as detecting a user finger or hover, in a manner that is perhaps simultaneous with active stylus communication.” *Id.* 2:54-57. “It is further important that the protocol support operation of the capacitive sensing panel 100 with respect to communicating with a plurality of active styluses.” *Id.* 2:57-60. Chandran thus discloses as important the same general objective as Lefevre—simultaneous interaction with multiple input objects. Ex. 1003, ¶92.

1. Claim 1

a. 1[pre]

Lefevre discloses an input device (board 105) comprising a detection surface coupled to a screen and a magnetized surface. Ex. 1008, ¶0057. The input device also “comprises a hardware module 130 (or central processing system).” *Id.* ¶0059.

Chandran discloses “a capacitive sensing panel 100” (the input device) “useful for a touchscreen panel for an electronic device.” Ex. 1009, 1:24-1:29. A POSITA would understand these devices require a processing system. Ex. 1020, 1[pre]. Chandran also discloses the “control circuitry 120 and active stylus 130...engage in a bidirectional communication.” Ex. 1009, 2:49-2:50. A POSITA would understand a processing system is required for such communication. Ex. 1020, 1[pre].

b. 1[a]

The input device of Lefevre includes “a hardware module 130 (or central processing system).” Ex. 1008, ¶0057. The hardware module 130 “presents a set of

standard connections 135” and “a wireless communication module...making it possible to interact with another computer system and/or to access data via a communication network.” *Id.* ¶0058. The calculation module in the hardware module includes a CPU, GPU, and memory components (e.g. RAM, ROM, Flash). *Id.* ¶0059.

Chandran discloses the control circuitry of the touchpad “causes a periodic signal to be applied to each column 115 and row 117 of interconnected capacitive-sensing nodes 113 in accordance with the panel transmit periods 152. This signal transmission may, for example, comprise a wake-up or polling message, with the active stylus functioning in a sleep mode waiting for receipt of the message.” Ex. 1009, 5:15-5:22. A POSITA would understand this as a sensor module coupled to sensor circuitry. Ex. 1020, 1[a].

c. 1[b]

Lefevre discloses “the activation of all the localisation modules is initiated by a central processing system (control module for position detection and capture) with a common activation signal, each localisation module independently determining its activation as a function of the common activation signal.” Ex. 1008, ¶0192. The “activation signal is a common activation signal for common control of the activation of a plurality of localisation modules.” *Id.* ¶0017. Transmitting, by the central processing system, a common activation signal to all the localisation modules of a

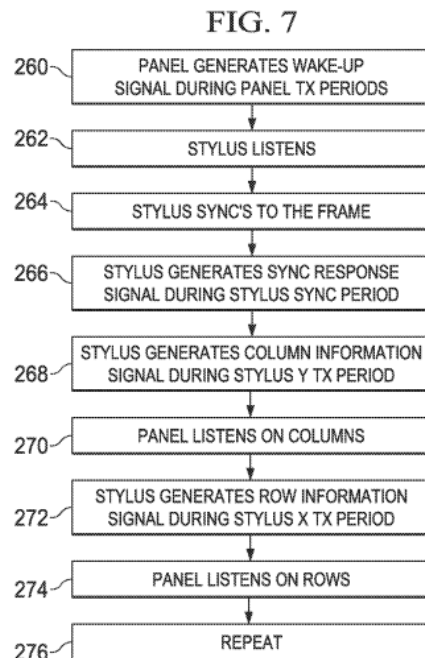
plurality of mobile elements 110, corresponds to broadcasting a current beacon signal to a plurality of active pens comprising a first active pen. Ex. 1020, 1[b]. Lefevre discloses a current beacon signal as “a common activation signal, denoted sync” and an upstream packet included in a current beacon signal as “an activation instruction included in a common activation signal, denoted sync.” Ex. 1008, ¶¶0194. Lefevre further discloses the upstream packet contains the index *i* (identification code), specifying a corresponding index *i* (identification code) associated with a mobile element, which a POSITA would understand to be specifying a pen ID associated with the active pen. *Id.* ¶¶0165-0166; Ex. 1020, 1[b].

Lefevre discloses that the first timeslot TS0 initiates a pulse of period P1 (corresponding to the prior beacon period) by broadcasting the previous common activation signal (corresponding to the prior beacon). Ex. 1008, ¶¶0210-0214, 0221-0225.

Lefevre further discloses that in the prior beacon period, during the timeslot TS0, the unpaired localisation module transmits a signal (corresponding to the ACK of the prior beacon), and if the central processing system receives a signal from the localisation module at the timeslot TS0, the central processing system emits a secondary activation signal at the end of each unassigned timeslot. After all the timeslots are allocated to corresponding localisation modules, at the beginning of each periodic pulse of period P1, the central processing system sends an activation

instruction (corresponding to an uplink packet) to all the localisation modules that transmit signals and occupy corresponding time slots. Ex. 1008, ¶¶0213-0231.

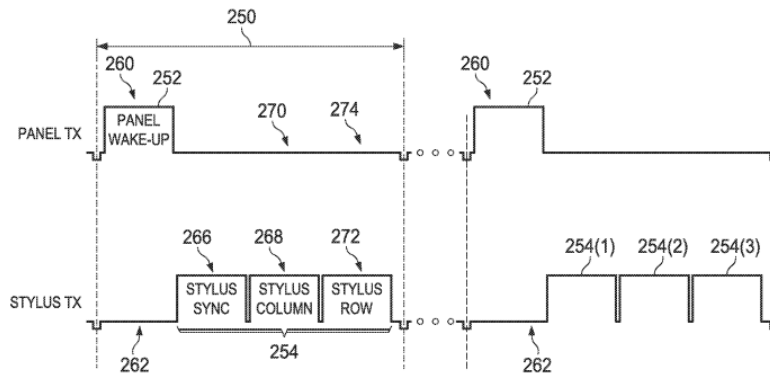
Chandran discloses the control circuitry of the touchpad “causes a wake-up signal to be applied by panel to each column 115 and row 117 of interconnected capacitive-sensing nodes 113 in accordance with the panel transmit periods 252.” Ex. 1009, 6:37-6:44. “The wake-up signal may be modulated to carry information if desired.” *Id.*



“[T]he wake-up signal...may be modulated to include stylus identification information...The stylus identification information may comprise an identification that is unique to a particular stylus...The receiving stylus 130 functions to compare its stylus identification value to the stylus identification information included in the

wake-up signal.” *Id.* 7:23-7:43. Thus, a POSITA would understand the signal (or beacon) from the panel (or input device) contains a pen ID. Ex. 1020, 1[b].

FIG. 8



Additionally, Chandran discloses, with respect to Fig. 4, “[i]n step 160, the control circuitry 120 causes a periodic signal to be applied to each column 115 and row 117 of interconnected capacitive-sensing nodes 113 in accordance with the panel transmit periods 152...the periodic signal may comprise a dedicated frequency (carrier) signal that is injected into each column 115 and row 117 of interconnected capacitive-sensing nodes 113 by the control circuitry 120. The periodic signal may, if desired, be modulated with information to be communicated to the stylus from the panel.” Ex. 1009, 5:12-5:53. A POSITA would understand the signal (or beacon) from the panel (or input device) contains a frequency. Ex. 1020, 1[b].

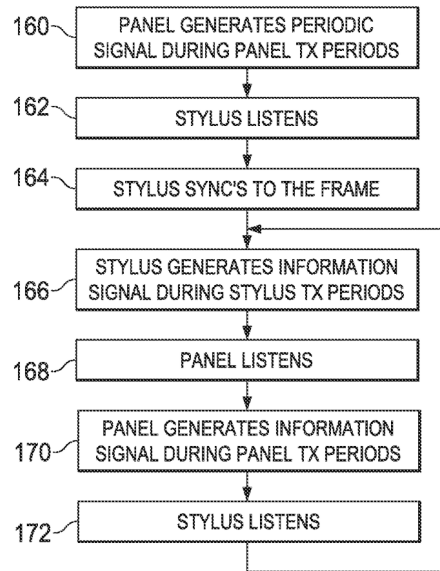


FIG. 4

Additionally, Chandran discloses “a time division multiplexed operation” communication mode. Ex. 1009, 4:51-5:8, Fig. 3:

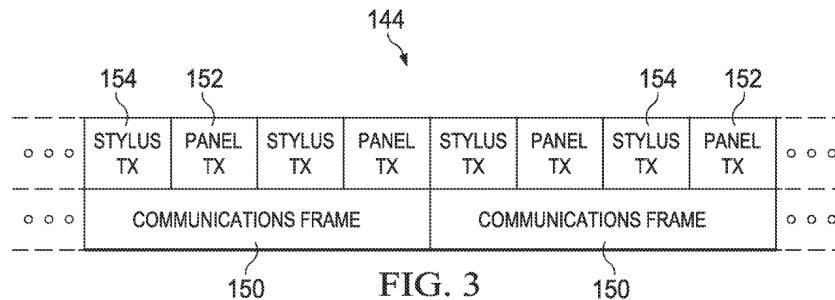


FIG. 3

This shows a plurality of timeslots. Ex. 1020, 1[b].

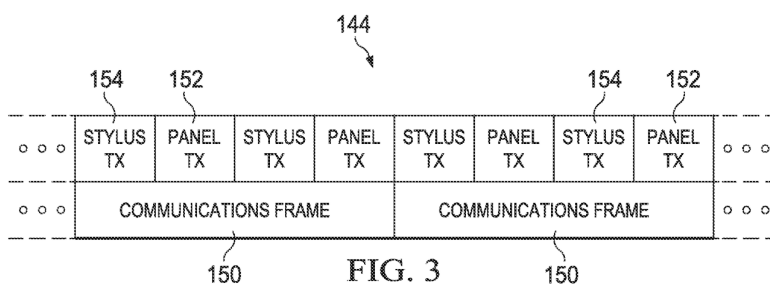
d. 1[c]

Lefevre discloses that the mobile elements (i.e., the active pens) have a localisation module with a “means for emitting a signal,” as well as a “means for receiving an activation signal” from a computer. Ex. 1008, ¶¶0010, 0027-0031. Because

the localization module can transmit and receive signals, a POSITA would understand it has a transceiver. Ex. 1020, 1[c].

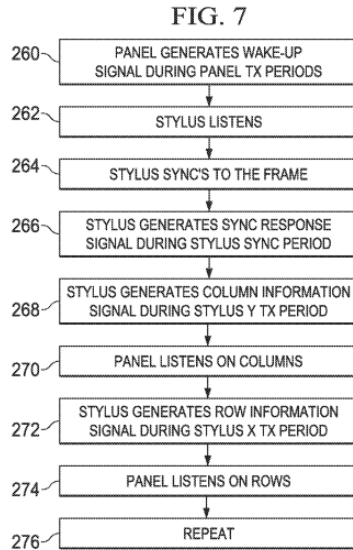
Lefevre discloses that, during its designated timeslot, the active pen can transmit information such as button status. Ex. 1008, ¶¶0261-0262.

Chandran discloses the control circuitry 120 and the active stylus 130 engage in a bidirectional communication. Ex. 1009, 2:49-60. The control circuitry 120 is a component of the capacitive sensing panel (i.e., a touchpad). *Id.* Fig. 1, 2:23-2:24, 4:53-5:8, Fig. 3:



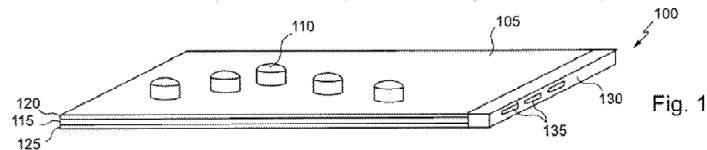
A POSITA would understand the active stylus has a transceiver for this bidirectional communication. Ex. 1020, 1[c].

Chandran discloses that, during its designated timeslot, the active pen can transmit information such as button status. At “step 268, the stylus 130 generates a column information signal for communication to the panel” which may “include button and pressure information.” Ex. 1009, 6:34-7:13, Fig. 7.



e. 1[d]

Lefevre discloses the concurrent use of multiple mobile elements (“110”), or active pens. Ex. 1008, ¶0056, Fig. 1:



A POSITA would understand Lefevre’s disclosures described in 1[c] apply to a second active pen. Ex. 1020, 1[d].

Chandran discloses the concurrent use of multiple styluses, or active pens. Ex. 1009, 7:44-7:45, 7:57-7:58, Fig. 10:

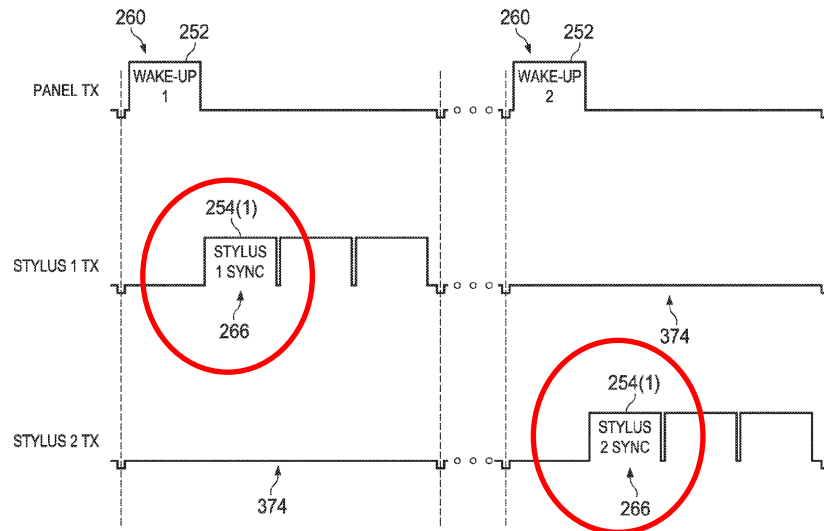
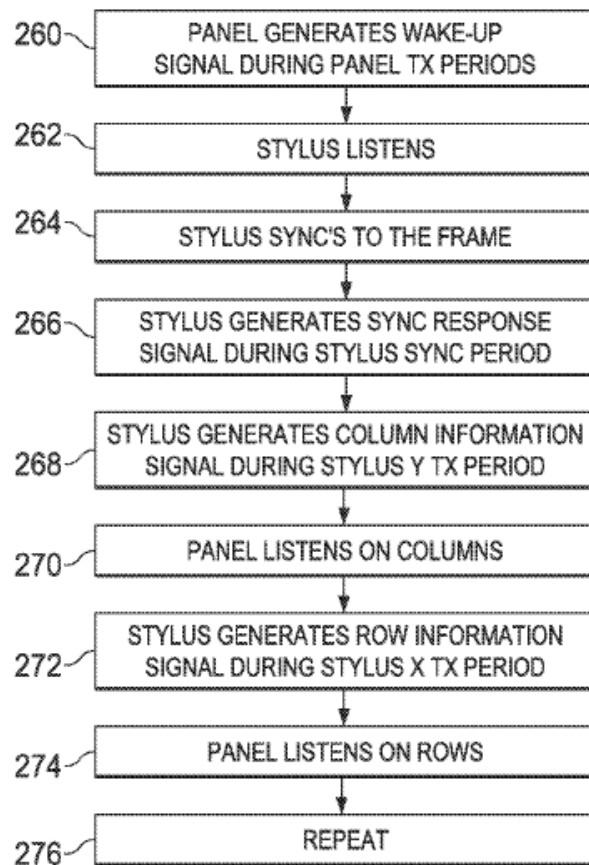


FIG. 10

FIG. 7



A POSITA would understand Chandran's disclosures described in 1[c] apply to a second active pen. Ex. 1020, 1[d].

f. 1[e]

Lefevre discloses "a hardware module 130 (or central processing system) to detect the position and, if necessary, the orientation of the mobile elements 110." Ex. 1008, ¶¶0057, ¶¶0058-0059. A POSITA would understand the hardware module contains a determination module for this detection. Ex. 1020, 1[e].

Chandran discloses the control circuitry of the touchpad "causes a wake-up signal to be applied by panel to each column 115 and row 117 of interconnected capacitive-sensing nodes," and that it "may be modulated to carry information if desired." Ex. 1009, 6:37-6:44. A POSITA would understand the processing system of the touchpad must have a determination module. Ex. 1020, 1[e].

Lefevre and Chandran disclose 1[e]. *Id.*

g. 1[f]

Lefevre discloses the activation process for localisation modules through an activation signal and the generation of an upstream packet. *See* 1[b]. Lefevre further discloses the upstream packet contains the index i (identification code), specifying a corresponding index i (identification code) associated with a mobile element, which a POSITA would understand as a pen ID. Ex. 1008, ¶¶0165-0166; Ex. 1020, 1[f].

Chandran discloses the control circuitry of the touchpad “causes a wake-up signal to be applied by panel to...capacitive-sensing nodes,” and that it “may be modulated to carry information if desired.” Ex. 1009, 6:37-6:44. The wake-up signal “may be modulated to include stylus identification information” (i.e., the stylus ID). *Id.* 7:23-7:43. Thus, a POSITA would understand the upstream packet contains a pen ID. Ex. 1020, 1[f].

h. 1[g]

Lefevre and Chandran disclose the transmittal of information from an active pen to the processing system of the input device. Ex. 1008, ¶¶0261-0262; Ex. 1009, 6:34-7:13, Fig. 7 (button data); *see also* 1[c].

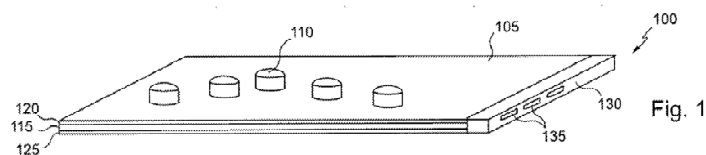
2. Claim 2

a. 2[pre]

See 1[pre]-[g].

b. 2[a]

Lefevre discloses that the mobile elements 110 (i.e., active pens) have what a POSITA would understand to be a transceiver. *See* 1[c]. Lefevre discloses the concurrent use of multiple mobile elements. *See* Ex. 1008, ¶0056; Fig. 1:



Thus, a POSITA would understand each mobile element has a transceiver. Ex. 1020, 2[a].

Chandran discloses that the active stylus (the active pen) has what a POSITA would understand to be a transceiver. *See* 1[c]. Chandran also discloses the concurrent use of multiple styluses, or active pens. *See, e.g.*, Ex. 1009, 7:44-7:45, 7:57-7:58, Fig. 10. Thus, a POSITA would understand each stylus has a transceiver. Ex. 1020, 2[a].

c. 2[b]

Lefevre discloses a “method [that] further comprises a step to transmit at least one item of data from said at least one localisation module to said computer system.” The item of data can represent an identifier, state, or function of the localization module. Ex. 1008, ¶0023.

Chandran discloses a method for the synchronization and use of multiple styluses. *See* 1[c], 2[a]. Chandran also discloses “[t]he unique identification of each responding stylus is stored (in step 372) so as to allow the control circuitry 120 to maintain a record of associated styluses and their identification values.” Ex. 1009, 7:57-8:12 and Fig. 9.

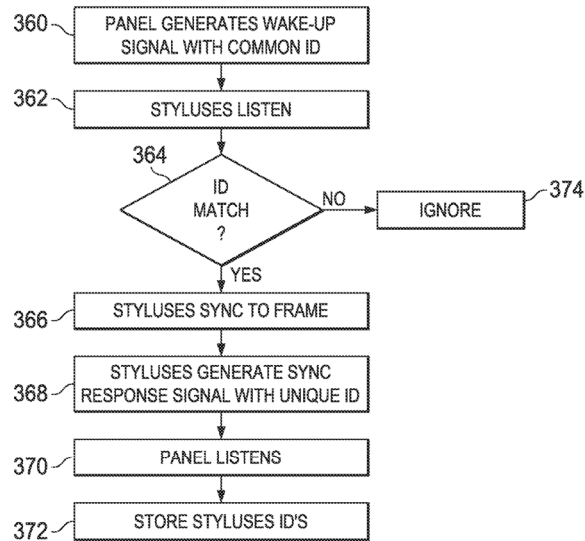


FIG. 9

A POSITA would understand the processing system would determine an attribute of the first active pen, namely that the first active pen is different from the second active pen. Ex. 1020, 2[b].

3. Claim 3

a. 3[pre]

See 1[pre]-1[g].

b. 3[a]

Lefevre discloses the attributes communicated by the mobile elements can include color and erasure data. Ex. 1008, ¶0261 (“...specific characteristics (colour, eraser or line thickness function for a mobile element representing a pencil) can be associated with the different mobile elements. They can be transmitted by the localisation modules...”). A POSITA would expect that the characteristics could include pen tilt data. Ex. 1020, 3[a].

Chandran discloses that different styluses can communicate their different colors to the processing system. Ex. 1009, 7:44-7:52. A POSITA would expect that the characteristics communicated could also include pen tilt and erasure mode data. Ex. 1020, 3[a].

Lefevre and Chandran disclose 3[a]. Ex. 1020, 3[a].

4. Claim 4

a. 4[pre]

See 1[pre]-[g].

b. 4[a]

A POSITA would understand Lefevre's and Chandran's disclosures described in 1[g] above could apply to a second active pen. *See* Ex. 1020, 4[a].

5. Claim 6

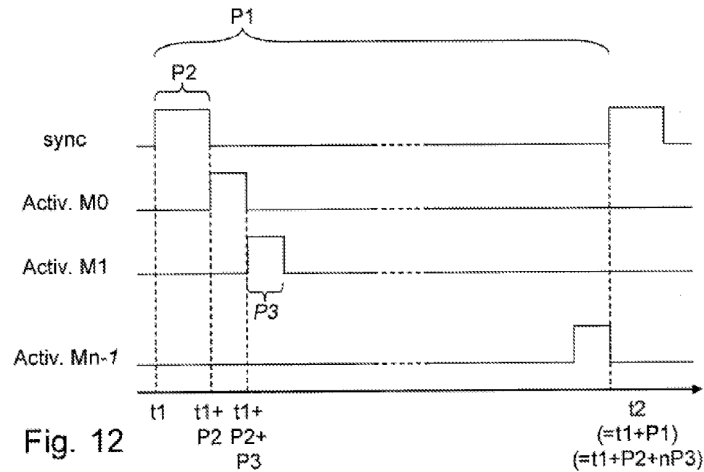
a. 6[pre]

See 4[pre]-[a].

b. 6[a]

Lefevre discloses that “a common activation signal, denoted sync, comprises here periodic pulses, of period P1 and duration P2. The purpose of each pulse is the sequential activation of the localisation modules”. Ex. 1008, ¶0194. As shown in Figure 12, each periodic pulse of period P1 includes a common activation signal (duration P2) and a plurality of timeslots with a period of P3, corresponding here to the duration of activation of each localisation module (P3 is here defined as

$P1 = P2 + n \times P3$, where n represents the number of localisation modules to be activated during a period $P1$). *Id.* ¶0196, Fig. 12.



Lefevre discloses “[a]t each cycle and for each free timeslot,” the timeslot could be chosen “by several localisation modules, which emit during the period of the timeslot: the central processing system detects a collision of signals and continues to indicate that the timeslot is free by emitting a secondary activation signal at the end of the timeslot.” *Id.* ¶0215; Ex. 1020, 6[a].

Chandran discloses a scenario where two or more styluses collide with each other. The control circuitry generates wake up signals again, which a POSITA would consider as detecting, generating, and sending a collision packet. Ex. 1009, 8:29-48; Ex. 1020, 6[a].

c. 6[b]

Lefevre discloses that cases of collisions are resolved by algorithms “such as those mentioned in the section entitled ‘Collision backoff and retransmission’ in the

IEEE 802.3 Ethernet standard.” *Id.* ¶0219. A POSITA would understand this standard utilizes “collision packets.” Ex. 1020, 6[b] (citing IEEE Std 802.3 at 4, 47).

For Chandran, see Ex. 1009, 8:29-48.

d. 6[c]

Ex. 1008 ¶0219 (citing IEEE standard for collision backoff and retransmission); Ex. 1009, 8:29-48; Ex. 1020, 6[c]

e. 6[d]

For Lefevre, a POSITA would understand, based on knowledge of the use of “collision packets” and relevant standards, that, once a collision packet is used, an input device would terminate the transmission and schedule another transmission attempt after a randomly selected time interval. Ex. 1008, ¶¶0224-0232; Ex. 1020, 6[d].

Chandran discloses “when two styluses are close to each other...the control circuitry will ignore the styluses and generate wake up signals again” Ex. 1009, 8:44-48, Fig. 9. A POSITA would understand the wake-up signal is re-sent at a random time interval. Ex. 1020, 6[d].

6. Claim 7

a. 7[pre]

See 1[pre]-[g].

b. 7[a]

Lefevre discloses a step to transmit at least one item of data from a localisation module to the computer system where data can represent an identifier, state, or a function of the localization module. Ex. 1008, ¶0023. A POSITA would understand the data transmitted could include force data. Ex. 1020, 7[a].

Chandran discloses that, during its designated timeslot, the active pen can transmit information such as “pressure information,” which a POSITA would understand to be a “force measurement.” *Id.*; Ex. 1009, 6:34-7:13, Fig. 7.

c. 7[b]

See 1[c].

7. Claim 9

a. 9[pre]

See 1[pre]-[g].

b. 9[a]

Lefevre discloses a “command reception and detection module” which can “detect the frequency of the carrier associated with the localisation module.” Ex. 1008, ¶0136. Lefevre also discloses “[t]he analog identification of a localisation module can be performed by sending a dedicated frequency...in particular according to a carrier frequency specific to each localisation module (this frequency identifies the localisation module which is activated).” *Id.* ¶0147; Ex. 1020, 9[a].

c. 9[b]

Lefevre discloses that each localisation module can have its own “dedicated frequency...according to a carrier frequency specific to each localisation module (this frequency identifies the localisation module which is activated).” Ex. 1008, ¶0147. A POSITA would understand this discloses each localisation modules (i.e., the active pens) can transmit their data using different frequencies. Ex. 1020, 9[b].

8. Claim 10

a. 10[pre]

See 9[pre]-[b].

b. 10[a]

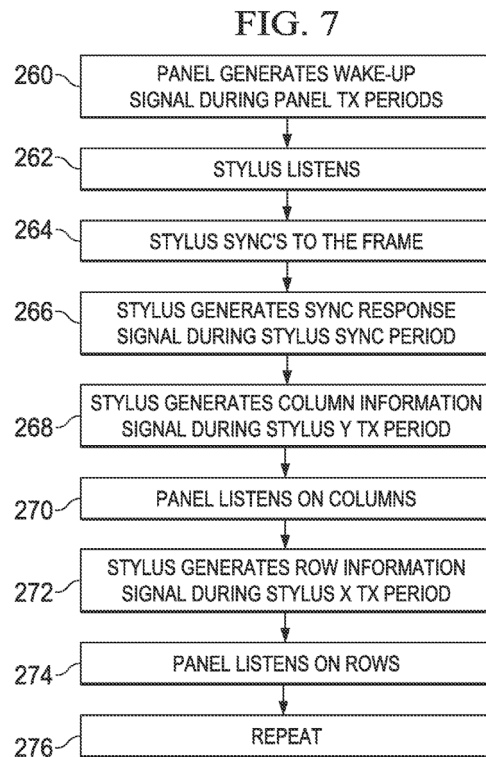
See 1[a].

c. 10[b]

Lefevre discloses the first timeslot TS0 initiates a periodic pulse of period P1 (corresponding to the prior beacon period) by broadcasting the previous common activation signal (corresponding to the prior beacon). Ex. 1008, ¶¶0210-0214, 0221-0225. The above process corresponds to initiating a prior beacon period by broadcasting a prior beacon. Ex. 1020, 10[b].

Chandran discloses that in step 260, the control circuitry causes a wake-up signal to be applied by panel to the capacitive-sensing nodes in accordance with the panel transmit periods. The wake-up signal may take the form of the periodic signal and may be modulated to carry information if desired. In step 262, the stylus

(through its capacitive coupling to the panel) operates in a listen mode and senses change capacitance at the nodes due to the wake-up signal applied by the panel control circuitry. By sensing the transmitted wake-up signal during the periods, the stylus can synchronize itself in step 264 to the communications frame and thus know the timing location of the stylus transmit periods. Ex. 1009, 6:37-6:52, Fig. 7:



In situations with multiple styli, “an initialization or configuration (as with a pairing) operation as shown in FIG. 9 is executed where the stylus identification information in the wake-up signal sent in step 360 is shared in common by a class or group of styluses.” *Id.* 7:57-8:48; Fig. 9:

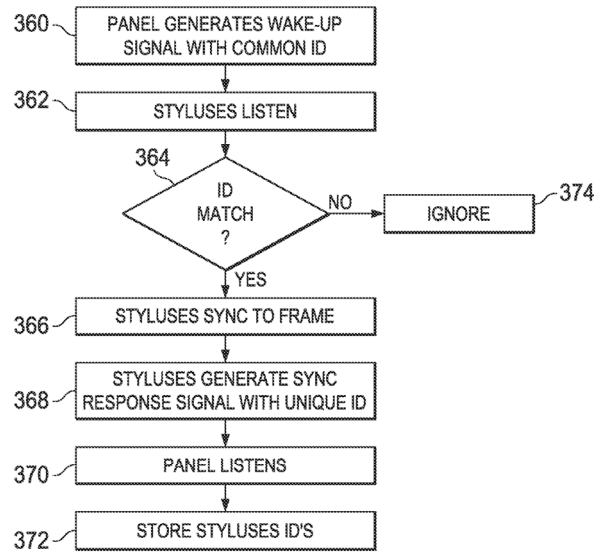


FIG. 9

These processes of generating a “wake-up signal” correspond to a prior beacon. Ex. 1020, 10[b].

d. 10[c]

Lefevre discloses that in the prior beacon period, during the timeslot TS0, the unpaired localisation module transmits a signal (corresponding to the ACK of the prior beacon), and if the central processing system receives a signal from the localisation module at that timeslot, the central processing system emits a secondary activation signal at the end of each unassigned timeslot. Then, after all the timeslots are allocated to corresponding localisation modules, at the beginning of each periodic pulse of period P1, the central processing system sends an activation instruction (corresponding to an uplink packet) to all localisation modules that transmit signals and occupy corresponding time slots. Ex. 1008, ¶¶0213-0231. Thus, Lefevre discloses

that the upstream packet as an activation instruction is generated in response to the acknowledgement, and the upstream packet as an activation instruction further specifies the first timeslot. Ex. 1020, 10[c].

As discussed above in 10[b], Chandran discloses that, in response to the wake-up signal, “[i]f there is a match or correlation regarding identification, the stylus 130 will synchronize itself in step 366 to the communications frame 250 and generate the responsive sync signal for communication back to the panel confirming synchronization to the panel in step 368.” Ex. 1009, 7:35-7:41. A POSITA would understand the “responsive sync signal” functions as an acknowledgment. Ex. 1020, 10[c].

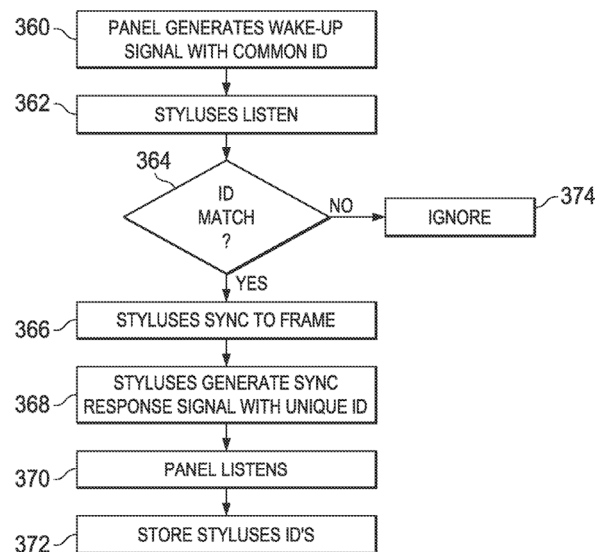


FIG. 9

e. 10[d]

Lefevre discloses that “the first timeslot TS0 begins at the moment of emission of an activation ‘instruction’ of the common activation signal. It is specific and

reserved for the arrival of new localisation modules.” Ex. 1008, ¶0212. The new localisation modules correspond to the unpaired localisation modules or the nonactivated localisation modules. Thus, Lefevre discloses that the first active pen is unpaired during a portion of the prior beacon period. Ex. 1020, 10[d].

Chandran discloses “in step 266, the stylus 130 generates a sync signal for communication to the panel (through its capacitive coupling) during the stylus sync transmit period 254(1) confirming synchronization to the panel and advising the panel to anticipate subsequent communication from the stylus.” Ex. 1009, 6:52-6:56. This is in response to the wake-up signal, meaning that the stylus was unpaired at the time it received the wake-up signal initializing the prior beacon period. Ex. 1020, 10[d]; *see also* Ex. 1009, 8:7-8:28 & Figs. 7, 9.

Lefevre and Chandran disclose 10[d]. Ex. 1020, 10[d].

f. 10[e]

For Lefevre, see Ex. 1008, ¶¶0213-0231 (specifying first timeslot (upstream packet) generated in response to acknowledgment).

Chandran discloses Figure 4 and Figure 5, which are a communication protocol flow diagram and timing diagram, respectively. “From sensing the panel transmitted periodic signal during the periods 152, the stylus 130 is activated and functions to synchronize itself in step 164 to the communications frame 150 and thus know the timing location of the stylus transmit periods 154. In step 166, the stylus

130 generates an information signal for communication to the panel (through its capacitive coupling) during the stylus transmit period 154 of the time division multiplexed frame. The panel operates in a listen mode during the stylus transmit period 154 in step 168 and recovers the transmitted information. **In step 170, the panel generates an information signal for communication to the stylus 130 during the panel transmit period 152.** The stylus 130...operates in a listen mode during the panel transmit period 152 in step 172 and recovers the transmitted information. The steps 166-172 are repeated...to support communication from the panel, communication from the stylus or bidirectional communication of information between the panel and stylus.” Ex. 1010, 5:12-5:45 (emphasis added).

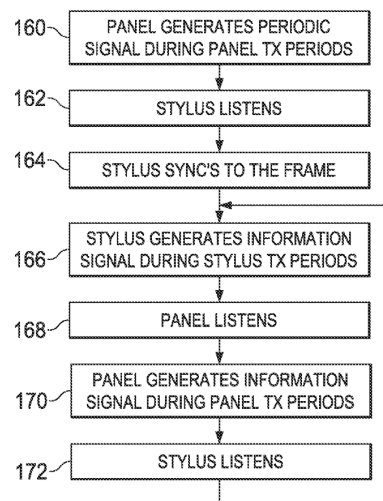


FIG. 4

Thus, in step 170, upstream packet from the input device is generated in response to the acknowledgement. Ex. 1020, 10[e].

g. 10[f]

Lefevre discloses that “the analog identification of a localisation module can be performed by sending a dedicated frequency, according to several modes, in particular according to a carrier frequency specific to each localisation module (this frequency identifies the localisation module which is activated).” Ex. 1008, ¶0147. Lefevre further discloses that “since the localisation modules only emit during timeslots assigned to them, the central processing system is able to identify from which localisation module the received data originate.” *Id.* ¶0240; Ex. 1020, 10[f].

Chandran discloses “an implementation of the communication protocol useful for the communication mode.” Ex. 1009, 5:12-5:45. As part of that protocol, “[f]rom sensing the panel transmitted periodic signal during the periods 152, the stylus 130 is activated and functions to synchronize itself in step 164 to the communications frame 150 and thus know the timing location of the stylus transmit periods 154.” *Id.* 5:26-5:30. A POSITA would understand the upstream packet must specify a timeslot for active pen communication because the stylus “know[s] the timing location of the stylus transmit periods.” *Id.*; Ex. 1020, 10[f].

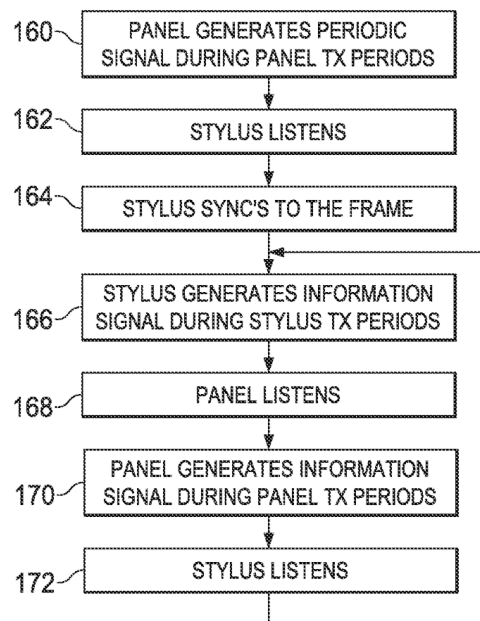


FIG. 4

9. Claim 12

a. 12[pre]

See 1[pre].

b. 12[a]

See 1[b].

c. 12[b]

See 1[b].

d. 12[c]

See 1[c].

e. 12[d]

See 1[d], 9[b].

f. 12[e]

See 1[g].

10. Claim 13

a. 13[pre]

See 12[pre]-12[e].

b. 13[a]

See 2[a].

c. 13[b]

See 2[b].

11. Claim 14

a. 14[pre]

See 12[pre]-12[e].

b. 14[a]

See 2[a]. A POSITA would understand Lefevre's and Chandran's disclosures described in 2[a] and 13[b] apply to a second active pen. Ex. 1020, 1[d].

12. Claim 16

a. 16[pre]

See 14[pre]-14[a].

b. 16[a]

See 6[a].

c. 16[b]

See 6[b]-6[c].

d. 16[c]

See 6[b]-6[d].

13. Claim 17

a. 17[pre]

See 12[pre]-12[e].

b. 17[a]

See 7[a]-7[b].

14. Claim 19

a. 19[pre]

See 12[pre]-12[e].

b. 19[a]

See 10[b].

c. 19[b]

See 10[c].

d. 19[c]

See 10[d].

e. 19[d]

See 10[e].

f. 19[e]

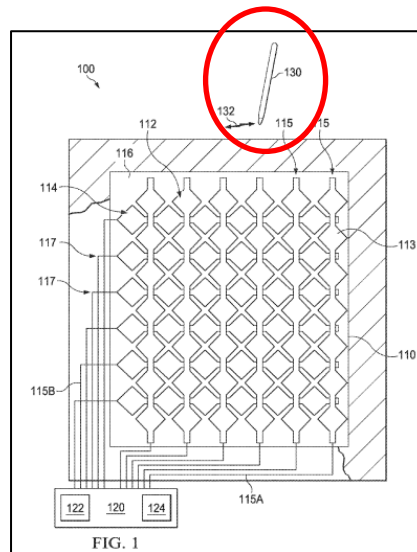
See 10[e].

15. Claim 20

a. 20[pre]

Lefevre provides an example of the mobile element 110 possibly being a pen. Ex. 1008, ¶¶0261-0262. Thus, Lefevre discloses a pen as “a mobile element 110.” Ex. 1020, 14[a].

Chandran discloses an active pen in the form of “active stylus 130.” Ex. 1009, 1:08, 4:51, Fig. 1:



b. 20[a]

Lefevre discloses that a mobile element comprises at least one localisation module, and “the central processing unit 255 transmits to the radio emitter 260 an identifier of a localisation module to be activated...Each localisation module receiving this signal can then compare the identifier received with its own identifier and activate itself if the identifiers are identical.” Ex. 1008, ¶¶0027, 0071.

Because the identifier of the localisation module is stored, a POSITA would understand the localisation module of the mobile element 110 inevitably comprises a memory. Ex. 1020, 20[a]. Therefore, Lefevre discloses an identification (ID) register, as a memory in the localisation module of the mobile element 110, storing a pen identification (ID) as an identifier of the localisation module. *Id.*

Chandran discloses the use of multiple styli where, during pairing, stylus identification information is shared with the styli upon wake-up (pairing) and the stylus compares its stylus identification value with the value in the wake-up signal. Ex. 1009, 7:57-8:12. Because the stylus is comparing the identification received during the wake-up signal with its own stylus identification value, a POSITA would understand the stylus necessarily has an identification register where its identification is stored. Ex. 1020, 20[a].

c. 20[b]

Lefevre discloses that “[f]or the same mobile element, it is also possible to change its characteristics by modifying one of these parameters upon user action (a ring, a thumbwheel, or a switch on the pen for example).” Ex. 1008, ¶0262. To a POSITA, a ring, a thumbwheel, or a switch on the pen could be a button of a pen. Ex. 1020, 20[a]-20[b].

Chandran discloses that the stylus generates information signals for communication to the panel that may “include button and pressure information.” Ex. 1009,

6:61-6:62, 6:64-6:65, 7:6-7:7. Because the stylus may transmit button information, it necessarily has a button. Ex. 1020, 20[b].

d. 20[c]

See 1[c] (discussing the active pen transceivers disclosed in Lefevre and Chandran).

e. 20[d]

See 1[b], 1[f], 12[a] (transmission of a pen ID in the upstream packet sent during the current beacon signal); 10[f] & 19[e] (discussing the transmission of a timeslot and a frequency in the upstream packet during the current beacon signal).

f. 20[e]

See 1[b], 12[b].

g. 20[f]

See 7[b], 17[a].

16. Claim 21

a. 21[pre]

See 20[pre]-20[f].

b. 21[a]

See 10[b].

c. 21[b]

See 10[b].

d. 21[c]

See 10[b]-10[d].

e. 21[d]

See 10[c].

17. Claim 22

a. 22[pre]

See 21[pre]-21[d].

b. 22[a]

See 6[b]-6[c].

c. 22[b]

See 6[c]-6[d].

d. 22[c]

See 6[c]-6[d].

18. Claim 23

a. 23[pre]

See 21[pre]-21[d].

b. 23[a]

The localisation module within the mobile element of Lefevre comprises a “command reception and detection module 710, which receives and demodulates a signal, for example an HF signal, emitted by an external control module for position detection and capture, in order to determine whether the signal received is intended

to activate the localisation module...such detection can be performed by comparing an identifier received with a previously stored identifier.” Ex. 1008, ¶0124; *see also id.* ¶¶0027-0031. A POSITA would understand the localisation module to be a determination module. Ex. 1020, 23[a].

Chandran discloses a stylus capable of “compar[ing] its stylus identification value to the stylus identification information included in the wake-up signal.” Ex. 1009, 7:34-7:43, 7:65-7:67, 8:23-8:25. The Chandran stylus’s ability to detect the identification information in the wake-up signal and determine whether there was a match would inform a POSITA that the stylus has a determination module. Ex. 1020, 23[a].

c. 23[b]

Lefevre discloses “[t]he release of timeslots is managed by the detection of the absence of emission by a localisation module. A time delay is then triggered. If, during the whole of the time delay, the central processing system does not receive an emission from a localisation module, the corresponding timeslot is considered released.” *Id.* ¶0220. The timeslot *i* is the timeslot corresponding to the localisation module labeled *i*. Ex. 1020, 23[b]. Accordingly, if no activation signal (corresponding to a beacon signal) is received from the central processing system (corresponding to the first input device), a POSITA would understand to set a determination module in the localisation module to release the label *i* as well, so as to release the timeslot

occupied by the localisation module, which is allocated by the central processing system. *Id.*

Chandran discloses that “where there is no match or correlation regarding identification” between the input device’s wake-up signal and the stylus’s identification value, “the stylus ignores the wake-up signal.” Ex. 1009, 7:35-7:43. A POSITA would understand this could be the detection of a missing beacon from the first input device. Ex. 1020, 23[b].

d. 23[c]

In view of Lefevre as discussed above, a POSITA would understand the memory that stores the label *i*, such as the ID register, is set to 0 so that the label *i* can be used by other localisation modules. Ex. 1020, 23[c]. Otherwise, if the central processing system releases the label *i* and the localisation module (denoted as localisation module 1) does not release the label *i*, the central processing system assigns the label *i* to another localisation module (denoted as localisation module 2). *Id.* When localisation module 1 approaches the central processing system again, both localisation module 1 and localisation module 2 will use the label *i*, which may cause localisation module 2 to exit the connection with the central processing system and lead to communication interruption. *Id.*

As discussed above with respect to Chandran, when the stylus disclosed in Chandran detects that “there is no match or correlation regarding identification” between the input device’s wake-up signal and the stylus’s identification value, “the stylus ignores the wake-up signal.” *See* 23[b]. At that point, the stylus would function “in a sleep mode.” Ex. 1009, 5:12-5:45. A POSITA would understand the memory (or “register”) that stores the identification value will be reset (i.e., “set to zero”) when the stylus ignores the wake-up signal. Ex. 1020, 23[c]. When the stylus gets activated again, it will listen to a new identification value after which the memory will be overwritten by the newly received identification value. *Id.* A POSITA would reasonably assume that the “pen ID” will also reset when the pen (i.e., stylus) unpairs. *Id.*

19. Claim 24

a. 24[pre]

See 20[pre]-20[f].

b. 24[a]

Lefevre discloses the transfer of data from the input device to the active pen. Ex. 1008, ¶¶0121, 0194, 0237. A POSITA would understand the information communicated could include a user ID. Ex. 1020, 24[a].

Chandran discloses the transfer of data from the input device to the active pen. Ex. 1009, Figs. 4-5, 5:36-5:38, 5:54-5:57. A POSITA would understand the information communicated could include a user ID. Ex. 1020, 24[a].

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

Lead Counsel	Back-Up Counsel
Mark A. Miller Registration No. 44,944 DORSEY & WHITNEY LLP 111 South Main Street, Suite 2100 Salt Lake City, UT 84111-2176 Tel: (801) 933-4068 Fax: (801) 933-7373 miller.mark@dorsey.com	Erin Kolter (<i>pro hac vice</i> to be filed) DORSEY & WHITNEY LLP Columbia Center 701 Fifth Avenue, Suite 6100 Seattle, WA 98104 Tel: (206) 903-8800 Fax: (206) 299-3849 kolter.erin@dorsey.com Payton George (<i>pro hac vice</i> to be filed) DORSEY & WHITNEY LLP 1401 New York Ave. NW, Suite 900 Washington DC, 20005 Tel: (202) 442-3000 Fax: (202) 315-3478 george.payton@dorsey.com

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.

IX. Service (37 C.F.R. §§42.6(e) and 42.105(a))

Attached is proof of service on Patent Owner through counsel listed at the USPTO for the '519 Patent.

Dated: September 10, 2025

Respectfully submitted,

/Mark Miller/

Mark Miller

Registration No. 44,944

DORSEY & WHITNEY LLP

Telephone: +1(801) 933-4068

Attorney for Petitioner

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

Under the provisions of 37 C.F.R. §42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 9,977,519 totals 13,995 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 2502 used to prepare the document.

Dated: September 10, 2025

Respectfully submitted,

/Mark Miller/

Mark Miller

Registration No. 44,944

DORSEY & WHITNEY LLP

Telephone: +1(801) 933-4068

Attorney for Petitioner

CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on September 10, 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.

FBFK/Synaptics
Bernice Chen
3200 Southwest Freeway, Suite 3200
Houston, TX 77027
United States

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

Via E-mail:

Michael Zachary
Marc Belloli
Richard Lin
Jerry D. Tice II
BUNSOW DE MORY LLP
701 El Camino Real
Redwood City, CA 94063
mzachary@bdiplaw.com
mbelloli@bdiplaw.com
rlin@bdiplaw.com
jtice@bdiplaw.com
BDIP-Wacom_Maxeye@bdiplaw.com

Elizabeth L DeRieux
CAPSHAW DERIEUX LLP

114 E Commerce Avenue
Gladewater, TX 75647
(903) 845-5770
ederieux@capshawlaw.com

Via FedEx

Richard Lin
Jerry D. Tice II
BUNSOW DE MORY LLP
701 El Camino Real
Redwood City, CA 94063

Attorneys for Plaintiff Wacom Co., Ltd.

/Mark Miller/
Mark Miller
Registration No. 44,944
DORSEY & WHITNEY LLP
Attorney for Petitioner