CARD HAVING METALLIC CORE LAYER AND SYSTEMS AND METHODS FOR CARD MANUFACTURING

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application Serial No. 62/541,909, filed on August 7, 2017, entitled "SYSTEMS AND METHODS FOR CARD MANUFACTURING," U.S. Provisional Application Serial No. 62/568,517, filed October 5, 2017, entitled "SYSTEMS AND METHODS FOR CARD MANUFACTURING," and U.S. Provisional Application Serial No. 62/617,863, filed on January 16, 2018, entitled "CARD HAVING METALLIC CORE LAYER AND SYSTEMS AND METHODS FOR CARD MANUFACTURING," each of which is incorporated herein in its respective entirety.

BACKGROUND

[0002] Information carrying cards provide identification, authentication, data storage and application processing. Such cards or parts include key cards, identification cards, telephone cards, credit cards, bankcards, tags, bar code strips, other smart cards and the like.

[0003] Current information carrying cards use plastic or other polymer material cores. Current materials fail to provide a desired tactile response and strength. For example, information carrying cards need to withstand flexing to protect identifying components from damage as well as offer good durability during use. In addition, information carrying cards should be appealing, in terms of appearance and feel, to the end user, in order to facilitate use and adoption of the information carrying card.

SUMMARY

[0003a] In a first aspect, the present disclosure provides an information carrying card, comprising: a core layer including a metal material, wherein the metal material is exposed on at least a first edge of the information carrying card, and wherein the core layer defines a cavity; an electronics layer disposed in the cavity of the core layer, the electronics layer comprising at least one circuit element; and a polymer material disposed in the cavity, wherein the polymer material is configured to position the electronics layer and fill the cavity, wherein the first edge is a finished edge generated during a card singulation process.

[0003b] In a second aspect, the present disclosure provides a location device, comprising: an imaging modality configured to identify a position of one or more information carrying cards within a laminate sheet; and a marking instrument configured to generate at least one mark on the laminate sheet, wherein a position of the at least one mark identifies the position of the one or more information carrying cards within the laminate sheet.

[0003c] In a third aspect, the present disclosure provides a separation device, comprising: an imaging modality configured to locate at least one marking formed on a laminate sheet including a plurality of information carrying cards formed integrally therewith, wherein the at least one marking corresponds to a position of the one or more information carrying cards within the laminate sheet; and at least one singulation mechanism configured to separate each of the one or more information carrying cards from the laminate sheet using the at least one marking.

[0003d] In a fourth aspect, the present disclosure provides a method of manufacturing, comprising: receiving a laminate sheet comprising a plurality of information carrying cards formed integrally therein; inspecting the laminate sheet to identify a location of each of the plurality of information carrying cards within the laminate sheet; generating information corresponding to the location of each of the plurality of information carrying cards; and separating the plurality of information carrying cards from the laminate sheet using the information corresponding to the location of each of the plurality of information carrying cards.

[0003e] In a fifth aspect, the present disclosure provides a non-transient computer-readable medium having a plurality of instructions stored thereon, wherein the operate a transfer arm to receive a laminate sheet having a plurality of information carrying cards formed integrally therewith; operate a location device to locate a position of at least one of the plurality of information carrying cards within the laminate sheet, wherein the location device is configured to generate a mapping file corresponding to the position of the at least one of the plurality of information carrying cards; and operate a separation device to separate the plurality of information carrying cards from the laminate sheet, wherein the separation device is operated according to the mapping file.

[0003f] In a sixth aspect, the present disclosure provides a method of forming a plurality of information carrying cards using a card manufacturing system comprising a transfer arm, a

locating device, and a separation device, the method comprising: transferring, by the transfer arm, a laminate sheet from a loading station to the locating device; determining, by the locating device, a position of at least one of a plurality of information carrying cards within the laminate sheet; generating, by the locating device, a mapping file corresponding to the position of the at least one of the plurality of information carrying cards; and separating the plurality of information carrying cards from the laminate sheet, wherein the separation device is operated according to the mapping file.

[0003g] In a seventh aspect, the present disclosure provides a method of manufacturing a laminate sheet, comprising: receiving a frame defining a plurality of cavities, wherein the frame comprises a first material; positioning one of a plurality of core layers within each of the plurality of cavities, wherein each core layer comprises a second material configured to be imaged in a non-visible spectrum by a locating device during a card manufacturing process, and wherein the second material is softer than the first material; positioning at least one additional layer above the core layer; and laminating the frame, each core layer, and the at least one additional layer to generate a laminate sheet containing a plurality of information carrying cards, wherein each of the plurality of information carrying cards includes one of the plurality of core layers.

[0003h] In an eighth aspect, the present disclosure provides a method of card manufacturing, comprising: manufacturing a plurality of laminate sheets, comprising: receiving a frame defining a plurality of cavities, wherein the frame comprises a first material; positioning one of a plurality of core layers within each of the plurality of cavities, wherein each core layer comprises a second material configured to be imaged in a non-visible spectrum by a locating device during a card manufacturing process, and wherein the second material is softer than the first material; positioning at least one additional layer above the core layer; and laminating the frame, each of the plurality of core layers, and the at least one additional layer; positioning the plurality of laminate sheets within a loading device; positioning the loading device adjacent to a card manufacturing system comprising the locating device and a separation device; and manufacturing a plurality of information carrying cards from each of the plurality of laminate sheets using the card manufacturing system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Aspects of the present disclosure are best understood from the following detailed description when read with the accompanying figures. It is noted that, in accordance with the standard practice in the industry, various features are not drawn to scale. In fact, the dimensions of the various features may be arbitrarily increased or reduced for clarity of discussion.

[0005] FIG. 1 illustrates a cross-sectional view of a layer structure of an information carrying card, in accordance with some embodiments.

CLAIMS

What is claimed is:

1. An information carrying card, comprising:

a core layer including a metal material, wherein the metal material is exposed on at least a first edge of the information carrying card, and wherein the core layer defines a cavity;

an electronics layer disposed in the cavity of the core layer, the electronics layer comprising at least one circuit element; and

a polymer material disposed in the cavity, wherein the polymer material is configured to position the electronics layer and fill the cavity,

wherein the first edge is a finished edge generated during a card singulation process.

2. The information carrying card of claim 1, comprising a printable film disposed over a first surface of the core layer, and wherein the printable film is formed prior to the card singulation process.

3. The information carrying card of claim 2, wherein the printable film includes a plurality of printed elements formed thereon.

4. The information carrying card of claim 1, comprising a transparent film disposed over a first surface of the core layer.

5. The information carrying card of claim 1, wherein the electronics layer comprises at least one printed circuit element.

6. The information carrying card of claim 1, wherein the at least one circuit element is embedded or surface-mounted on a supporting film.

7. A locating device, comprising:

an imaging modality configured to identify a position of one or more information carrying cards within a laminate sheet; and

a marking instrument configured to generate at least one mark on the laminate sheet, wherein a position of the at least one mark identifies the position of the one or more information carrying cards within the laminate sheet.

8. The locating device of claim 7, wherein the imaging modality comprises a non-visible spectrum imaging selected from the group consisting of: an x-ray imager, an ultrasonic imager, a nuclear imager, an ultraviolet imager, and a sonogram imager.

9. The locating device of claim 7, wherein at least one mark is selected from the group consisting of a visible mark, a non-visible mark, and a reactive mark.

10. A separation device, comprising:

an imaging modality configured to locate at least one marking formed on a laminate sheet including a plurality of information carrying cards formed integrally therewith, wherein the at least one marking corresponds to a position of the one or more information carrying cards within the laminate sheet; and

at least one singulation mechanism configured to separate each of the one or more information carrying cards from the laminate sheet using the at least one marking.

11. The separation device of claim 10, wherein the at least one singulation mechanism is selected from the group consisting of a rotating bit, a cutting edge, a laser cutter, a water jet, and an ultrasonic wire cutter.

12. The separation device of claim 10, wherein the at least one marking is selected from the group consisting of a visible marking, a non-visible marking, and a reactive marking.

13. A method of manufacturing, comprising:

receiving a laminate sheet comprising a plurality of information carrying cards formed integrally therein;

inspecting the laminate sheet to identify a location of each of the plurality of information carrying cards within the laminate sheet;

generating information corresponding to the location of each of the plurality of information carrying cards; and

separating the plurality of information carrying cards from the laminate sheet using the information corresponding to the location of each of the plurality of information carrying cards.

14. The method of claim 13, comprising forming the laminate sheet prior to receiving the laminate sheet.

15. The method of claim 14, wherein forming the laminate sheet comprises:

receiving a frame defining a plurality of cavities, wherein the frame comprises a first material;

positioning at least one core layer within at least one of the plurality of cavities, wherein the at least one core layer comprises a second material, and wherein the second material includes a metal;

forming a printed layer above the at least one core layer; and

laminating the frame, the at least one core layer, and the printed layer to generate at least one information carrying card.

16. The method of claim 13, wherein inspecting the laminate sheet comprises imaging the laminate sheet with an imaging modality, wherein the imaging modality is configured to identify the location of each of the plurality of information carrying cards.

17. The method of claim 16, wherein the imaging modality comprises a non-visible spectrum imaging modality.

18. The method of claim 13, wherein generating the information corresponding to the position of each of the plurality of information carrying cards comprises forming at least one marking on the laminate sheet, wherein the at least one marking corresponds to the position of at least one of the plurality of information carrying cards.

19. The method of claim 13, wherein generating the information corresponding to the position of each of the plurality of information carrying cards comprises generating a mapping file comprising position data corresponding to the position of at least one of the plurality of information carrying cards.

20. The method of claim 13, wherein separating the plurality of information carrying cards comprises guiding a singulation mechanism to remove material from a periphery of each of the information carrying cards in the laminate sheet, wherein the singulation mechanism is guided by the information corresponding to the position of each of the plurality of information carrying cards.

21. The method of claim 20, wherein a predetermined portion of each of the information carrying cards is removed from the periphery of the information carrying card by the singulation mechanism.

22. The method of claim 21, wherein the predetermined portion is selected such that an edge of a core layer of the information carrying card is exposed after the information carrying card is removed from the laminate sheet.

23. The method of claim 13, comprising finishing an edge of the information carrying card to have a predetermined geometry.

24. The method of claim 13, wherein a location device is configured to inspect the laminate sheet, a separation device is configured to separate the plurality of information carrying cards from the laminate sheet, and wherein the method comprises transferring the laminate sheet from the locating device to the separation device.

25. A non-transient computer-readable medium having a plurality of instructions stored thereon, wherein the

operate a transfer arm to receive a laminate sheet having a plurality of information carrying cards formed integrally therewith;

operate a location device to locate a position of at least one of the plurality of information carrying cards within the laminate sheet, wherein the location device is configured to generate a mapping file corresponding to the position of the at least one of the plurality of information carrying cards; and

operate a separation device to separate the plurality of information carrying cards from the laminate sheet, wherein the separation device is operated according to the mapping file.

26. The non-transient computer-readable medium of claim 25, wherein operating the location device comprises operating an imaging modality to image the laminate sheet, wherein the imaging modality is configured to identify the location of each of the plurality of information carrying cards, and wherein the imaging modality comprises a non-visible spectrum imaging modality.

27. The non-transient computer-readable medium of claim 25, wherein operating the location device comprises forming at least one marking on the laminate sheet, wherein the at least one marking corresponds to the position of at least one of the plurality of information carrying cards.

28. The non-transient computer-readable medium of claim 25, wherein operating the separation device comprises guiding a singulation mechanism to remove material from a periphery of each of the information carrying cards in the laminate sheet, wherein the singulation mechanism is guided by the mapping file.

29. The non-transient computer-readable medium of claim 28, wherein a predetermined portion of each of the information carrying cards is removed from the periphery of the information carrying card by the singulation mechanism.

30. The non-transient computer-readable medium of claim 29, wherein the predetermined portion is selected such that an edge of a core layer of the information carrying card is exposed after the information carrying card is removed from the laminate sheet.

31. The non-transient computer-readable medium of claim 25, wherein operating the separation device comprises finishing an edge of the information carrying card to have a predetermined geometry.

32. The non-transient computer-readable medium of claim 25, wherein operating the transfer arm comprises operating a vacuum system formed integrally with the transfer arm to transfer the laminate sheet from the locating device to the separation device.

33. A method of forming a plurality of information carrying cards using a card manufacturing system comprising a transfer arm, a locating device, and a separation device, the method comprising:

transferring, by the transfer arm, a laminate sheet from a loading station to the locating device;

determining, by the locating device, a position of at least one of a plurality of information carrying cards within the laminate sheet;

generating, by the locating device, a mapping file corresponding to the position of the at least one of the plurality of information carrying cards; and

separating the plurality of information carrying cards from the laminate sheet, wherein the separation device is operated according to the mapping file.

34. A method of manufacturing a laminate sheet, comprising:

receiving a frame defining a plurality of cavities, wherein the frame comprises a first material;

positioning one of a plurality of core layers within each of the plurality of cavities, wherein each core layer comprises a second material configured to be imaged in a non-visible spectrum by a locating device during a card manufacturing process, and wherein the second material is softer than the first material;

positioning at least one additional layer above the core layer; and

laminating the frame, each core layer, and the at least one additional layer to generate a laminate sheet containing a plurality of information carrying cards, wherein each of the plurality of information carrying cards includes one of the plurality of core layers.

35. The method of claim 34, wherein the frame comprises polyvinyl chloride.

36. The method of claim 34, comprising positioning at least one electronic component within an internal cavity defined by at least one the plurality of core layers.

37. The method of claim 36, comprising filling the internal cavity with a filler material to self-level the at least one electronic component.

38. The method of claim 37, wherein the filler material is selected from the group consisting of moly-based material, a polyvinyl chloride material, and a polyethylene terephthalate material.

39. The method of claim 34, comprising applying a surface preparation technique to at least one of the core layer or the at least one additional layer prior to laminating the frame.

40. The method of claim 34, wherein each of plurality of core layers include a first area and an information carrying card including one of the plurality of core layers has a second area, wherein the second area is less than the first area, and wherein a portion each of the core layers is configured to be removed during a card singulation process.

41. The method of claim 34, wherein at least two of the plurality of core layers are connected prior to placement within the frame.

42. The method of claim 41, wherein the at least two of the plurality of core layers are coupled by one or more runners.

43. The method of claim 42, wherein the one or more runners comprises the second material.

44. The method of claim 42, wherein the one or more runners comprises the first material.

45. A method of card manufacturing, comprising:

manufacturing a plurality of laminate sheets, comprising:

receiving a frame defining a plurality of cavities, wherein the frame comprises a first material;

positioning one of a plurality of core layers within each of the plurality of cavities, wherein each core layer comprises a second material configured to be imaged in a non-visible spectrum by a locating device during a card manufacturing process, and wherein the second material is softer than the first material;

positioning at least one additional layer above the core layer; and

laminating the frame, each of the plurality of core layers, and the at least one additional layer;

positioning the plurality of laminate sheets within a loading device;

positioning the loading device adjacent to a card manufacturing system comprising the locating device and a separation device; and

manufacturing a plurality of information carrying cards from each of the plurality of laminate sheets using the card manufacturing system.

46. The method of claim 45, wherein manufacturing the plurality of information carrying cards comprises:

inspecting one of the plurality of laminate sheets to identify a location of each of the plurality of core layers within the one of the plurality of laminate sheets;

generating information corresponding to the location of each of the plurality of core layers; and

removing a predetermined portion of the frame from a periphery of each of the plurality of core layers to singulate the plurality of information carrying cards from the one of the plurality of laminate sheets, wherein the predetermined portion of the frame is removed according to the information corresponding to the location of each of the plurality of core layers.

47. The method of claim 46, wherein manufacturing the plurality of information carrying cards further comprises removing a portion each of the plurality of core layers such that a portion of a corresponding core layer is exposed about an edge of each of the plurality of information carrying cards.

48. The method of claim 45, comprising:

finishing an edge of each of the plurality of information carrying cards; and

transferring each of the plurality of information carrying cards to an unload station.