

EXHIBIT A-2
Kremin alone and in view of Kaneko
U.S. Patent No. 9,280,220

Upon information and belief, U.S. Patent Publication No. 20120105362 to Kremin et al. (“Kremin”) (published published May 3, 2012) either expressly, implicitly, or inherently anticipates the asserted claims of U.S. Patent No. 9,280,220 (“’220 Patent”) under 35 U.S.C. § 102 and/or renders those claims obvious under 35 U.S.C. § 103 alternatively in view of Japanese Patent Application No. 2008-152640 (“Kaneko”) as set forth in the chart below.

A person of ordinary skill in the art would have been motivated to modify the technology of Kremin based on Kaneko for the obvious benefit of providing additional status information related to the stylus. Katabami, 16:34-42. One of ordinary skill would be motivated to combine Kaneko with Kremin because both are in the same area of art and Kaneko provides additional information about modulating and demodulating sensor data.

The following contentions are subject to revision and amendment pursuant to Federal Rule of Civil Procedure 26(e) and the Court Orders in this matter subject to further investigation and discovery regarding the references.

1[a] one or more sensors;

Kremin claims multiple types of sensors in multiple embodiments, including force sense data, battery data, acceleration data, and button status data. Kremin at Claims 1–4. Kremin claims a force sensor 1360 that may be either a passive sensor or an active sensor within the stylus, and a motion sensor to detect motion of the stylus. Kremin at Claims 2-3, 11–13, ¶ [00109]. Accordingly, Kremin discloses limitation 1[a].

Kremin further discloses an embodiment includes a microcontroller block 1305 with buttons 1340, 1341, from which pushes are detected adding additional functionality such as a “left click” and “right click” function. *Id.* ¶ [00105], [00108]. A person of ordinary skill in the art would appreciate that a button is a kind of a sensor, which can output a value such as a binary value. Claim 4 of the ‘220 Patent itself recites that the one or more sensors may comprise “a button.” Kremin describes the buttons themselves as being mechanical, electrical, capacitive, or other types known by one of ordinary skill. *Id.* ¶ [00108]. A person of ordinary skill would understand that capacitive detection, and a capacitive “button,” requires a capacitive sensor—a type of sensor. *Id.* ¶ [00108]. Similarly, Kremin discloses an embodiment wherein the orientation or acceleration of the stylus may be detected by an accelerometer—an inertial sensor that measures a change in velocity of an object over time. *Id.* ¶ [00109]. A person of ordinary skill in the art would recognize an accelerometer as a sensor which senses movement to measure acceleration. Kremin therefore discloses not only an embodiment with a force sensor but an embodiment with multiple sensors, including a force sensor, a motion sensor, buttons (which may be capacitive sense buttons), and an accelerometer/inertial sensor.

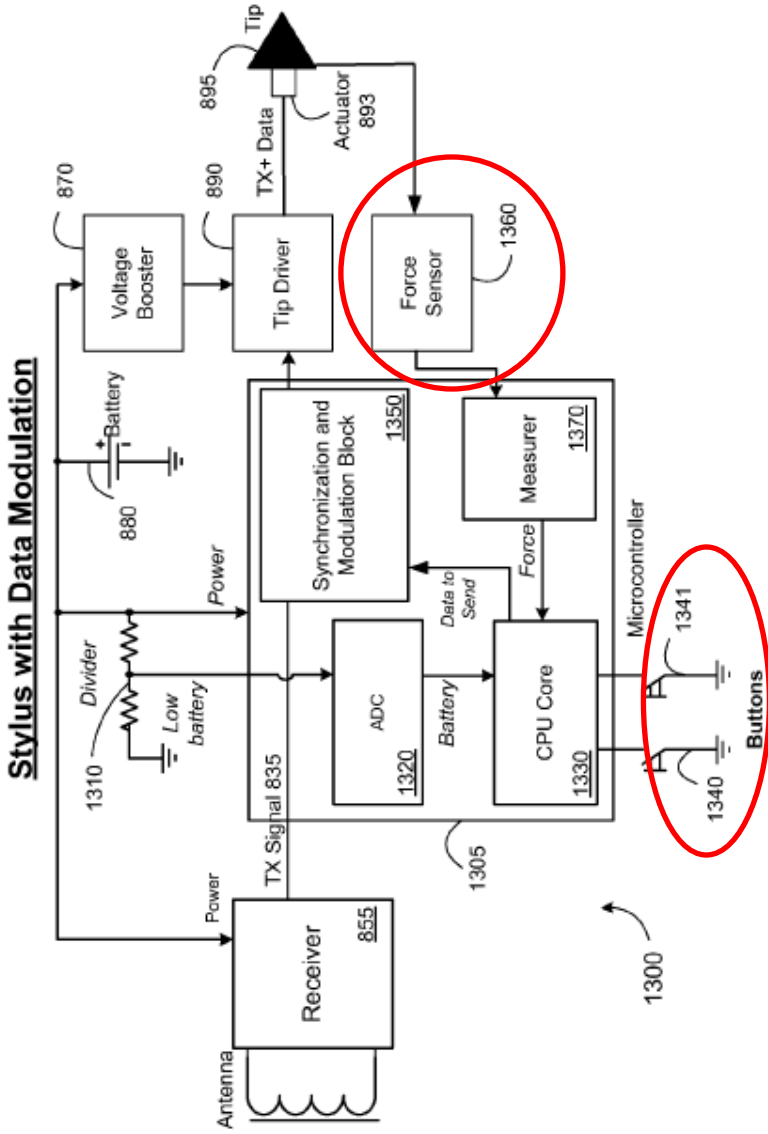


FIG. 13 of Kremin

1|b| one or more electrodes configured to communicate with a device by receiving signals from and transmitting signals to a touch sensor of the device; and

The stylus 850 of Kremin contains a stylus tip 895 by which the stylus transmit signal is capacitively coupled to the capacitive sense array. Kremin Claim 6, ¶ [0085]. Capacitive coupling is a transfer of electric signals that inherently requires a pairing of electrodes by proximity—a person of ordinary skill would understand that the tip 895 must comprise an electrode.

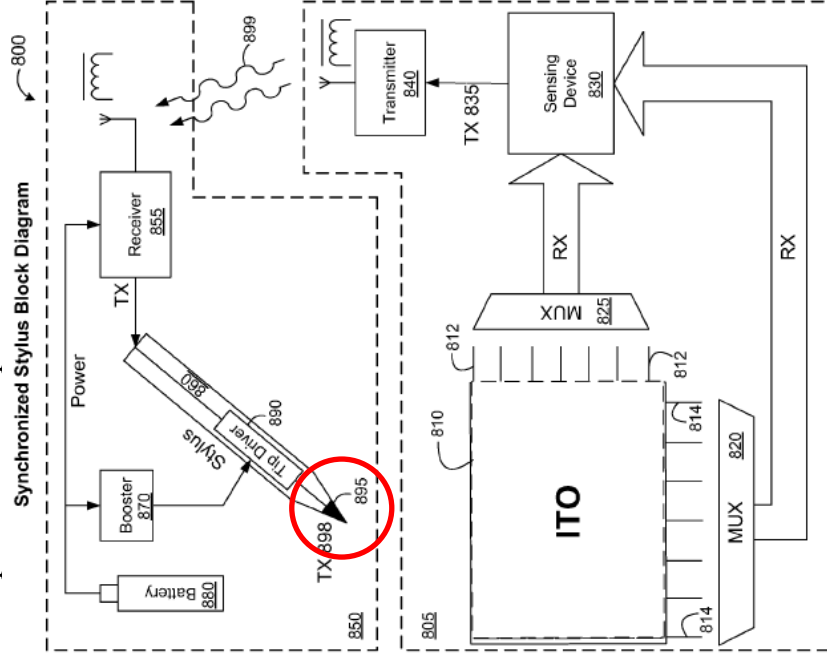


FIG. 8 of Kremin

And in describing the position tracking system for the stylus, Kremin discloses that the row 660 and column 640 electrodes in the sense array are capacitively coupled to the stylus 680, detecting the charge coupled at the contact point 695 with the stylus—this is inherently only possible if there is electrode in the stylus, as well. Kremin ¶ [0073].

The stylus 850 of Kremin contains a stylus tip 895 by which the stylus transmit signal is capacitively coupled to the capacitive sense array. Kremin Claim 6, ¶ [0085]. Capacitive coupling is a transfer of electric signals that inherently requires a pairing of electrodes by proximity, including by touch—a person of ordinary skill would understand that the tip 895 must comprise an electrode, and therefore there is at least one electrode configured to communicate with a device.

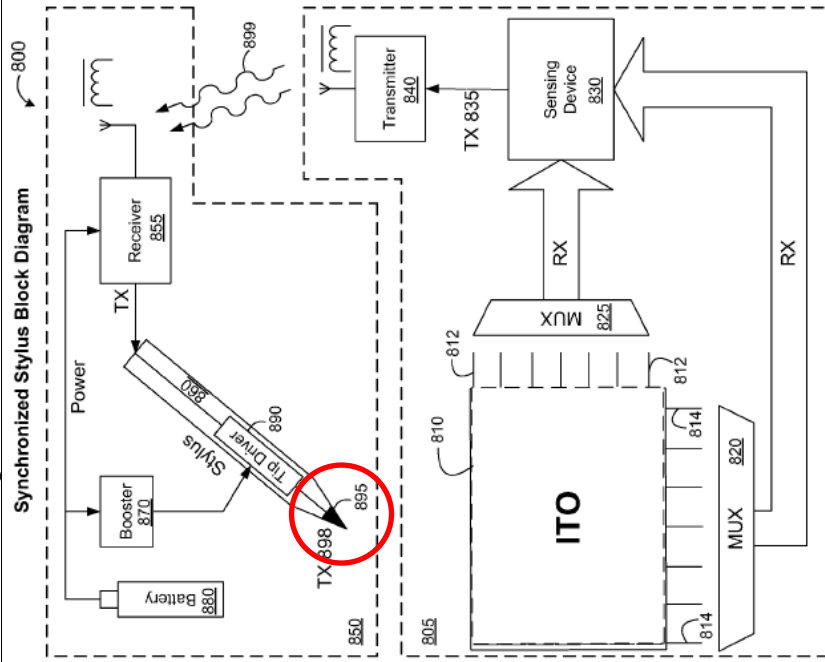


FIG. 8 of Kremin

Kremin further discloses that the stylus 850 communicates with the device through an initial signal 835 that goes through a transmitter 840 and is sent 899 to the stylus receiver 855; the tip driver 890 drives or amplifies (with booster 870) the transmit signal 835, and the stylus tip 895 capacitively couples the amplified stylus transmit signal 898 to the device's touch sense array 810. Kremin ¶¶ [0082]–[0085]. A person of ordinary skill would understand that the transmitter 840 and receiver 855 require the use of signal and ground electrodes to transmit and receive electrical signals by nature. Kremin therefore discloses a stylus containing one or more electrodes that communicate with a device by receiving and transmitting signals, and as such discloses limitation **1b**].

1[c] one or more computer-readable non-transitory storage media embodying logic that is operable when executed to:

Kremin discloses a stylus 850 that contains a receiver 855 that receives signals 835, 899 from the sensing device and pushes that signal through the tip driver 890, which may boost the voltage of the signal via the booster 870, to the stylus tip 895, by which the amplified stylus transmit signal is capacitively coupled to the capacitive sense array. Kremin ¶ [0085]. A person of ordinary skill would appreciate that the stylus 850 includes at least one computer-readable non-transitory storage medium (e.g., memory) containing the necessary logic to control the operations of the receiver, tip driver, and booster, and ultimately the process by which the stylus receives, processes, and transmits signals.

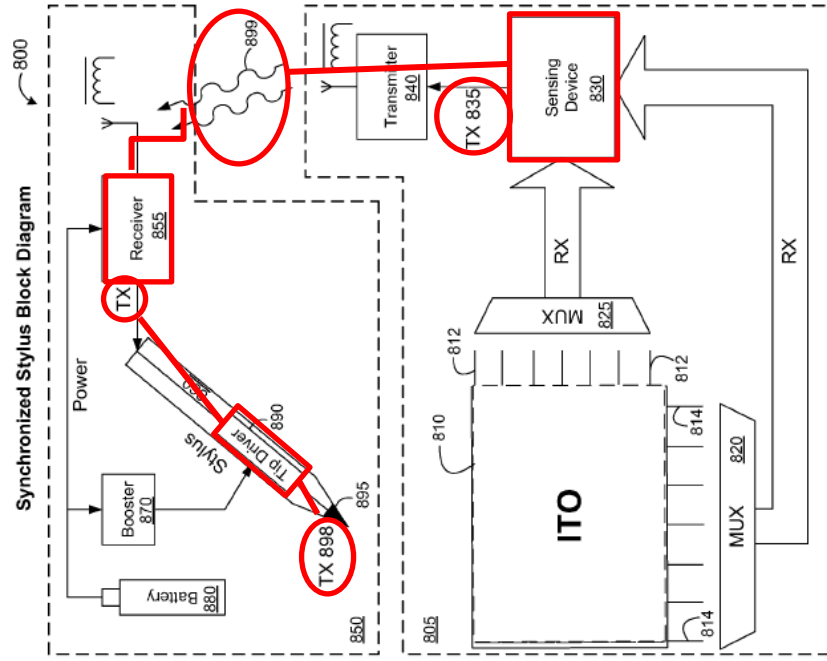


FIG. 8 of Kremin

Kremin further discloses an embodiment with a CPU (central processing unit) core 1330 to process signals such as force data detected from a force sensor 1360 and send it to a modulator which then sends it to a tip driver 890. Kremin ¶¶ [00107]–[00109]. A person of ordinary skill would understand that a CPU contains at least two elements, a control unit and an arithmetic-logic unit—the control unit contains circuitry to direct the system to execute stored instructions and the arithmetic-logic unit executes all arithmetic and logical operations.

Stylus with Data Modulation

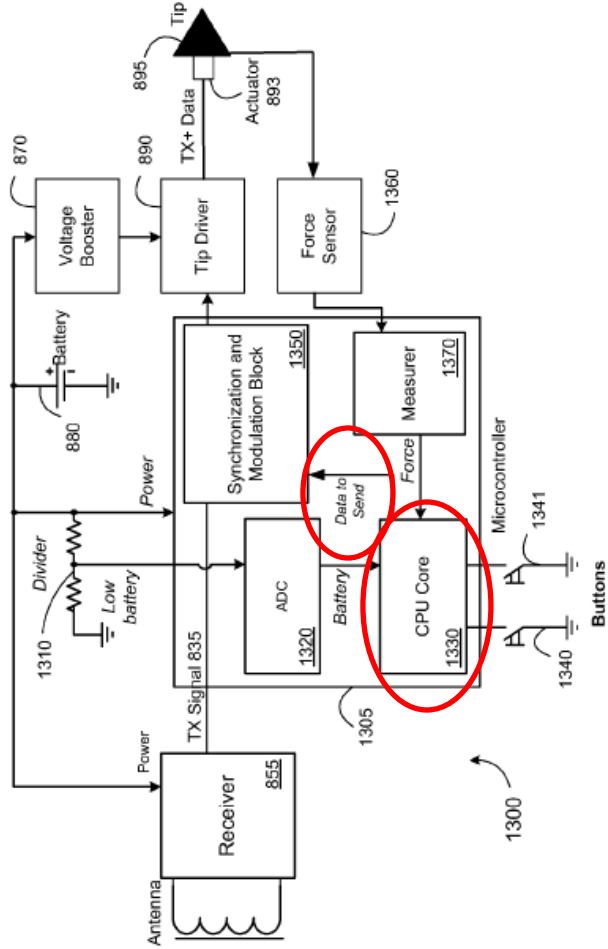


FIG. 13 of Kremin

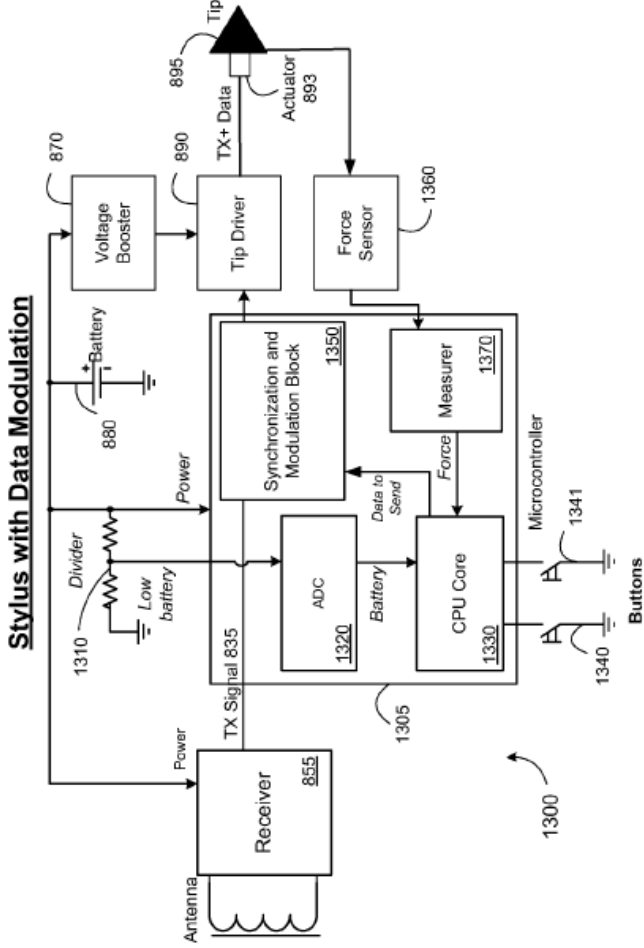
Lastly, Kremin discloses that embodiments may be implemented in a manner that includes instructions stored on a computer-readable medium. Kremin ¶ [00140]. The instructions may be used to program a processor to perform the described operations. *Id.* Kremin lists a non-exhaustive variety of computer readable storage media, including random access memory or optical disks; such storage is “non-transitory,” or unchanging. *Id.* A person of ordinary skill would understand the storage mediums described by Kremin as computer-readable non-transitory storage media, and would understand that instructions are operable logic to control the operations of the stylus. Accordingly, Kremin fully discloses limitation 1[c].

1[c1] receive sensor data from the one or more sensors;

As described above, in an embodiment the CPU core 1330 of Kremin is coupled with the force sensor 1360 and measurer 1370, which then processes the force signal or other signal to send it to the synch mod block 1350 to be converted to a signal. Kremin ¶ [00109]. The CPU core 1330 may also be connected to the buttons (which are identified as sensors by claim 4 of the ‘220 patent, by Plaintiff’s infringement contentions, and which may be capacitive sensors by definition), and it processes the button input data. The stylus is therefore receiving sensor data from the one or more sensors. Accordingly, Kremin discloses limitation 1[c1].

1[c3] generate a second signal by modulating a carrier signal based on the sensor data; and

As described above, the stylus 850 in Kremin contains a receiver 855 that receives a signal 835, 899 generated from the sensing device 830. Kremin at Claims 1, 6, 7, ¶ [0085]. In an embodiment, the synch mod block 1350 is configured to modulate additional data into the carrier’s TX signal 835 (received by the stylus in the receiver 855) incorporating the sensor data. *Id.* ¶ [00105]. Some types of additional data that may be modulated into the stylus TX signal 835 include battery charge data, acceleration data, 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. *Id.* ¶ [00106]–[00109]. Kremin therefore discloses claim 1[c3].



Kremin describes an embodiment where the synch mod block 1350 modulates by a non-exhaustive list of modulation schemes, including phase modulation, pulse position modulation, binary phase shift keying, and other modulation schemes that would be appreciated by a person of ordinary skill. *Id.* ¶ [00110]. Kremin states that binary phase shift keying is one of several preferred modulation schemes for adding additional data to a signal and describes its benefits in signal-to-noise ratio and reiterates that other modulation schemes may be used as would be known by a person of ordinary skill with the benefit of that disclosure. *Id.* ¶ [115]. Figure 15C of Kremin uses as an example the encoding of button data by binary phase shift keying, where the button is pressed 1570 or not pressed 1580.

Plaintiff’s infringement contentions for limitation 1[c3] specifically describe the carrier signal that modulates using differential binary phase shift keying, and also describes that as “a form of phase modulation.” More specifically, it is a form of binary phase shift keying, with 180 degree shifts described exactly in line with Kremin, *id.* ¶ [00115], and including waveforms mirroring the wave pulse 1500 in Figure 15A of

Claim 1

Example Disclosures in Prior Art

Kremin. Kremin fully discloses limitation 1[c3], and a person of ordinary skill would use variations to the modulation scheme with the benefit of that disclosure as used in the ‘220 patent.

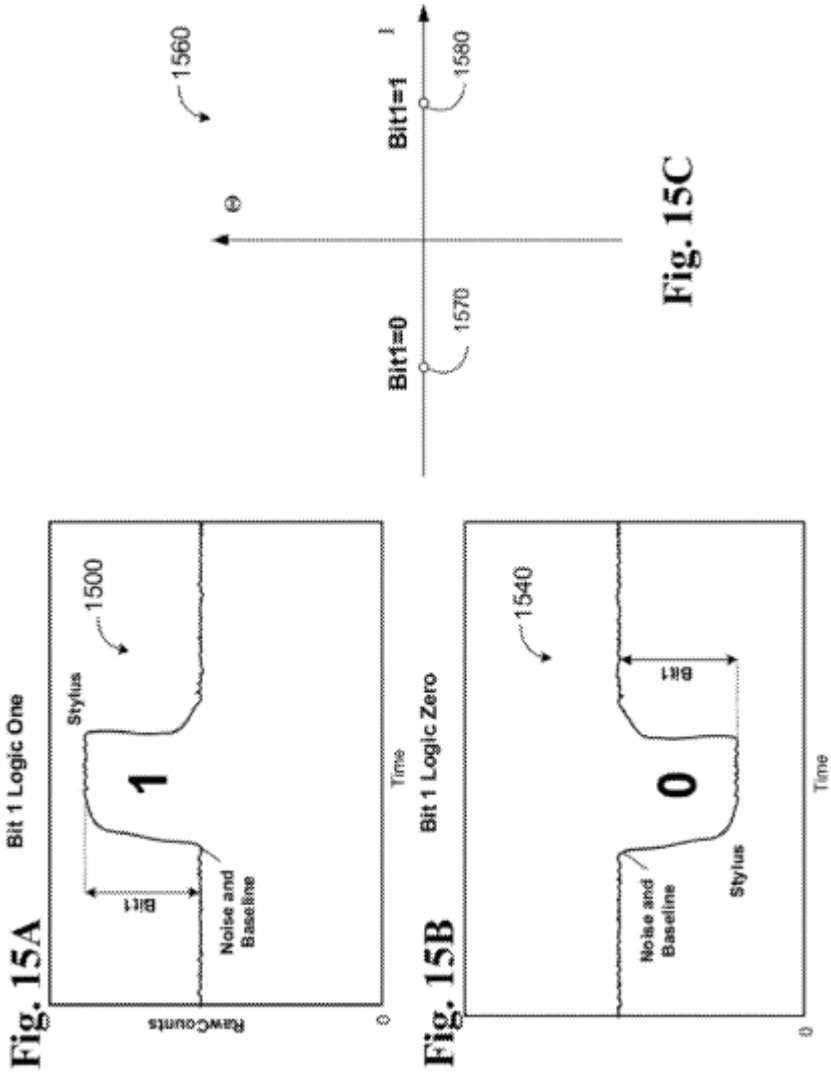


FIG. 15 of Kremin

1[c4] transmit to the device, in response to the first signal, the second signal, the sensor data being obtainable by demodulating the second signal.

As described above, the stylus 850 in Kremin contains a receiver 855 that receives a signal 835, 899 generated from the sensing device 830. Kremin ¶ [0085]. In an embodiment, the synch mod block 1350 is configured to modulate additional data into the carrier's TX signal 835, incorporating the sensor data. *Id.* ¶ [00105]. The stylus 850 contains a stylus tip 895 through which the stylus transmit signal 898 is capacitively coupled to the capacitive sense array. *Id.* Claim 6, ¶ [0085].

Figure 14 of Kremin illustrates the modulation 1405 and demodulation 1435 process on a data stream, according to one embodiment of the invention. Kremin ¶ [00112]. Kremin describes an embodiment where a modulated transmit signal 1430 is sent from the stylus, incorporating the transmit data signal 1410 embodied as the stylus's transmit data signal and additional data 1420 embodied as force and button data from the stylus. *Id.* ¶ [00113]. The modulated signal 1430 combining the transmit signal and data signal is transmitted from the stylus to the device, either via capacitive coupling between the tip 895 and the device's sense array or wirelessly from the stylus 850 to the sensing device 830. *Id.* The signal 1430 arrives at a demodulator block 1435. *Id.* ¶ [00114]. In one embodiment, the received signal arrives to the device as current spikes 1440, which are demodulated into a signal 1450 that is further processed into decoded data corresponding to the additional data 1420. *Id.*

Kremin therefore discloses that the second signal is transmitted responsive to the first signal and sends the sensor data through that second signal, obtainable through demodulation; Kremin discloses limitation **1[c4]**.

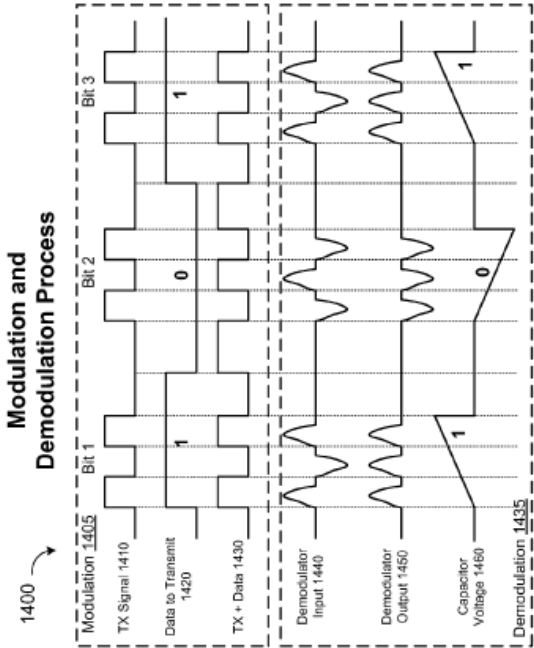


FIG. 14 of Kremin

To the extent Plaintiff contends Kremin does not expressly, implicitly, or inherently disclose the substance of limitation **1[c4]**, one of ordinary skill in the art would, based on one's knowledge and Kremin, understand how to modify Kremin to meet this limitation. Alternatively, one of ordinary skill could modify Kremin in view of Kaneko to meet this limitation. One of ordinary skill would be motivated to combine Kaneko

with Kremin because both are in the same area of art and Kaneko provides additional information about modulating and demodulating sensor data.

Kaneko discloses a stylus/electronic pen with a pressure detection mechanism, that is, a sensor to detect pressure from the stylus. Kaneko ¶ [0024]. After converting the detected signal (the pressure sensed by the stylus/pen) to digital form, the signal is modulated via a modulation circuit in the stylus and incorporated into the electric current (or signal) flowing from the stylus to the device. *Id.* The controller unit in the device 120 includes a transmission and reception processing unit 130 with a receiving circuit 133 to detect the electronic field/signal 134 from the stylus/pen, and then demodulates 133d that signal 134 to a demodulated output 133e. *Id.* ¶ [0037]. By demodulating the change in electric current, the intensity/pressure data from the stylus/pen is obtained by the device. *Id.* ¶ [0024]. Kaneko further discloses an embodiment by which the data from the host 190 side may be transmitted to the stylus/pen; the excitation frequency serves as a carrier and the data being sent can be transmitted by modulating that carrier signal. *Id.* ¶ [0037].

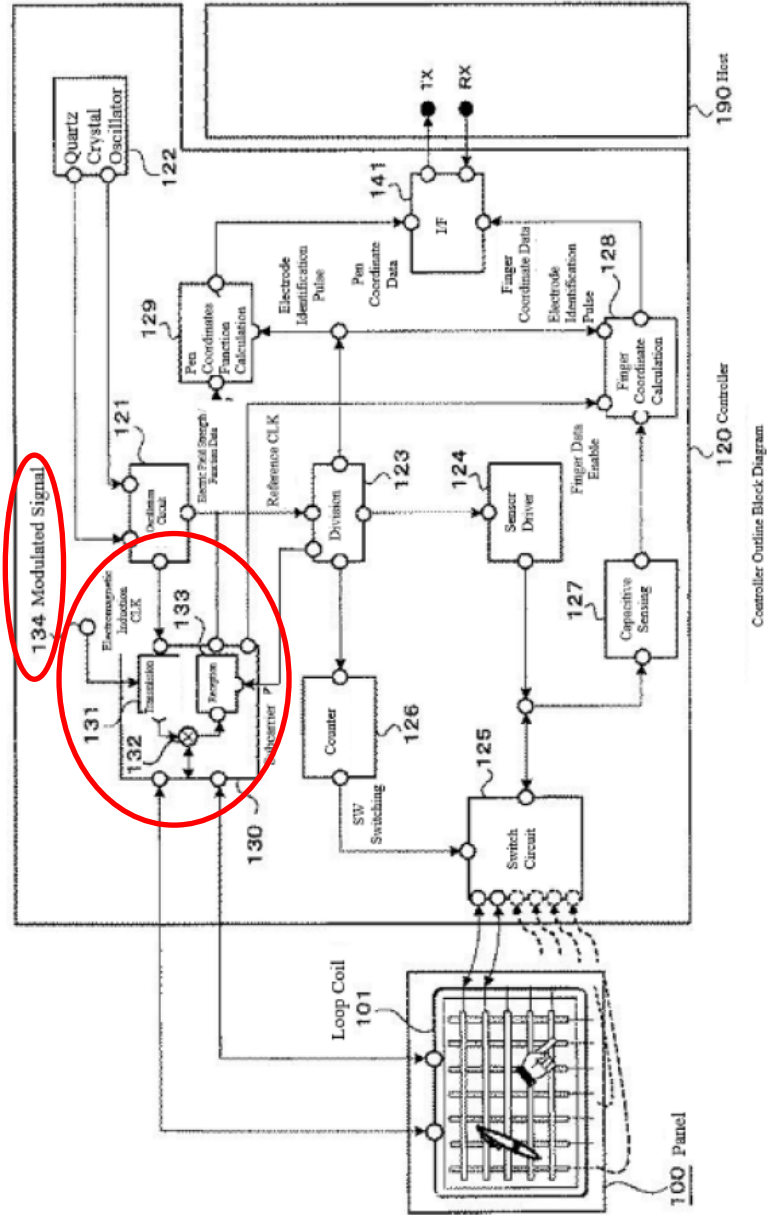
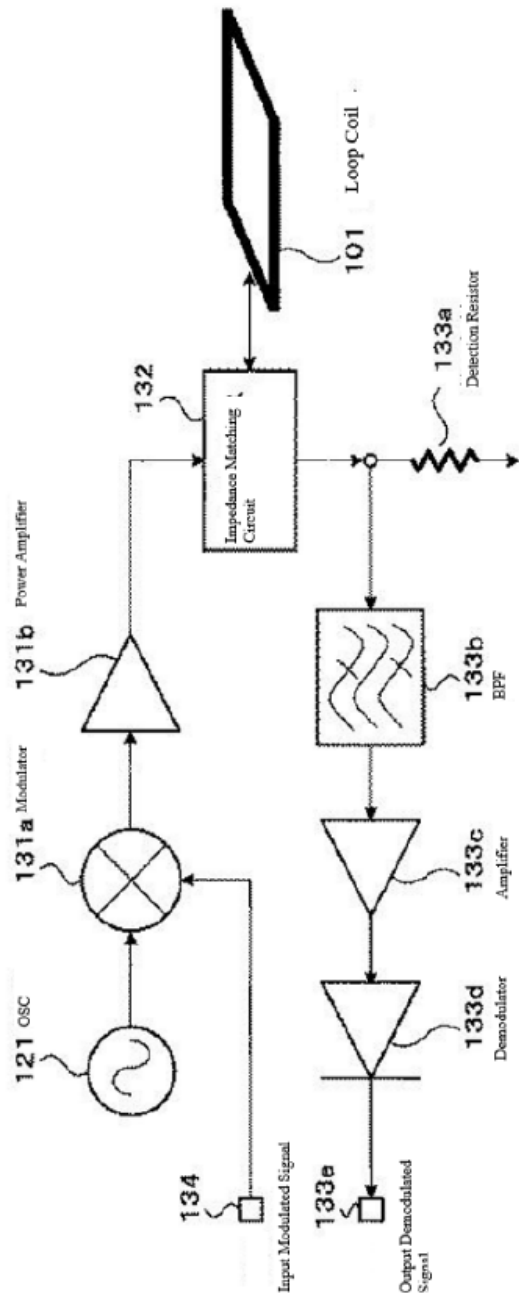


FIG. 3 of Kaneko



Controller Side Transmission and Reception Circuit Configuration

FIG. 4 of Kaneko

3. The stylus of claim 1, wherein the second signal is generated using one of: amplitude modulation; frequency modulation; and phase modulation.

As described above, Kremin describes an embodiment where the synch mod block 1350 modulates the signal by a non-exhaustive list of modulation schemes, including phase modulation, pulse position modulation, binary phase shift keying, and other modulation schemes that would be appreciated by a person of ordinary skill. *Id.* ¶ [00110]. Other modulation schemes include modulation by amplitude modulation, frequency modulation, and phase modulation, which are claimed in Claims 4 and 14. Kremin ¶ [00110], Claims 4, 14. Accordingly, Kremin discloses Claim 3.

Claim 4

4. The stylus of claim 1, wherein:
the one or more sensors comprise a pressure sensor and a button; and
the sensor data comprises pressure data and button state data.

Example Disclosures in Prior Art

Kremin claims multiple types of sensors in multiple embodiments, including force sense data, battery data, acceleration data, and button status data. Kremin at Claims 1–4. Kremin claims a force sensor 1360 to detect the force applied to the stylus via the actuator 893 and tip 895, measured by the measurer 1370. Kremin at Claims 2-3, 11–13, ¶ [00109]. Kremin further discloses an embodiment includes a microcontroller block 1305 with buttons 1340, 1341, from which pushes are detected adding additional functionality such as a “left click” and “right click” function. *Id.* ¶¶ [00105], [00108]. The data from those Kremin therefore discloses a stylus where the specific sensors are force/pressure sensors and a button—a pair specifically illustrated in Figure 13. The additional data to be modulated into the signal is force data and button data, routed through the CPU core 1330 and sent to the sych mod block 1350. *Id.* ¶¶ [00105], [00109]. Figures 19A and 19B further describe how pairs of sensor data may be transmitted together or separately. *Id.* ¶¶ [0044]–[0045]. Kremin discloses claim 4.

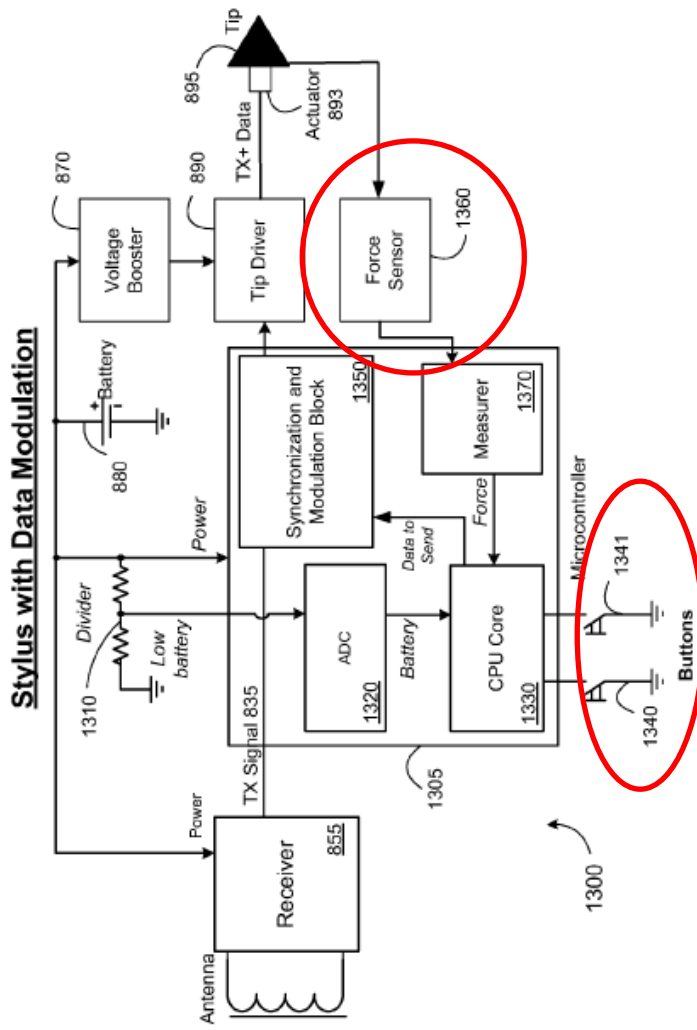


FIG. 13 of Kremin

Claim 5

5. The stylus of claim 1, wherein the sensor data is digital.

Example Disclosures in Prior Art

As discussed above, Kremin claims multiple types of sensors in multiple embodiments, including force sense data, battery data, acceleration data, and button status data. Kremin at Claims 1–4. Kremin claims a force sensor 1360 that may be either a passive sensor or an active sensor within the stylus, and a motion sensor to detect motion of the stylus. Kremin at Claims 2-3, 11–13, ¶ [00109]. Kremin further discloses that other methods may be used to quantitatively determine and digitize a force applied to stylus, implying that the force measurements are necessarily digitized when output as sensor data. *Id.*

Additionally, the data from the buttons 1341 and force sensor 1360 redirect through the CPU core 1330. A person of ordinary skill would understand that to do so, the data would need to be digitized: a CPU can only process digital data, that is, binary discrete values of 0s and 1s. A CPU cannot process analog data, which is continuous and on a range. Accordingly, all sensor data must be digital by nature. Where it is not digital, an analog-to-digital converter (ADC) is necessary 1320, as depicted in Figure 13, which would result in sensor data being digital.

Kremin specifically claims a stylus including that ADC for voltage representative of battery status, embodied in Figure 13. Kremin Claim 8, ¶ [00100]. Specifically, it discloses an embodiment where voltage indicating battery status is processed by the ADC and turned into digital data to be processed by the CPU 1330. *Id.* ¶¶ [00107]. A person of ordinary skill in the art would appreciate that unless specified as analog, many of these forms of information—force data, battery level, etc.—are either already digital or would need to be adapted in the ADC to be processed by the CPU, which is a necessary step before the data can be modulated into a signal.

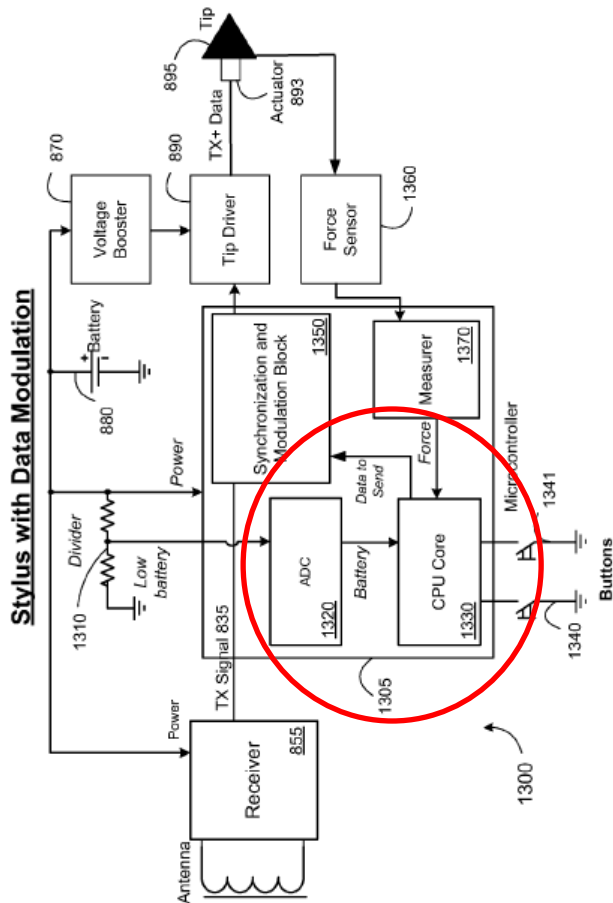


FIG. 13 of Kremin

**7

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pre]
```** One or more computer-readable non-transitory storage media embodying logic that is operable when executed to:

To the extent the preamble is considered limiting, Kremin discloses a stylus 850 that contains a receiver 855 that receives signals 835, 899 from the sensing device and pushes that signal through the tip driver 890, which may boost the voltage of the signal via the booster 870, to the stylus tip 895, by which the amplified stylus transmit signal is capacitively coupled to the capacitive sense array. Kremin ¶ [0085]. A person of ordinary skill would appreciate that the stylus 850 includes at least one computer-readable non-transitory storage medium (e.g., memory) containing the necessary logic to control the operations of the receiver, tip driver, and booster, and ultimately the process by which the stylus receives, processes, and transmits signals.

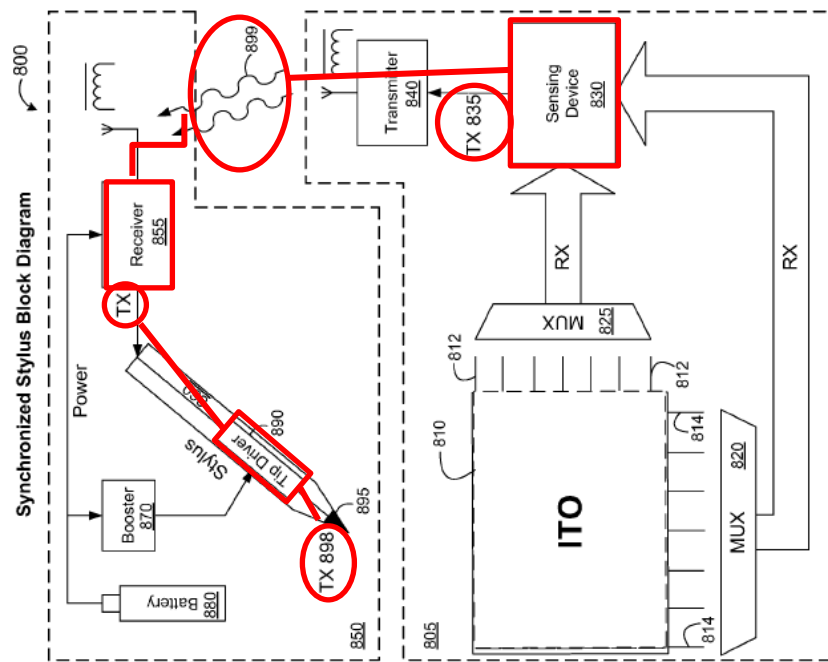


FIG. 8 of Kremin

Kremin further discloses an embodiment with a CPU (central processing unit) core 1330 to process signals such as force data detected from a force sensor 1360 and send it to a modulator which then sends it to a tip driver 890. Kremin ¶¶ [00107]–[00109]. A person of ordinary skill would understand that a CPU contains at least two elements, a control unit and an arithmetic-logic unit—the control unit contains circuitry to direct the system to execute stored instructions and the arithmetic-logic unit executes all arithmetic and logical operations.

Stylus with Data Modulation

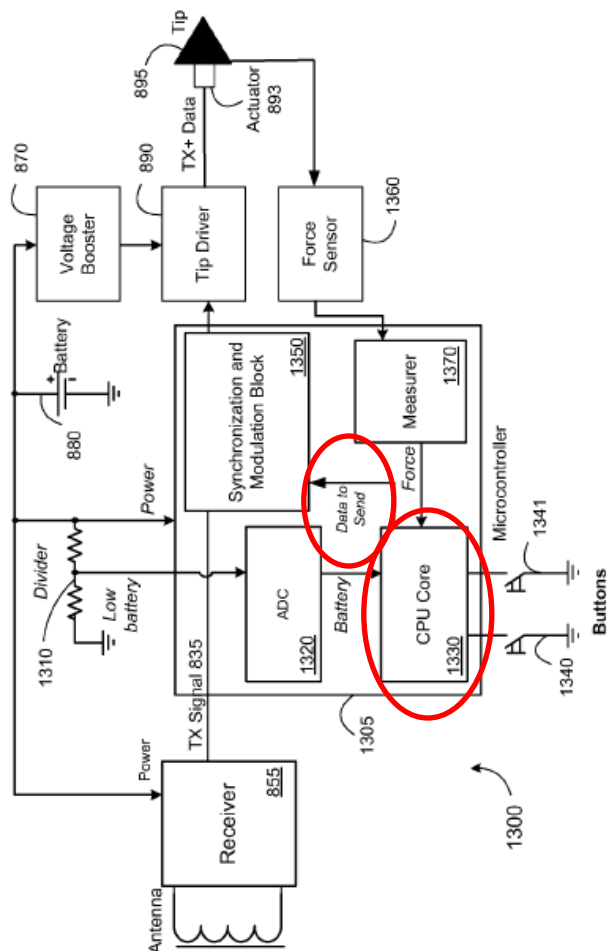


FIG. 13 of Kremin

Lastly, Kremin discloses that embodiments may be implemented in a manner that includes instructions stored on a computer-readable medium. Kremin ¶ [00140]. The instructions may be used to program a processor to perform the described operations. *Id.* Kremin lists a non-exhaustive variety of computer readable storage media, including random access memory or optical disks; such storage is “non-transitory,” or unchanging. *Id.* A person of ordinary skill would understand the storage mediums described by Kremin as computer-readable non-transitory storage media, and would understand that instructions are operable logic to control the operations of the stylus. Accordingly, Kremin fully discloses limitation 7[pre].

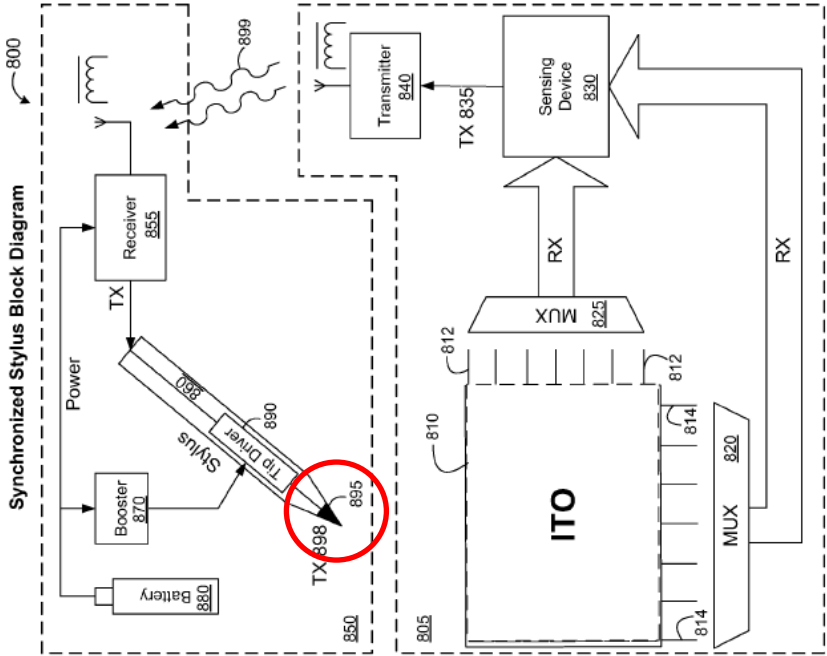


FIG. 8 of Kremin

Kremin further discloses that the stylus 850 communicates with the device through an initial signal 835 that goes through a transmitter 840 and is sent 899 to the stylus receiver 855; the tip driver 890 drives or amplifies (with booster 870) the transmit signal 835, and the stylus tip 895 capacitively couples the amplified stylus transmit signal 898 to the device's touch sense array 810. Kremin ¶¶ [0082]–[0085]. A person of ordinary skill would understand that the transmitter 840 and receiver 855 require the use of signal and ground electrodes to transmit and receive electrical signals by nature. Kremin therefore discloses a stylus containing one or more electrodes that communicate with a device by receiving and transmitting signals. Accordingly, Kremin fully discloses limitation 7[a].

7[b] receive a first signal generated by the device;

Kremin discloses a stylus 850 that contains a receiver 855 that receives a signal 835, 899 generated from the sensing device 830. Kremin [0085]. Therefore, Kremin discloses limitation 7[b].

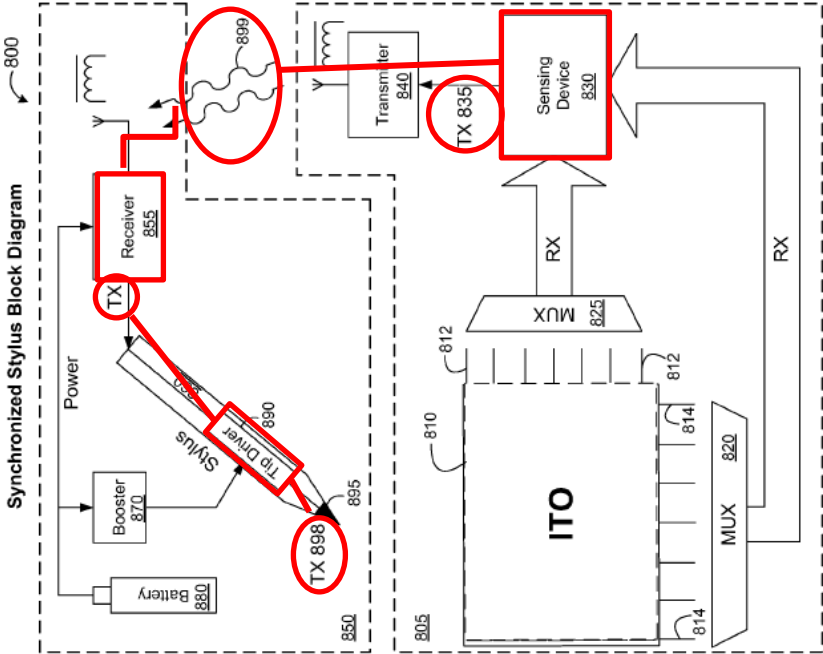
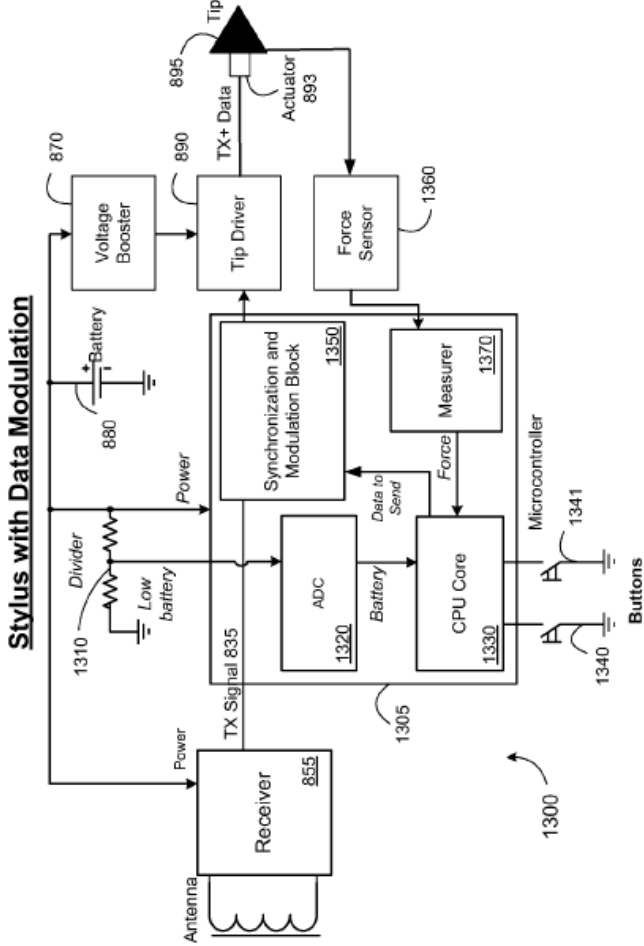


FIG. 8 of Kremin

7[c] generate a second signal by modulating a carrier signal based on the sensor data; and

As described above, the stylus 850 in Kremin contains a receiver 855 that receives a signal 835, 899 generated from the sensing device 830. Kremin at Claims 1, 6, 7, ¶ [0085]. In an embodiment, the synch mod block 1350 is configured to modulate additional data into the carrier’s TX signal 835 (received by the stylus in the receiver 855) incorporating the sensor data. *Id.* ¶ [00105]. Some types of additional data that may be modulated into the stylus TX signal 835 include battery charge data, acceleration data, 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. *Id.* ¶ [00106]–[00109]. Kremin therefore discloses claim 7[c].



Kremin describes an embodiment where the synch mod block 1350 modulates by a non-exhaustive list of modulation schemes, including phase modulation, pulse position modulation, binary phase shift keying, and other modulation schemes that would be appreciated by a person of ordinary skill. *Id.* ¶ [00110]. Kremin states that binary phase shift keying is one of several preferred modulation schemes for adding additional data to a signal and describes its benefits in signal-to-noise ratio and reiterates that other modulation schemes may be used as would be known by a person of ordinary skill with the benefit of that disclosure. *Id.* ¶ [115]. Figure 15C of Kremin uses as an example the encoding of button data by binary phase shift keying, where the button is pressed 1570 or not pressed 1580.

To the extent Plaintiff refers back to claim 1[c3], Plaintiff’s infringement contentions for limitation 1[c3] specifically describe the carrier signal that modulates using differential binary phase shift keying, and also describes that as “a form of phase modulation.” More specifically, it is a form of binary phase shift keying, with 180 degree shifts described exactly in line with Kremin, *id.* ¶ [00115], and including waveforms

mirroring the wave pulse 1500 in Figure 15A of Kremin. Kremin fully discloses limitation 1[c3], and a person of ordinary skill would use variations to the modulation scheme with the benefit of that disclosure as used in the ‘220 patent.

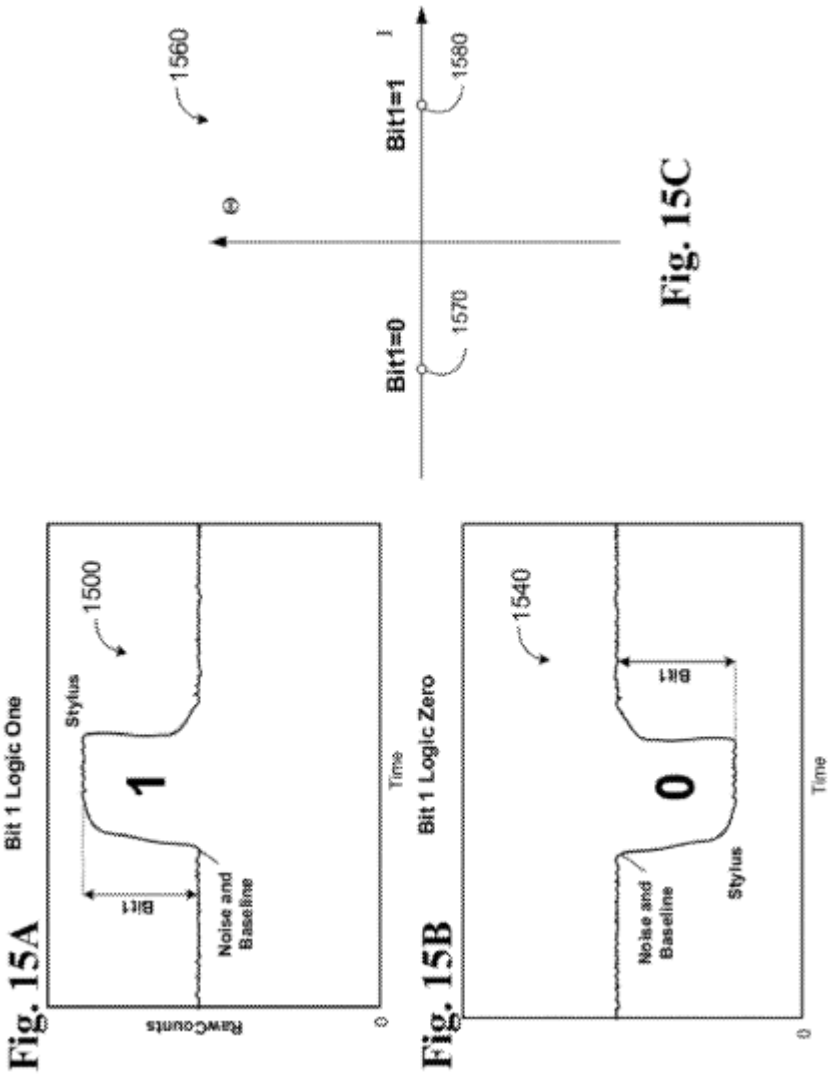


FIG. 15 of Kremin

7[d] transmit to the device, in response to the first signal, the second signal, the sensor data being obtainable by demodulating the second signal.

As described above, the stylus 850 in Kremin contains a receiver 855 that receives a signal 835, 899 generated from the sensing device 830. Kremin ¶ [0085]. In an embodiment, the synch mod block 1350 is configured to modulate additional data into the carrier’s TX signal 835, incorporating the sensor data. *Id.* ¶ [00105]. The stylus 850 contains a stylus tip 895 through which the stylus transmit signal 898 is capacitively coupled to the capacitive sense array. *Id.* Claim 6, ¶ [0085].

Kremin describes an embodiment where a modulated transmit signal 1430 is sent from the stylus that includes the transmit signal 1410 and additional data 1420 like force and button data. *Id.* ¶ [00113]. The signal 1430 is transmitted from the stylus, either via capacitive coupling between the tip 895 and the device’s sense array or wirelessly from the stylus 850 to the sensing device 830. *Id.* The signal 1430 arrives at a demodulator block 1435. *Id.* ¶ [00114]. In one embodiment, the received signal arrives to the device as current spikes 1440, which are demodulated into a signal 1450 that is further processed into decoded data corresponding to the additional data 1420. *Id.*

Kremin therefore discloses that the second signal is transmitted responsive to the first signal and sends the sensor data through that second signal, obtainable through demodulation; Kremin discloses limitation 7[d].

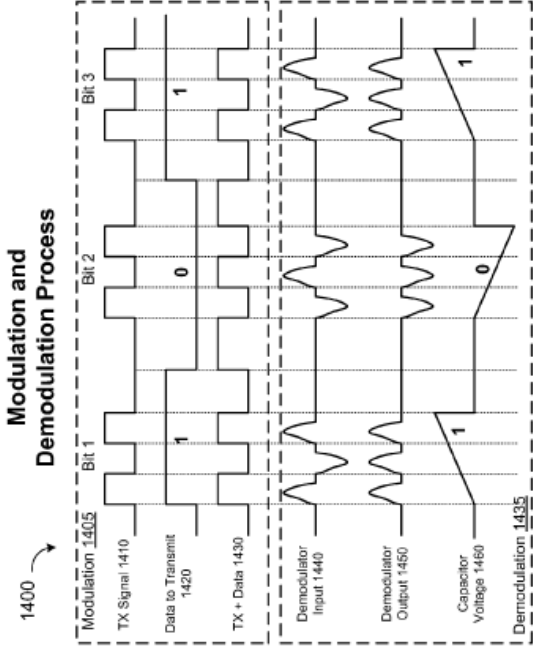


FIG. 14 of Kremin

To the extent Plaintiff contends Kremin does not expressly, implicitly, or inherently disclose the substance of limitation 7[d], one of ordinary skill in the art would, based on one’s knowledge and Kremin, understand how to modify Kremin to meet this limitation. Alternatively, one of ordinary skill could modify Kremin in view of Kaneko to meet this limitation.

Kaneko discloses a stylus/electronic pen with a pressure detection mechanism, that is, a sensor to detect pressure from the stylus. Kaneko ¶ [0024]. After converting the detected signal (the pressure sensed by the stylus/pen) to digital form, the signal is modulated via a modulation circuit in the stylus and incorporated into the electric current (or signal) flowing from the stylus to the device. *Id.* The controller unit in the

device 120 includes a transmission and reception processing unit 130 with a receiving circuit 133 to detect the electronic field/signal 134 from the stylus/pen, and then demodulates 133d that signal 134 to a demodulated output 133e. *Id.* ¶ [0037]. By demodulating the change in electric current, the intensity/pressure data from the stylus/pen is obtained by the device. *Id.* ¶ [0024]. Kaneko further discloses an embodiment by which the data from the host 190 side may be transmitted to the stylus/pen; the excitation frequency serves as a carrier and the data being sent can be transmitted by modulating that carrier signal. *Id.* ¶ [0037].

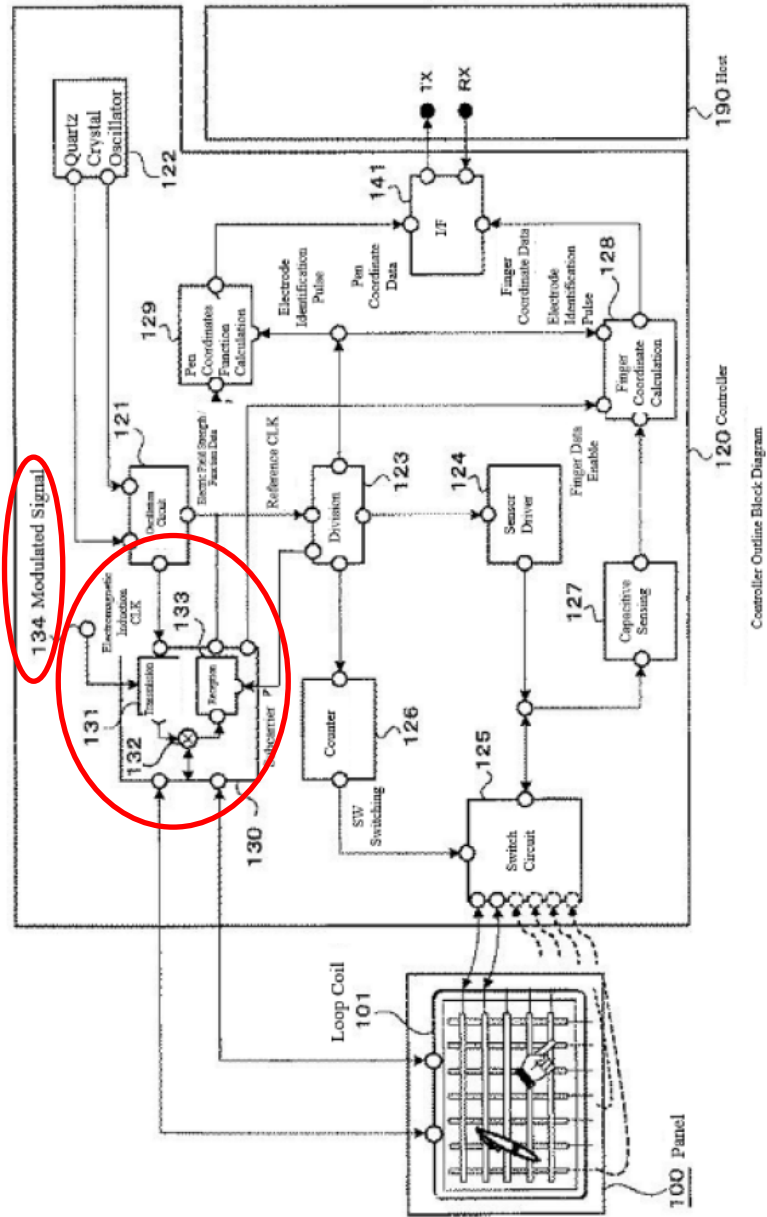


FIG. 3 of Kaneko

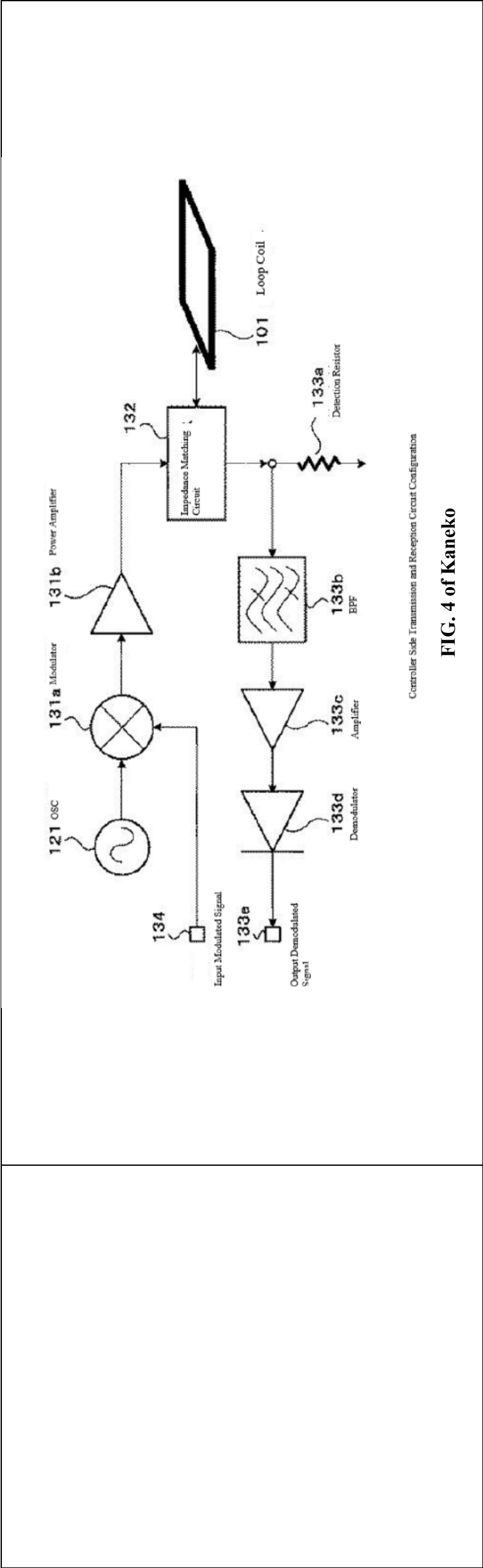


FIG. 4 of Kaneko

Controller Side Transmission and Reception Circuit Configuration

| Claim 9 | Example Disclosures in Prior Art |
|--|----------------------------------|
| 9. The media of claim 7, wherein the second signal is generated using one of: amplitude modulation; frequency modulation; and phase modulation. | See claim 3 above. |
| Claim 10 | Example Disclosures in Prior Art |
| 10. The media of claim 7, wherein: the one or more sensors comprise a pressure sensor and a button; and the sensor data comprises pressure data and button state data. | See claim 4 above. |
| Claim 11 | Example Disclosures in Prior Art |

11. The media of claim 7, wherein the sensor data is digital.

See claim 5 above.

Claim 13

13[pre] A system comprising:

To the extent the preamble is considered limiting, Kremin discloses in one embodiment an electronic system 300 having a processing device 310, touch screen 325, and touch sensor pad 320 for detecting the presence of a touch object 340 and a stylus 330, laid out in Figure 3. Kremin ¶ [0051]. Kremin discloses 13[pre].

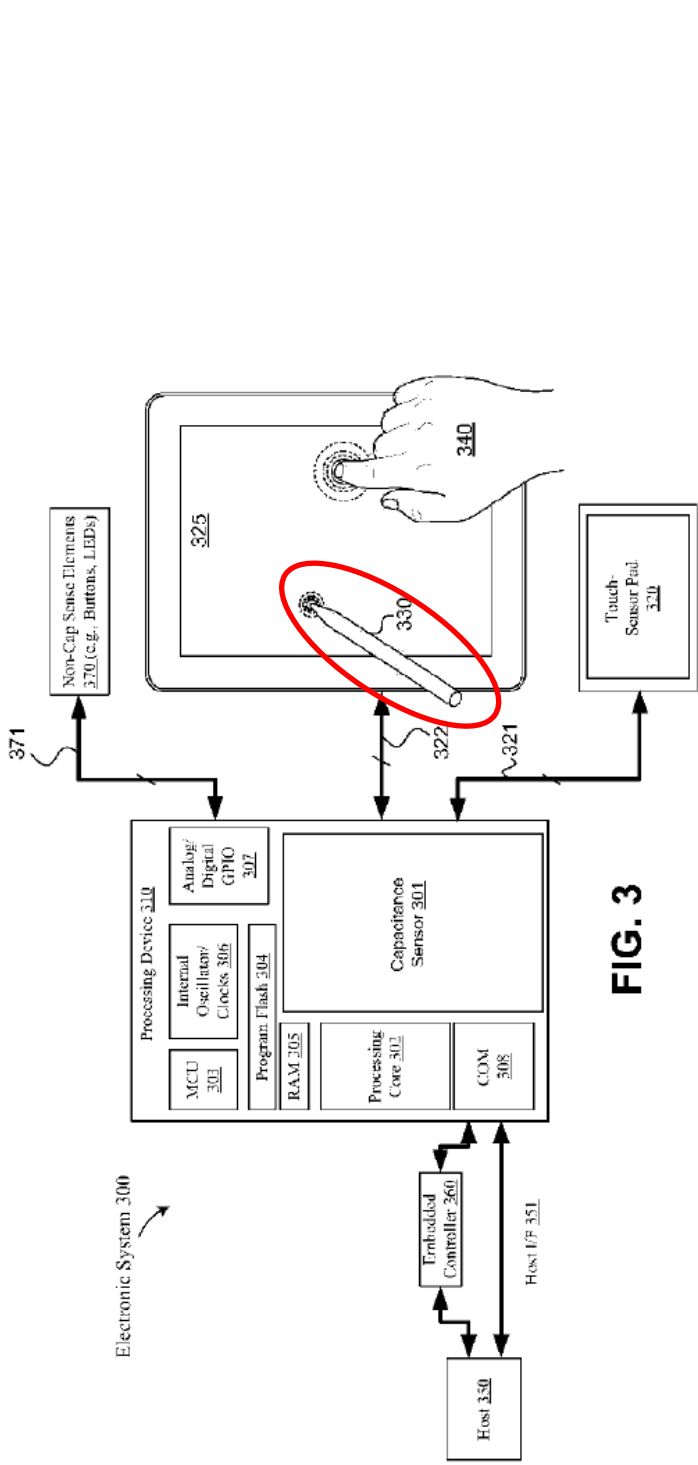


FIG. 3 of Kremin

13[a] a device comprising a touch sensor; and

13[b] a stylus comprising:

13[b1] one or more sensors;

As shown in FIG. 3 above, the device of the system 300 of Kremin includes a touch screen 325 with a touch sensor pad 320. Kremin ¶ [0051]. Kremin discloses a stylus 330. Kremin ¶ [0051].

Kremin claims multiple types of sensors in multiple embodiments, including force sense data, battery data, acceleration data, and button status data. Kremin at Claims 1–4. Kremin claims a force sensor 1360 that may be either a passive sensor or an active sensor within the stylus, and a motion sensor to detect motion of the stylus. Kremin at Claims 2-3, 11–13, ¶ [00109]. Accordingly, Kremin discloses limitation 13[b1].

Kremin further discloses an embodiment includes a microcontroller block 1305 with buttons 1340, 1341, from which pushes are detected adding additional functionality such as a “left click” and “right click” function. *Id.* ¶¶ [00105], [00108]. A person of ordinary skill in the art would appreciate that a button is a kind of a sensor, which can output a value such as a binary value. Claim 4 of the ‘220 Patent itself recites that the one or more sensors may comprise “a button.” Kremin describes the buttons themselves as being mechanical, electrical, capacitive, or other types known by one of ordinary skill. *Id.* ¶ [00108]. A person of ordinary skill would understand that capacitive detection, and a capacitive “button,” requires a capacitive sensor—a type of sensor. *Id.* ¶ [00108]. Similarly, Kremin discloses an embodiment wherein the orientation or acceleration of the stylus may be detected by an accelerometer—an inertial sensor that measures a change in velocity of an object over time. *Id.* ¶ [00109]. A person of ordinary skill in the art would recognize an accelerometer as a sensor which senses movement to measure acceleration. Kremin therefore discloses not only an embodiment with a force sensor but an embodiment with multiple sensors, including a force sensor, a motion sensor, buttons (which may be capacitive sense buttons), and an accelerometer/inertial sensor.

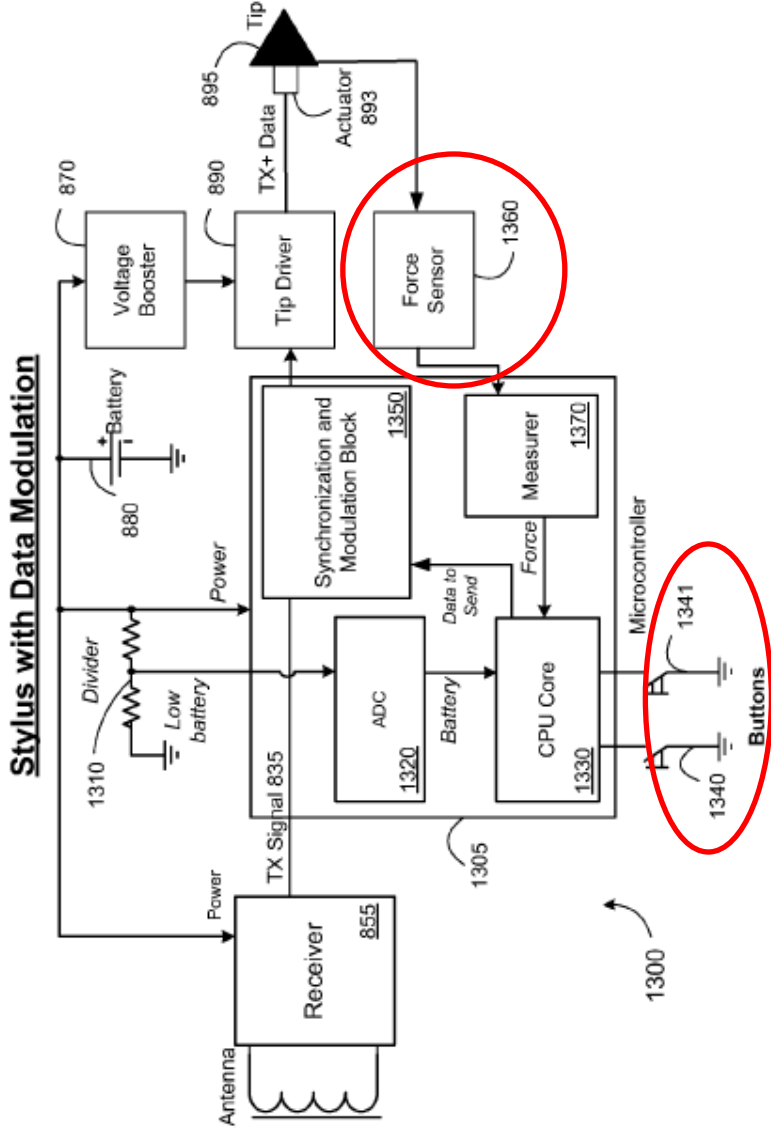


FIG. 13 of Kremin

13|b2] one or more electrodes configured to communicate with a device by receiving signals from and transmitting signals to a touch sensor of the device; and

As described above, in an embodiment the CPU core 1330 of Kremin is coupled with the force sensor 1360 and measurer 1370, which then processes the force signal or other signal to send it to the synch mod block 1350 to be converted to a signal. Kremin ¶ [00109]. The CPU core 1330 may also be connected to the buttons (which are identified as sensors by claim 4 of the ‘220 patent, by Plaintiff’s infringement contentions, and which may be capacitive sensors by definition), and it processes the button input data. The stylus is therefore receiving sensor data from the one or more sensors.

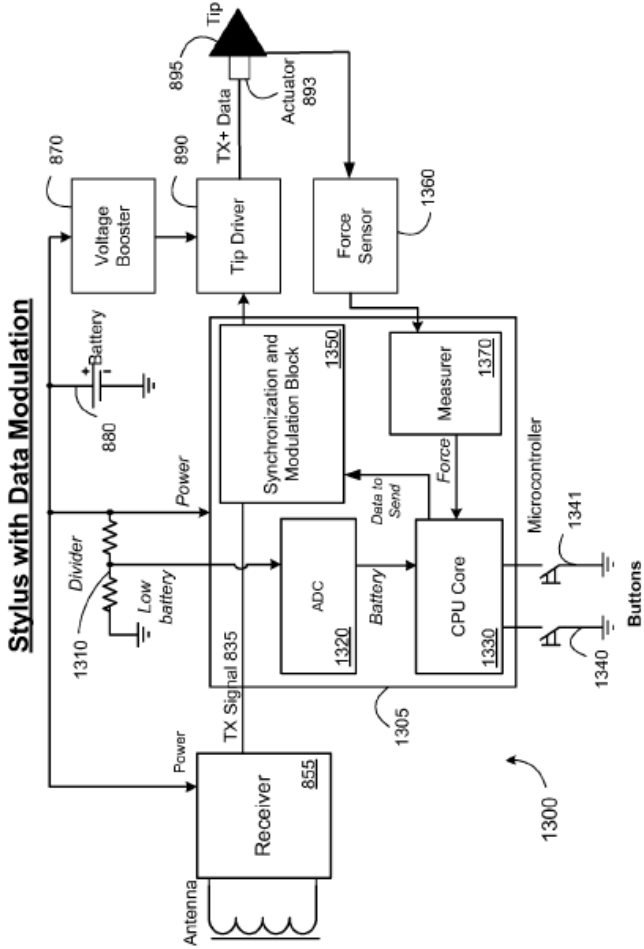


FIG. 13 of Kremin

And in describing the position tracking system for the stylus, Kremin discloses that the row 660 and column 640 electrodes in the sense array are capacitively coupled to the stylus 680, detecting the charge coupled at the contact point 695 with the stylus—this is inherently only possible if there is electrode in the stylus, as well. Kremin ¶ [0073].

The stylus 850 of Kremin contains a stylus tip 895 by which the stylus transmit signal is capacitively coupled to the capacitive sense array. Kremin Claim 6, ¶ [0085]. Capacitive coupling is a transfer of electric signals that inherently requires a pairing of electrodes by proximity, including by touch—a person of ordinary skill would understand that the tip 895 must comprise an electrode, and therefore there is at least one electrode configured to communicate with a device.

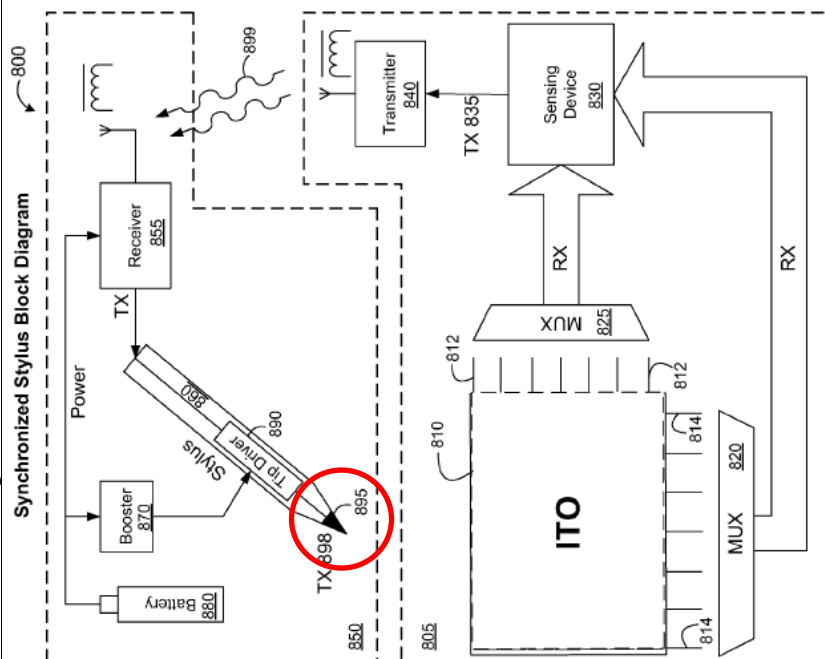


FIG. 8 of Kremin

Kremin further discloses that the stylus 850 communicates with the device through an initial signal 835 that goes through a transmitter 840 and is sent 899 to the stylus receiver 855; the tip driver 890 drives or amplifies (with booster 870) the transmit signal 835, and the stylus tip 895 capacitively couples the amplified stylus transmit signal 898 to the device's touch sense array 810. Kremin ¶¶ [0082]–[0085]. A person of ordinary skill would understand that the transmitter 840 and receiver 855 require the use of signal and ground electrodes to transmit and receive electrical signals by nature. Kremin therefore discloses a stylus containing one or more electrodes that communicate with a device by receiving and transmitting signals. Accordingly, Kremin fully discloses limitation **13[b2]**.

13[b3] one or more computer-readable non-transitory storage media embodying logic that is operable when executed to:

Kremin discloses a stylus 850 that contains a receiver 855 that receives signals 835, 899 from the sensing device and pushes that signal through the tip driver 890, which may boost the voltage of the signal via the booster 870, to the stylus tip 895, by which the amplified stylus transmit signal is capacitively coupled to the capacitive sense array. Kremin ¶ [0085]. A person of ordinary skill would appreciate that the stylus 850 includes at least one computer-readable non-transitory storage medium (e.g., memory) containing the necessary logic to control the operations of the receiver, tip driver, and booster, and ultimately the process by which the stylus receives, processes, and transmits signals.

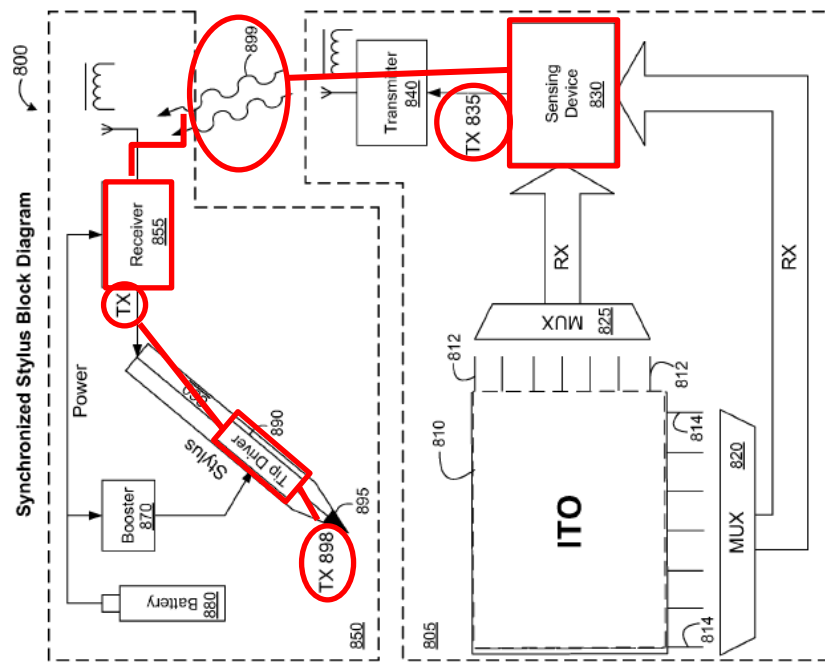


FIG. 8 of Kremin

Kremin further discloses an embodiment with a CPU (central processing unit) core 1330 to process signals such as force data detected from a force sensor 1360 and send it to a modulator which then sends it to a tip driver 890. Kremin ¶¶ [00107]–[00109]. A person of ordinary skill would understand that a CPU contains at least two elements, a control unit and an arithmetic-logic unit—the control unit contains circuitry to direct the system to execute stored instructions and the arithmetic-logic unit executes all arithmetic and logical operations.

Stylus with Data Modulation

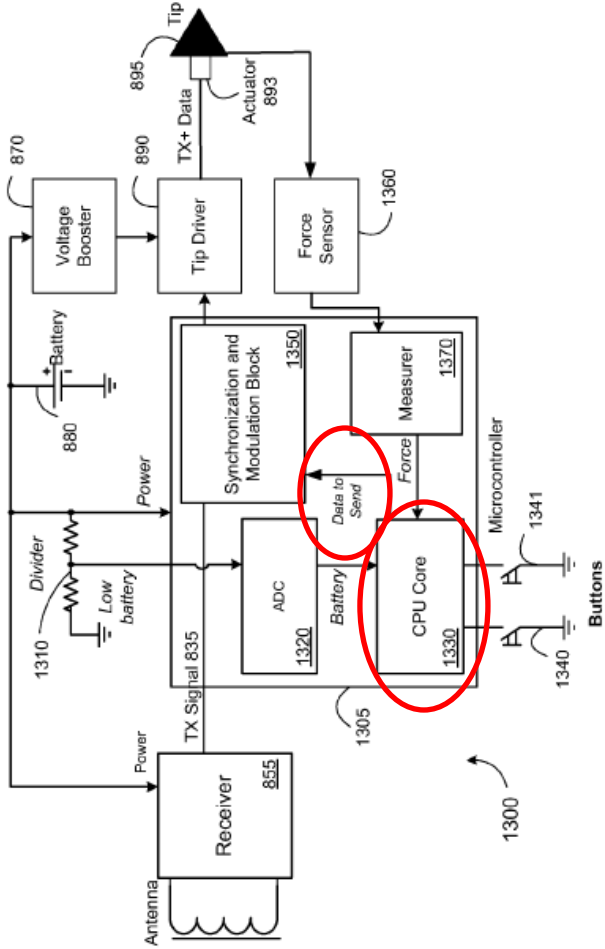


FIG. 13 of Kremin

Lastly, Kremin discloses that embodiments may be implemented in a manner that includes instructions stored on a computer-readable medium. Kremin ¶ [00140]. The instructions may be used to program a processor to perform the described operations. *Id.* Kremin lists a non-exhaustive variety of computer readable storage media, including random-access memory or optical disks; such storage is “non-transitory,” or unchanging. *Id.* A person of ordinary skill would understand the storage mediums described by Kremin as computer-readable non-transitory storage media, and would understand that instructions are operable logic to control the operations of the stylus. Accordingly, Kremin fully discloses limitation **13[b3]**.

13[b3A] receive sensor data from the one or more sensors;

As described above, in an embodiment the CPU core 1330 of Kremin is coupled with the force sensor 1360 and measurer 1370, which then processes the force signal or other signal to send it to the synch mod block 1350 to be converted to a signal. Kremin ¶ [00109]. The CPU core 1330 may also be connected to the buttons (which are identified as sensors by claim 4 of the '220 patent, by Plaintiff's infringement contentions, and which may be capacitive sensors by definition), and it processes the button input data. The stylus is therefore receiving sensor data from the one or more sensors.

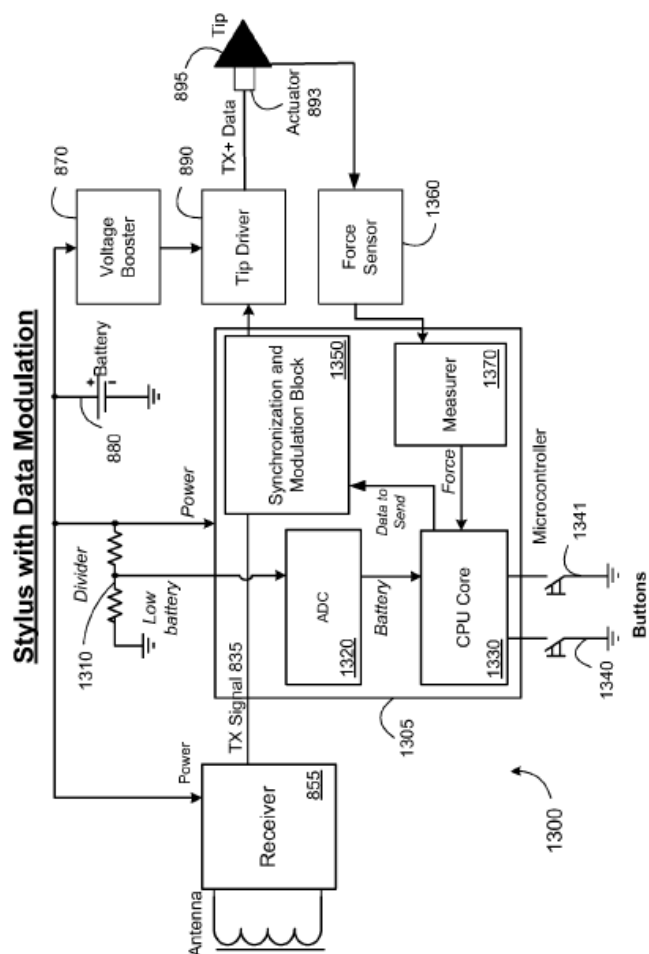


FIG. 13 of Kremin

And in describing the position tracking system for the stylus, Kremin discloses that the row 660 and column 640 electrodes in the sense array are capacitively coupled to the stylus 680, detecting the charge coupled at the contact point 695 with the stylus—this is inherently only possible if there is electrode in the stylus, as well. Kremin ¶[0073].

The stylus 850 of Kremin contains a stylus tip 895 by which the stylus transmit signal is capacitively coupled to the capacitive sense array. Kremin Claim 6, ¶ [0085]. Capacitive coupling is a transfer of electric signals that inherently requires a pairing of electrodes by proximity, including by touch—a person of ordinary skill would understand that the tip 895 must comprise an electrode, and therefore there is at least one electrode configured to communicate with a device.

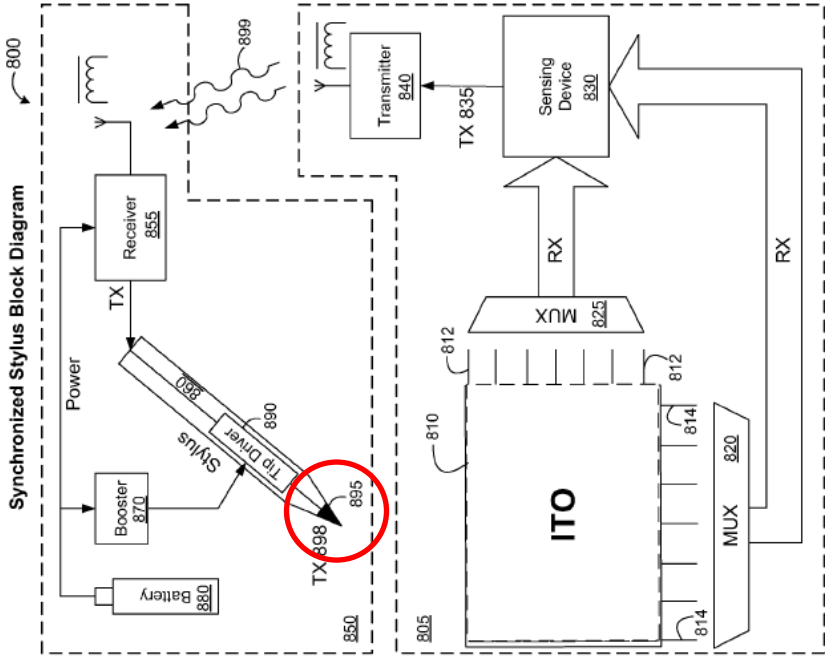


FIG. 8 of Kremin

Kremin further discloses that the stylus 850 communicates with the device through an initial signal 835 that goes through a transmitter 840 and is sent 899 to the stylus receiver 855; the tip driver 890 drives or amplifies (with booster 870) the transmit signal 895, and the stylus tip 895 capacitively couples the amplified stylus transmit signal 898 to the device's touch sense array 810. Kremin ¶¶ [0082]–[0085]. A person of ordinary skill would understand that the transmitter 840 and receiver 855 require the use of signal and ground electrodes to transmit and receive electrical signals by nature. Kremin therefore discloses a stylus containing one or more electrodes that communicate with a device by receiving and transmitting signals. Accordingly, Kremin fully discloses limitation 13[b3A].

Claim 13

13[b3B] receive a first signal generated by the device;

Example Disclosures in Prior Art

Kremin discloses a stylus 850 that contains a receiver 855 that receives a signal 835, 899 generated from the sensing device 830. Kremin ¶ [0085]. Therefore, Kremin discloses limitation 13[b3B].

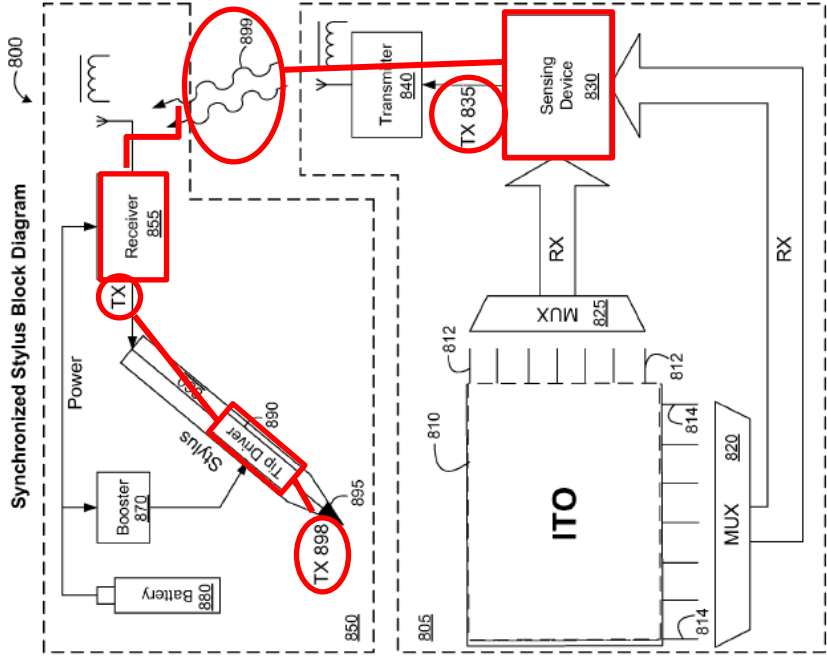


FIG. 8 of Kremin

13|b3C| generate a second signal by modulating a carrier signal based on the sensor data; and

As described above, the stylus 850 in Kremin contains a receiver 855 that receives a signal 835, 899 generated from the sensing device 830. Kremin at Claims 1, 6, 7, ¶ [0085]. In an embodiment, the synch mod block 1350 is configured to modulate additional data into the carrier’s TX signal 835 (received by the stylus in the receiver 855) incorporating the sensor data. *Id.* ¶ [00105]. Some types of additional data that may be modulated into the stylus TX signal 835 include battery charge data, acceleration data, 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. *Id.* ¶ [00106]–[00109]. Kremin therefore discloses claim 13|b3C|.

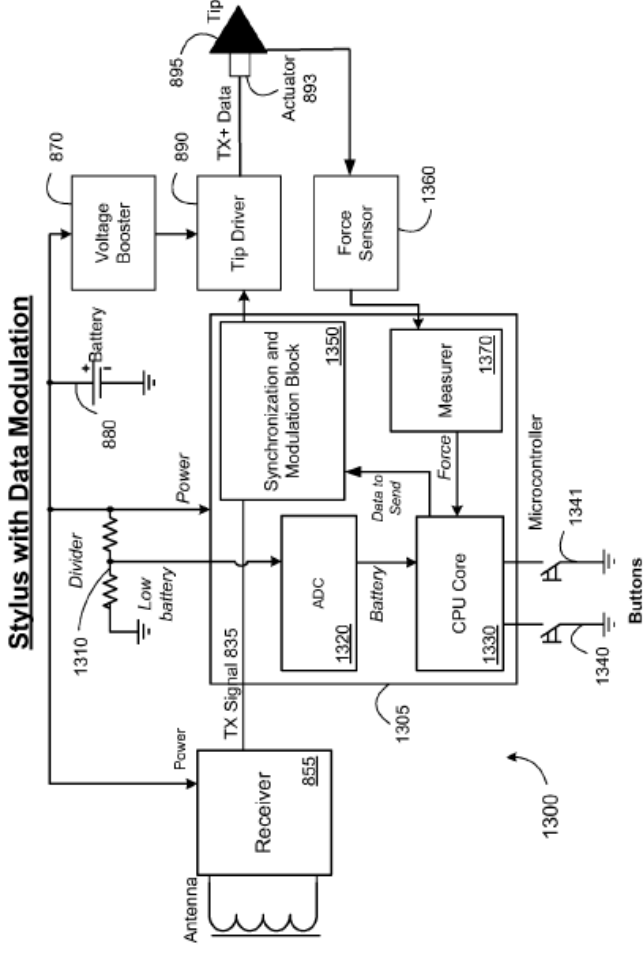


FIG. 13 of Kremin

Kremin describes an embodiment where the synch mod block 1350 modulates by a non-exhaustive list of modulation schemes, including phase modulation, pulse position modulation, binary phase shift keying, and other modulation schemes that would be appreciated by a person of ordinary skill. *Id.* ¶ [00110]. Kremin states that binary phase shift keying is one of several preferred modulation schemes for adding additional data to a signal and describes its benefits in signal-to-noise ration and reiterates that other modulation schemes may be used as would be known by a person of ordinary skill with the benefit of that disclosure. *Id.* ¶ [115]. Figure 15C of Kremin uses as an example the encoding of button data by binary phase shift keying, where the button is pressed 1570 or not pressed 1580.

To the extent Plaintiff refers back to claim 1|c3|, Plaintiff’s infringement contentions for limitation 1|c3| specifically describe the carrier signal that modulates using differential binary phase shift keying, and also describes that as “a form of phase modulation.” More specifically, it is a form of binary phase shift keying, with 180 degree shifts described exactly in line with Kremin, *id.* ¶ [00115], and including waveforms

mirroring the wave pulse 1500 in Figure 15A of Kremin. Kremin fully discloses limitation 1[c3], and a person of ordinary skill would use variations to the modulation scheme with the benefit of that disclosure as used in the '220 patent.

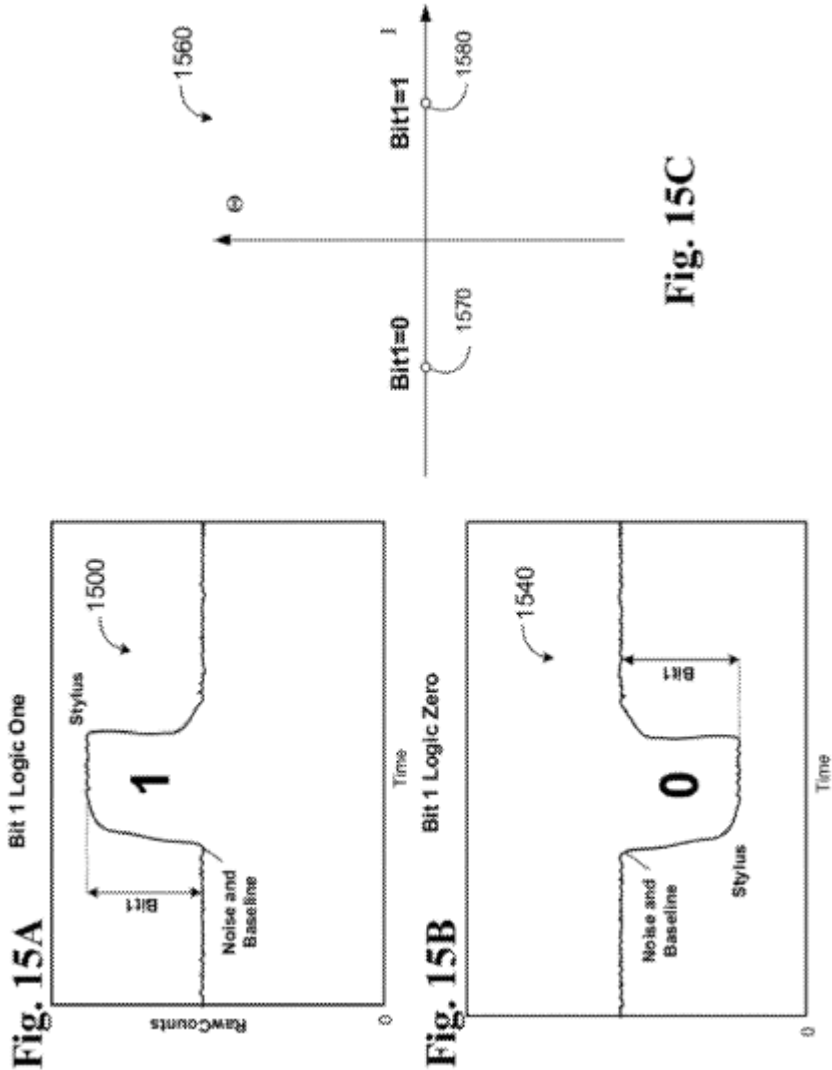


FIG. 15 of Kremin

13[b3D] transmit to the device, in response to the first signal, the second signal, the device being operable to obtain the sensor data by demodulating the second signal.

As described above, the stylus 850 in Kremin contains a receiver 855 that receives a signal 835, 899 generated from the sensing device 830. Kremin ¶ [0085]. In an embodiment, the synch mod block 1350 is configured to modulate additional data into the carrier’s TX signal 835, incorporating the sensor data. *Id.* ¶ [00105]. The stylus 850 contains a stylus tip 895 through which the stylus transmit signal 898 is capacitively coupled to the capacitive sense array. *Id.* Claim 6, ¶ [0085].

Kremin describes an embodiment where a modulated transmit signal 1430 is sent from the stylus that includes the transmit signal 1410 and additional data 1420 like force and button data. *Id.* ¶ [00113]. The signal 1430 is transmitted from the stylus, either via capacitive coupling between the tip 895 and the device’s sense array or wirelessly from the stylus 850 to the sensing device 830. *Id.* The signal 1430 arrives at a demodulator block 1435. *Id.* ¶ [00114]. In one embodiment, the received signal arrives to the device as current spikes 1440, which are demodulated into a signal 1450 that is further processed into decoded data corresponding to the additional data 1420. *Id.*

Kremin therefore discloses that the second signal is transmitted responsive to the first signal and sends the sensor data through that second signal, obtainable through demodulation; Kremin discloses limitation **13[b3D]**.

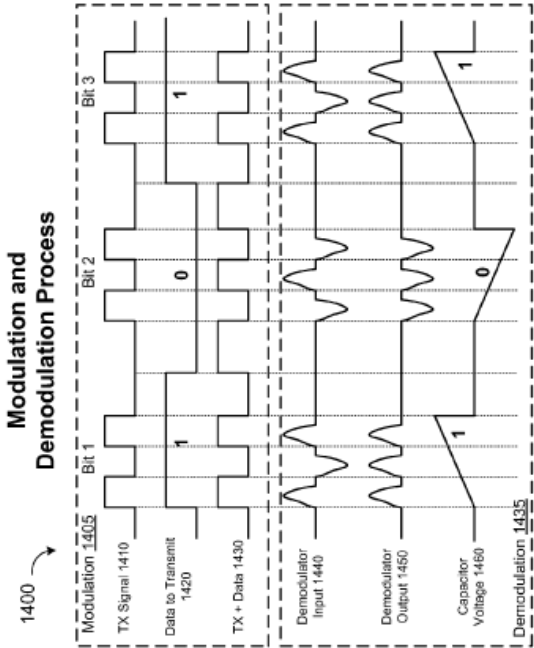


FIG. 14 of Kremin

To the extent Plaintiff contends Kremin does not expressly, implicitly, or inherently disclose the substance of limitation 13.2c4, one of ordinary skill in the art would, based on one’s knowledge and Kremin, understand how to modify Kremin to meet this limitation. Alternatively, one of ordinary skill could modify Kremin in view of Kaneko to meet this limitation.

Kaneko discloses a stylus/electronic pen with a pressure detection mechanism, that is, a sensor to detect pressure from the stylus. Kaneko ¶ [0024]. After converting the detected signal (the pressure sensed by the stylus/pen) to digital form, the signal is modulated via a modulation

circuit in the stylus and incorporated into the electric current (or signal) flowing from the stylus to the device. *Id.* ¶ [0037]. The controller unit in the device 120 includes a transmission and reception processing unit 130 with a receiving circuit 133 to detect the electronic field/signal 134 from the stylus/pen, and then demodulates 133d that signal 134 to a demodulated output 133e. *Id.* ¶ [0037]. By demodulating the change in electric current, the intensity/pressure data from the stylus/pen is obtained by the device. *Id.* ¶ [0024]. Kaneko further discloses an embodiment in which the data from the host 190 side may be transmitted to the stylus/pen; the excitation frequency serves as a carrier and the data being sent can be transmitted by modulating that carrier signal. *Id.* ¶ [0037].

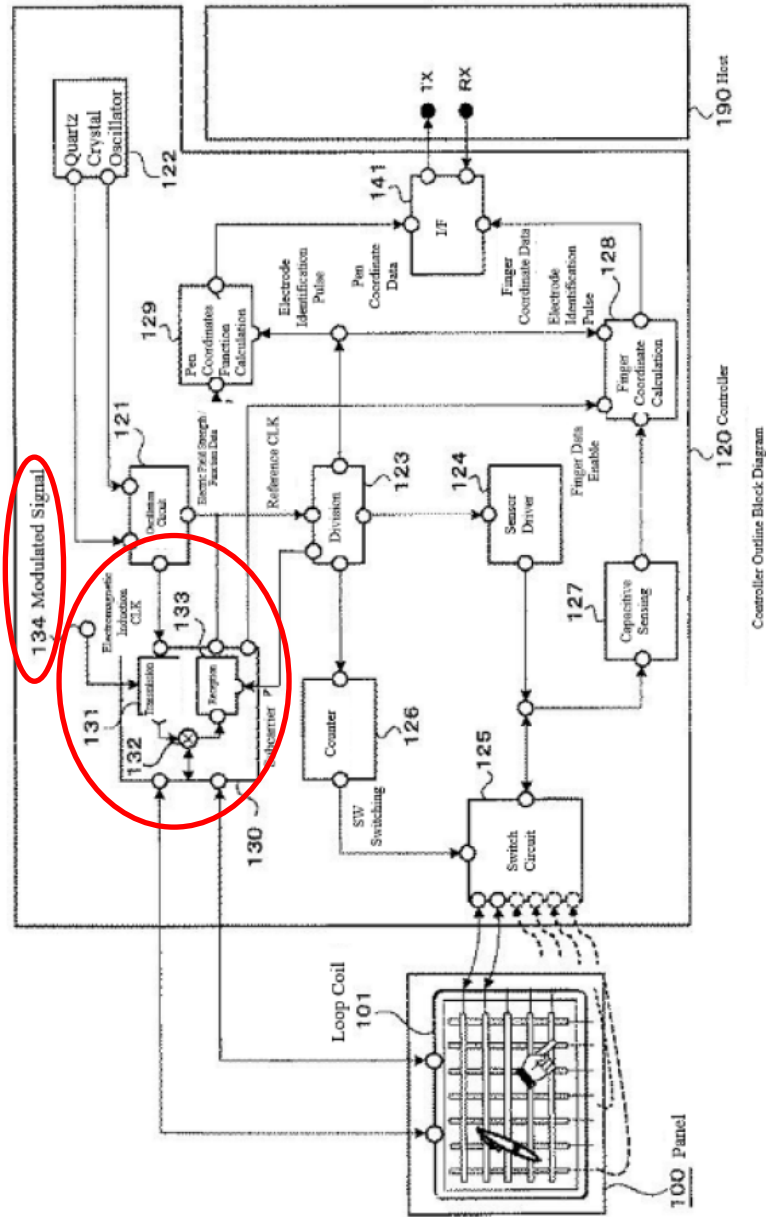
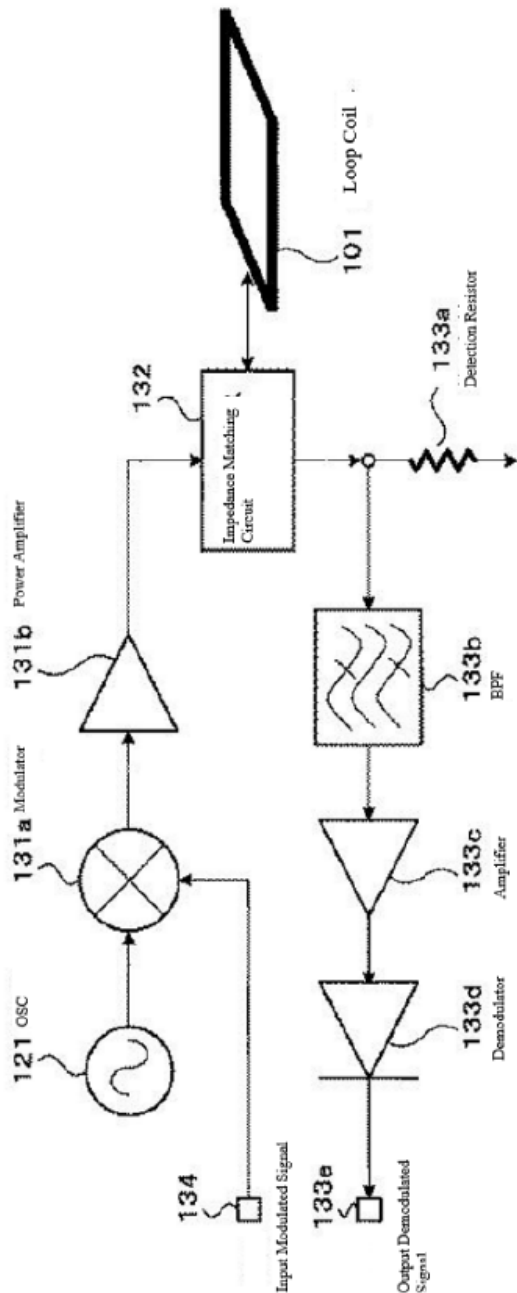


FIG. 3 of Kaneko

Claim 13

Example Disclosures in Prior Art



Controller Side Transmission and Reception Circuit Configuration

FIG. 4 of Kaneko

Claim 15

Example Disclosures in Prior Art

15. The system of claim 13, wherein the second signal is generated using one of: amplitude modulation; frequency modulation; and phase modulation.

Claim 16

Example Disclosures in Prior Art

16. The system of claim 13, wherein: the one or more sensors comprise a pressure sensor and a button; and the sensor data comprises pressure data and button state data.

| Claim 17 | Example Disclosures in Prior Art |
|---|----------------------------------|
| 17. The system of claim 13, wherein the sensor data is digital. | See claim 5 above. |