A SYSTEM FOR TRACKING A DEVICE USING A PROBE AND CAPACITIVE COUPLING~~SYSTEM FOR SUPPLY CHAIN MANAGEMENT~~

CROSS-REFERENCE TO RELATED APPLICATIONS

[001] This application claims priority under 35 USC 119 from US Provisional Application Serial No. 61/258,182 filed on Nov 4, 2009 titled Method, Device and System for Supply Chain management of Ingestible Event Markers by inventor Mark Zdeblick, which is incorporated herein.

FIELD OF THE INVENTION

[002] The present invention is related to methods and systems for using electronic devices to track products. More specifically, the present disclosure includes a methods, devices, and system for tracking medical inventory from source to consumer.

BACKGROUND

[003] Suppliers of pharmaceutical products are concerned about counterfeit products being substituted for original products from the time the products leave the manufacturer to the time the products are delivered to the end user. Additionally, there is a need for accurately determining the quantity and content of a package so that the distributors can identify the products throughout the supply chain. Known methods and systems use near field communication, such as RFID. These known methods have inherent limitations such as lack of data integrity, confidentiality etc. Therefore, what is needed is a system for interrogating a product to ensure validity and origin of the product throughout the supply chain, from manufacturer to end user or consumer.

SUMMARY

[004] Embodiments seek to provide~~Disclosed is~~ a system to manage product supply in a supply chain environment. ~~In~~ various embodiments may~~aspects, the invention~~ include~~s~~ capacitive plates which probe a variety of products, resulting in indications of product validity or invalidity. In this manner, various supply chain or other pursuits may be accomplished.

[005] The products may include, for example, IV bags, syringes, ingestible event markers (IEMs) and similar devices, as disclosed and described in PCT application serial no. PCT/US2006/016370 published as WO/2006/116718; PCT application serial no. PCT/US2007/082563 published as WO/2008/052136; PCT application serial no. PCT/US2007/024225 published as WO/2008/063626; PCT application serial no. PCT/US2007/022257 published as WO/2008/066617; PCT application serial no. PCT/US2008/052845 published as WO/2008/095183; PCT application serial no. PCT/US2008/053999 published as WO/2008/101107; PCT application serial no. PCT/US2008/056296 published as WO/2008/112577; PCT application serial no. PCT/US2008/056299 published as WO/2008/112578; PCT application serial no. PCT/US2008/077753 published as WO 2009/042812; PCT application serial no. PCT/US09/53721; and PCT application serial no. PCT/US2007/015547 published as WO 2008/008281; as well as United States Provisional Application Serial Nos. 61/142,849; 61/142,861; 61/177,611; 61/173,564; each in its entirety is incorporated herein by reference. Such products may typically be designed to include conductive materials/components. The use of capacitive coupling to probe the product's conductive materials and components by the capacitive plates may indicate the presence of the correct configuration of conductive components of the product. Alternatively, failure to communicatively couple when probed may indicate product nonconformance, e.g., one or more conductive materials is absent, incorrectly configured, etc.

[005a] According to an aspect, there is provided an ingestible device configured to be tested using a probe located external from the ingestible device, the ingestible device comprising: a substrate comprising a control unit and a memory for storing information; and a first and second ingestible plates physically associated with the substrate, the first ingestible plate configured to be communicatively coupled to a first probing plate of the probe located external from the ingestible device and the second ingestible plate configured to be communicatively coupled to a second probing plate of the probe such that information can be communicated between the first ingestible plate and the first probing plate of the probe and between the second ingestible plate and the second probing plate of the probe; wherein the ingestible device is configured to be physically associated with a pharmaceutical product; and wherein the ingestible device is configured to be tested by the probe to validate the ingestible device in a supply chain application.

BRIEF DESCRIPTION OF THE DRAWINGS

[006] Figure 1A shows a pharmaceutical product with a device that can be interrogated using capacitive coupling in accordance with one aspect of the present invention.

in contact with a conductive liquid and wherein the control unit is configured to alter a conductance between the first and second ingestible plates such that a magnitude of a current flow is varied to encode information in a signal communicated by the conducting liquid such that the encoded information can be remotely detectable by a receiver.

8. The ingestible device of any of the preceding claims, further comprising an antenna coupled to the control unit, wherein the antenna is configured to communicate with an external device.

9. The ingestible device of claim 8, wherein the antenna includes a coil.

10. The ingestible device of claim 8, further comprising a power source associated with the antenna.

~~11. A system for tracking an ingestible device configured to be tested using a probe located external from the ingestible device from an origin to a destination, the system comprising:~~

~~a probe comprising:~~

~~a power source;~~

~~a processor coupled to the power source, the processor configured to receive and send information; a first probing plate coupled to the processor; and~~

~~a second probing plate coupled to the processor,~~

~~wherein the power source is configured to be controlled by the processor to produce an output at the first and the second probing plates; and~~

~~an ingestible device comprising:~~

~~a substrate comprising a control unit and a memory configured to store information; and~~

~~a first ingestible plate physically associated with the substrate; and~~

~~a second ingestible plate physically associated with the substrate,~~

~~wherein the ingestible device is configured to communicatively couple to the first and second probing plates of the probe such that information can be communicated between the ingestible device and the probe;~~

wherein the ingestible device is configured to be physically associated with a pharmaceutical product; and

wherein the ingestible device is configured to be tested by the probe to validate the ingestible device from the origin to the destination.

12. The system of claim 11, wherein the first probing plated has a surface facing a surface of the second probing plate such that the ingestible device is configured to be in communication with the probe when the ingestible device is positioned between the surface of the first probing plate and the surface of the second probing plate.

13. The system of claim 11 or 12, wherein the first probing plate is positioned adjacent to the second probing plate such that the ingestible device is configured to be in communication with the probe when the ingestible device is brought within an operative proximity of the probe.

14. The system of any of claims 11 to 13, wherein the probe further comprises a tube having the first and second probing plates contained therein.

15. The system of any of claims 11 to 14, wherein the first and second ingestible plates are configured to be communicatively coupled to the control unit.

16. The system of any of claims 11 to 15, wherein the ingestible device further comprising a region of conductive material physically associated with the substrate.

17. The system of claim 16, wherein the region of conductive material comprises a mixture of a first material and a second material, the first material being a conductive material.

18. The system of any of claims 11 to 17, wherein the first and second materials comprise a conducting ink.

19. The system of any of claims 11 to 18, wherein the ingestible device is configured to communicate with an external device.

20. The system of claim 19, wherein the ingestible device comprises a communication element configured to communicate with the external device, the communication element including at least one of:

an antenna , or a first material and a second material different from the first material, the first material and the second material selected to provide a voltage potential

difference as a result of the materials being in contact with a conductive liquid, and wherein the control unit is configured to alter the conductance between the first material and the second material such that a magnitude of a current flow is varied to encode information in a signal communicated by the conducting liquid to produce encoded information such that the encoded information is remotely detectable by a receiver.