SUMMARY

[004] Disclosed is a system to manage product supply in a supply chain environment. In various aspects, the invention includes 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.

[004a] According to a first 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 first and second materials physically associated with the substrate, the first material configured to be capacitively coupled to a first plate of a probe located external from the ingestible device and the second material is configured to be capacitively coupled to a second plate of the probe such that information can be communicated between the first material and the first plate and between the second material and the second plate; wherein the first and second materials are configured to energize the ingestible device by a transfer of energy from the first and second plates to the corresponding first and second materials to validate the functionality of the ingestible device.

[004b] According to a second aspect, there is provided a system for tracking, from an origin to a destination, an ingestible device configured to be tested using a probe located external from the ingestible device, the system comprising: a probe comprising: a power source; a processor coupled to the power source configured to receive and send information; a first plate coupled to the processor; and a second 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 plates; and an ingestible device comprising: a substrate comprising a control unit and a memory for storing information; and first and second materials physically associated with the substrate, the first material configured to be capacitively coupled to the first plate of the probe located external from the ingestible device and the second material is configured to be capacitively coupled to the second plate of the probe such that information can be communicated between the first material and the first plate and between the second material and the second plate;

wherein the first and second materials are configured to energize the ingestible device by a transfer of energy from the first and second plates to the corresponding first and second materials to validate the functionality of the ingestible device.

[005] The products 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.

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.

What is claimed is:

1. 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

    first and second materials physically associated with the substrate, the first material configured to be capacitively coupled to a first plate of a probe located external from the ingestible device and the second material is configured to be capacitively coupled to a second plate of the probe such that information can be communicated between the first material and the first plate and between the second material and the second plate;

    wherein the first and second materials are configured to energize the ingestible device by a transfer of energy from the first and second plates to the corresponding first and second materials to validate the functionality of the ingestible device.

2. The ingestible device of claim 1, wherein the first and second materials are communicably coupled to the control unit.

3. The ingestible device of claim 1, further comprising a region of conductive material physically associated with the substrate.

4. The ingestible device of claim 3, wherein the region of conductive material comprises a mixture of particles of a conductive material and at least one other material.

5. The ingestible device of claim 4, wherein the at least one other material comprises at least one pharmaceutical material, at least one excipient, or at least one placebo material.

6. The ingestible device of claim 1, wherein the first material comprises a material dissimilar from a material of the second material.

7. The ingestible device of claim 6, wherein the first and second materials are configured to provide a voltage potential difference when the dissimilar materials of the first material and the second material are in contact with an electrically conductive liquid and wherein the control unit is configured to alter a conductance between the first and second materials such that a current is varied to encode information in a signal communicated by the electrically conductive liquid such that the encoded information can be remotely detectable by a receiver.

8. The ingestible device of claim 1, further comprising an antenna coupled to the control unit, the antenna configured to communicate with an external device.

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

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

a probe comprising:

a power source;

a processor coupled to the power source configured to receive and send information;

a first plate coupled to the processor; and

a second 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 plates; and

an ingestible device comprising:

a substrate comprising a control unit and a memory for storing information; and

first and second materials physically associated with the substrate, the first material configured to be capacitively coupled to the first plate of the probe located external from the ingestible device and the second material is configured to be capacitively coupled to the second plate of the probe such that information can be communicated between the first material and the first plate and between the second material and the second plate;

wherein the first and second materials are configured to energize the ingestible device by a transfer of energy from the first and second plates to the corresponding first and second materials to validate the functionality of the ingestible device.

11. The system of claim 10, wherein the first plate has a surface facing a surface of the second plate such that the ingestible device is configured to be in capacitive communication with the probe when the ingestible device is positioned between the surfaces of the first and second plates.

12. The system of claim 10, wherein the first plate is positioned adjacent the second plate such that the ingestible device is configured to be in capacitive communication with the probe when the ingestible device is brought within an operative proximity of the probe.

13. The system of claim 10, wherein the probe further comprises a tube having the first and second plates contained therein.

14. The system of claim 10, wherein the first and second materials are configured to be communicably coupled to the control unit.

15. The system of claim 10, wherein the ingestible device comprises a region of conductive material physically associated with the substrate.

16. The system of claim 15, wherein the region of conductive material comprises a mixture of materials, wherein at least a portion of the mixture of materials is a conductive material.

17. The system of claim 16, wherein the mixture of materials comprises a conducting ink.

18. The system of claim 10, wherein the ingestible device is configured to communicate with an external device.

19. The system of claim 18, 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 the first material and the second material different from the first material, wherein the first material and the second material are selected to provide a voltage potential difference as a result of the different materials being in contact with an electrically conductive liquid, and wherein the control unit is configured to alter a conductance between the first and second materials such that a current is varied to encode information in a signal communicated by the electrically conductive liquid to produce encoded information such that the encoded information is remotely detectable by a receiver.