

[0033] Figure 7C is a block diagram illustrating an embodiment of an item identifier. In some embodiments, item identifier 740 comprises volume placer 742. Item identifier 740 receives tag placement indication and places selected tags in a volume of an item. Volume placer 742 receives indication of tag placement and places selected tags in a pattern or in a volume – for example, suspended in a liquid or distributed homogenously or inhomogenously within an SODF – of the item.

[0034] Although the foregoing embodiments have been described in some detail for purposes of clarity of understanding, the invention is not limited to the details provided. There are many alternative ways of implementing the invention. The disclosed embodiments are illustrative and not restrictive.

[0035] ~~WHAT IS CLAIMED IS:~~

CLAIMS

1. A system for packaging an item with an identifier, comprising:

5 An identifier adder, wherein the identifier adder adds one or more types of silica-based tags to an item, wherein each type of silica-based tag has a first signature readable using an optical spectroscopic reader;

A labeler, wherein a label is generated based at least in part on reading the one or more types of silica-based tags of the item using the optical spectroscopic reader, and wherein the label includes goods info; and

10 A packager, wherein the packager includes the label on a package, and wherein the packager includes the item in the package.

2. A system as in claim 1, wherein each type of silica-based tag has a second signature readable using an optical imaging reader.

3. A system as in claim 1, wherein one of the one or more types of silica tags are selected for one or more of the following: a shape, having a characterization associated with a number, a placement in a spatial arrangement, characterization by imaging a shape of one of the one or more types of silica tags, or characterization by imaging a plurality of the one or more types of silica tags with or without a fiducial visible in a field of view.

4. A system as in claim 1, wherein the one or more types of randomly-shaped silica tags are produced using ultrasonic agitation.

- 20 5. A system as in claim 1, wherein the item comprises a solid oral dosage form.

6. A system as in claim 5, wherein the solid oral dosage form comprises one of the following: a tablet, a capsule, a caplet, a powder, a crystal, or a thin film.

7. A system as in claim 1, wherein the item comprises a liquid.

8. A system as in claim 7, wherein the liquid comprises one of the following: a cream, a gel, a liniment, a balm, a lotion, an injectable, or an ointment.

- 25 9. A package of items, comprising:

One or more items, wherein one or more types of silica-based tags are added to the one or more items, wherein each type of silica-based tags has a signature readable using an optical spectroscopic reader; and

A label, wherein the label is generated based at least in part on reading the one or more types of silica-based tags.

10. A package as in claim 9, wherein each type of silica-based tags has a second signature readable using an optical imaging reader.

11. A package as in claim 9, wherein one of the one or more items comprises a solid oral dosage form.

12. A package as in claim 11, wherein the solid oral dosage form comprises one of the following: a tablet, a capsule, a caplet, a powder, a crystal, or a thin film.

13. A package as in claim 9, wherein one of the one or more items comprises a liquid.

14. A package as in claim 13, wherein the liquid comprises one of the following: a cream, a gel, a liniment, a balm, a lotion, an injectable, or an ointment.

15. A system for packaging a type of item with an identifier, comprising:

An encoder, wherein the encoder determines one or more identifiers for a type of item;

A tag producer, wherein the tag producer produces one or more types of silica-based tags, wherein the one or more types of silica-based tags are determined based at least in part on the one or more identifiers; and

An identifier adder, wherein the one or more types of silica-based tags are added to the item.

16. A system as in claim 15, wherein one of the one or more types of silica tags are selected for one or more of the following: a shape, having a characterization associated with a number, a placement in a spatial arrangement, characterization by imaging a shape of one of the one or more types of silica tags, or characterization by imaging a plurality of the one or more types of silica tags with or without a fiducial visible in a field of view.

17. A system as in claim 15, wherein the one or more types of randomly-shaped silica tags are produced using ultrasonic agitation
18. A system as in claim 15, wherein the item comprises a solid oral dosage form.
19. A system as in claim 18, wherein the solid oral dosage form comprises one of the following:
5 a tablet, a capsule, a caplet, a powder, a crystal, or a thin film.
20. A system as in claim 15, wherein the item comprises a liquid.
21. A system as in claim 20, wherein the liquid comprises one of the following: a cream, a gel, a liniment, a balm, a lotion, an injectable, or an ointment.
22. An item with an identifier, comprising:
10 An item, wherein one or more types of silica-based tags are added to the SODF or the liquid, wherein each type of silica-based tags has a signature readable using an optical spectroscopic reader.
23. An item as in claim 22, wherein each type of silica-based tags has a signature readable using an imager.
- 15 24. An item as in claim 22, wherein the item comprises a solid oral dosage form.
25. An item as in claim 24, wherein the solid oral dosage form comprises one of the following: a tablet, a capsule, a caplet, a powder, a crystal, or a thin film.
26. An item as in claim 22, wherein one of the one or more items comprises a liquid.
27. An item as in claim 26, wherein the liquid comprises one of the following: a cream, a gel, a
20 liniment, a balm, a lotion, an injectable, or an ointment.

What is claimed is:

1. A system for packaging an item with an identifier, comprising:

A tag producer, wherein the tag producer produces one or more types of silica-based tags to be encoded with a first signature determined by an encoder, wherein the first signature is readable using an optical spectroscopic reader, wherein the silica-based tag comprises a complex porous silicon micro-tag that was programmed during electrochemical synthesis to display a reflectivity spectrum containing the first signature, and wherein the tag producer comprises:

a waveform determiner configured to determine a waveform to generate the silica-based tag; and

a tag creator configured to generate the silica-based tag based on the determined waveform;

An identifier adder, wherein the identifier adder adds the one or more types of silica-based tags to an item, wherein the identifier adder comprises a tag selector, wherein the tag selector selects one or more tags to be added to the item out of the one or more types of silica-based tags produced by the tag producer based at least on the one or more tags has a correct first signature;

A labeler, wherein a label is generated based at least in part on reading the one or more types of silica-based tags added to the item using the optical spectroscopic reader, and wherein the label includes goods info; and

A packager, wherein the packager includes the label on a package, and wherein the packager includes the item in the package.

2. A system as in claim 1, wherein each type of silica-based tag has a second signature readable using an optical imaging reader.

3. A system as in claim 2, wherein the second signature comprises the one or more types of silica-based tags are placed in a pattern or arrangement.

4. A system as in claim 1, wherein the one or more tags selected by the tag selector are selected based on one or more of the following: characterization by imaging a shape

of one of the one or more types of silica tags, having a correct shape, appropriate reflectivity peaks, appropriate reflectivity amplitudes, or characterization by imaging a plurality of the one or more types of silica tags with or without a fiducial visible in a field of view.

5. A system as in claim 1, wherein the item comprises a solid oral dosage form.
6. A system as in claim 5, wherein the solid oral dosage form comprises one of the following: a tablet, a capsule, a caplet, a powder, a crystal, or a thin film.
7. A system as in claim 1, wherein the item comprises a liquid.
8. A system as in claim 7, wherein the liquid comprises one of the following: a cream, a gel, a liniment, a balm, a lotion, an injectable, or an ointment.
9. A system as in claim 1, wherein the silica-based tag comprises a rugate filter.
10. A system as in claim 1, wherein the waveform is a current-time wave.
11. A method for packaging an item with an identifier, comprising:
 - producing one or more types of silica-based tags to be encoded with a first signature determined by an encoder, wherein the first signature is readable using an optical spectroscopic reader, wherein the silica-based tag comprises a complex porous silicon micro-tag that was programmed during electrochemical synthesis to display a reflectivity spectrum containing the first signature, and wherein the producing of the one or more types of silica-based tags to be encoded with a first signature determined by the encoder comprises:
 - determining a waveform to generate the silica-based tag; and
 - generating the silica-based tag based on the determined waveform;
 - adding the one or more types of silica-based tags to an item, comprising:
 - selecting one or more tags to be added to the item out of the one or more types of silica-based tags based at least on the one or more tags has a correct first signature;

generating a label based at least in part on reading the one or more types of silica-based tags added to the item using the optical spectroscopic reader, and wherein the label includes goods info; and

placing the label on a package, and the item in the package.

12. A method as in claim 11, wherein each type of silica-based tag has a second signature readable using an optical imaging reader.

13. A method as in claim 12, wherein the second signature comprises the one or more types of silica-based tags are placed in a pattern or arrangement.

14. A method as in claim 11, wherein the selecting of the one or more tags one or more tags includes selecting the one or more tags based on one or more of the following: characterization by imaging a shape of one of the one or more types of silica tags, having a correct shape, appropriate reflectivity peaks, appropriate reflectivity amplitudes, or characterization by imaging a plurality of the one or more types of silica tags with or without a fiducial visible in a field of view.

15. A method as in claim 11, wherein the item comprises a solid oral dosage form.

16. A method as in claim 15, wherein the solid oral dosage form comprises one of the following: a tablet, a capsule, a caplet, a powder, a crystal, or a thin film.

17. A method as in claim 11, wherein the item comprises a liquid.

18. A method as in claim 17, wherein the liquid comprises one of the following: a cream, a gel, a liniment, a balm, a lotion, an injectable, or an ointment.

19. A method as in claim 11, wherein the silica-based tag comprises a rugate filter.

20. A method as in claim 11, wherein the waveform is a current-time wave.

21. A computer program product for packaging an item with an identifier, the computer program product being embodied in a tangible non-transitory computer readable storage medium and comprising computer instructions for:

producing one or more types of silica-based tags to be encoded with a first signature determined by an encoder, wherein the first signature is readable using an optical spectroscopic reader, wherein the silica-based tag comprises a complex porous silicon micro-tag that was programmed during electrochemical synthesis to display a reflectivity spectrum containing the first signature, and wherein the producing of the one or more types of silica-based tags to be encoded with a first signature determined by the encoder comprises:

determining a waveform to generate the silica-based tag; and

generating the silica-based tag based on the determined waveform;

adding the one or more types of silica-based tags to an item, comprising:

selecting one or more tags to be added to the item out of the one or more types of silica-based tags based at least on the one or more tags has a correct first signature;

generating a label based at least in part on reading the one or more types of silica-based tags added to the item using the optical spectroscopic reader, and wherein the label includes goods info; and

placing the label on a package, and the item in the package.

22. A computer program product as in claim 21, wherein each type of silica-based tag has a second signature readable using an optical imaging reader.

23. A computer program product as in claim 22, wherein the second signature comprises the one or more types of silica-based tags are placed in a pattern or arrangement.

24. A computer program product as in claim 21, wherein the selecting of the one or more tags one or more tags includes selecting the one or more tags based on one or more of the following: characterization by imaging a shape of one of the one or more types of silica tags, having a correct shape, appropriate reflectivity peaks, appropriate

reflectivity amplitudes, or characterization by imaging a plurality of the one or more types of silica tags with or without a fiducial visible in a field of view.

25. A computer program product as in claim 21, wherein the item comprises a solid oral dosage form.

26. A computer program product as in claim 25, wherein the solid oral dosage form comprises one of the following: a tablet, a capsule, a caplet, a powder, a crystal, or a thin film.

27. A computer program product as in claim 21, wherein the item comprises a liquid.

28. A computer program product as in claim 27, wherein the liquid comprises one of the following: a cream, a gel, a liniment, a balm, a lotion, an injectable, or an ointment.

29. A computer program product as in claim 21, wherein the silica-based tag comprises a rugate filter.

30. A computer program product as in claim 21, wherein the waveform is a current-time wave.