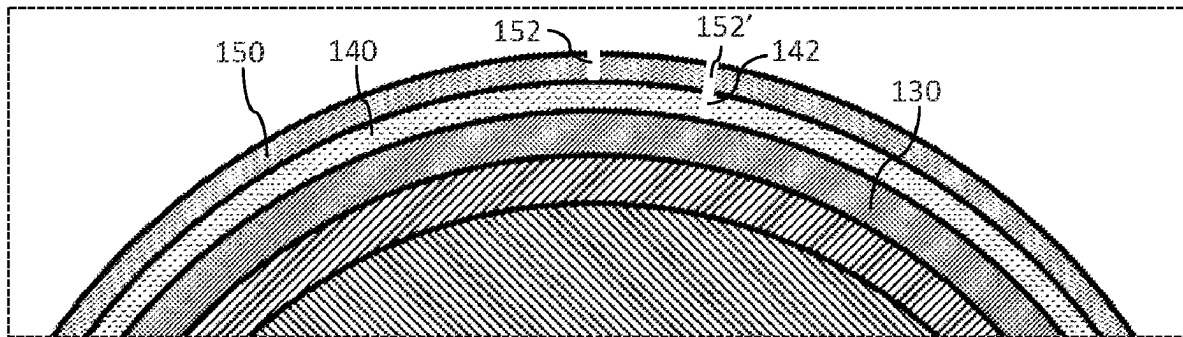


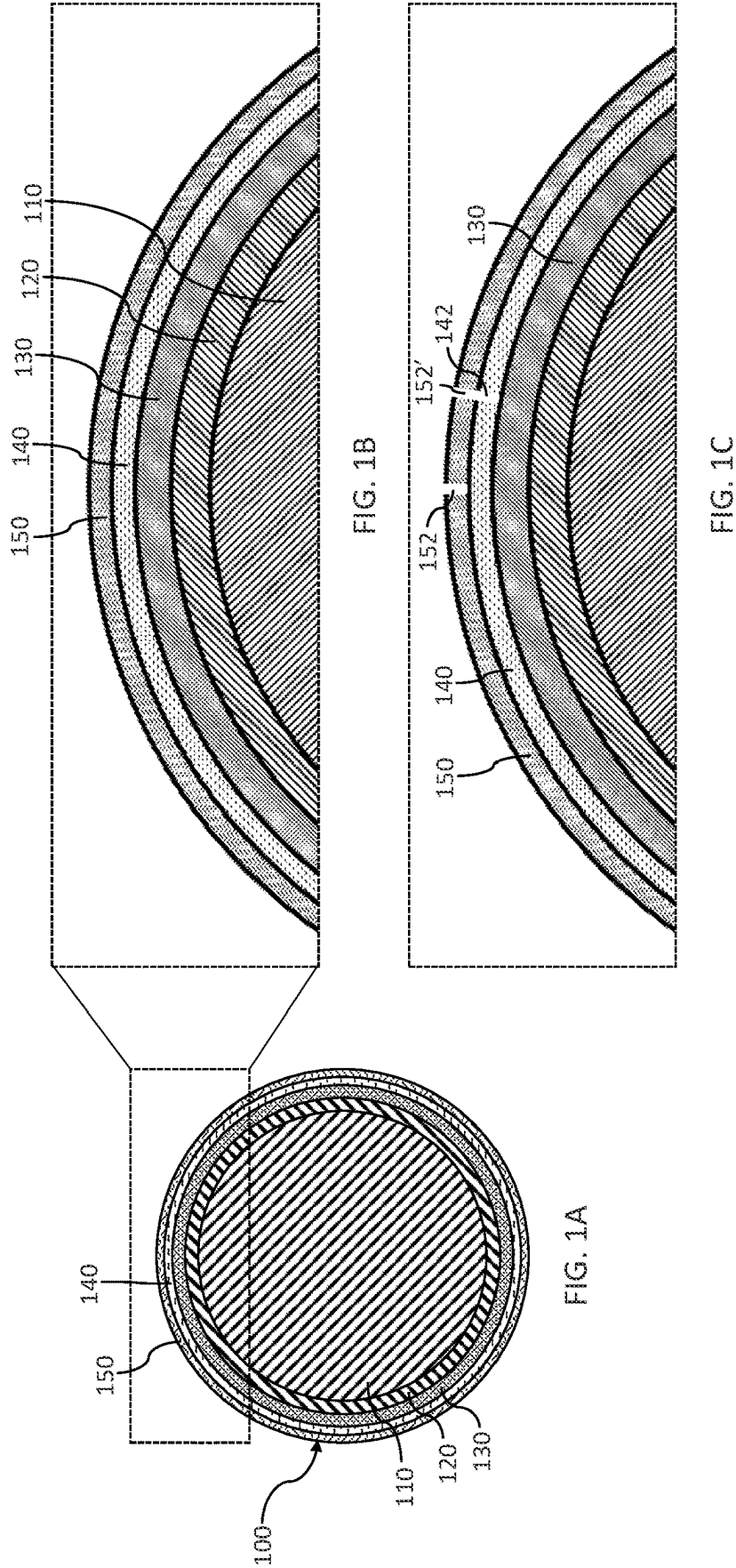


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(19) **United States**(12) **Patent Application Publication**
Kuntimaddi et al.(10) **Pub. No.: US 2025/0256162 A1**(43) **Pub. Date: Aug. 14, 2025**(54) **METHOD OF PROVIDING INDICIA ON
GOLF BALLS**(52) **U.S. Cl.**
CPC **A63B 37/00221** (2020.08)(71) Applicant: **Acushnet Company**, Fairhaven, MA
(US)(72) Inventors: **Manjari Kuntimaddi**, Raynham, MA
(US); **Michael R. Madson**, Easton, MA
(US)(73) Assignee: **Acushnet Company**, Fairhaven, MA
(US)(21) Appl. No.: **18/440,498**(22) Filed: **Feb. 13, 2024****Publication Classification**(51) **Int. Cl.**
A63B 37/00 (2006.01)(57) **ABSTRACT**

A method and configuration of forming markings, indicia, or other design features on golf balls is disclosed herein. The present disclosure uses any one or more of various material removal processes or techniques, such as laser engraving, or similar processes, to remove portions of layers or components of a golf ball, such as a paint layer, coating layer, cover, casing, or any other intermediate layers. Removal of material can either: (i) expose an underlying differently colored portion, layer, or component of the golf ball, or (ii) create for a void or pocket that is configured to subsequently receive ink. Based on this arrangement, markings, indicia, or other design features can be provided on golf balls without using traditional printing techniques.





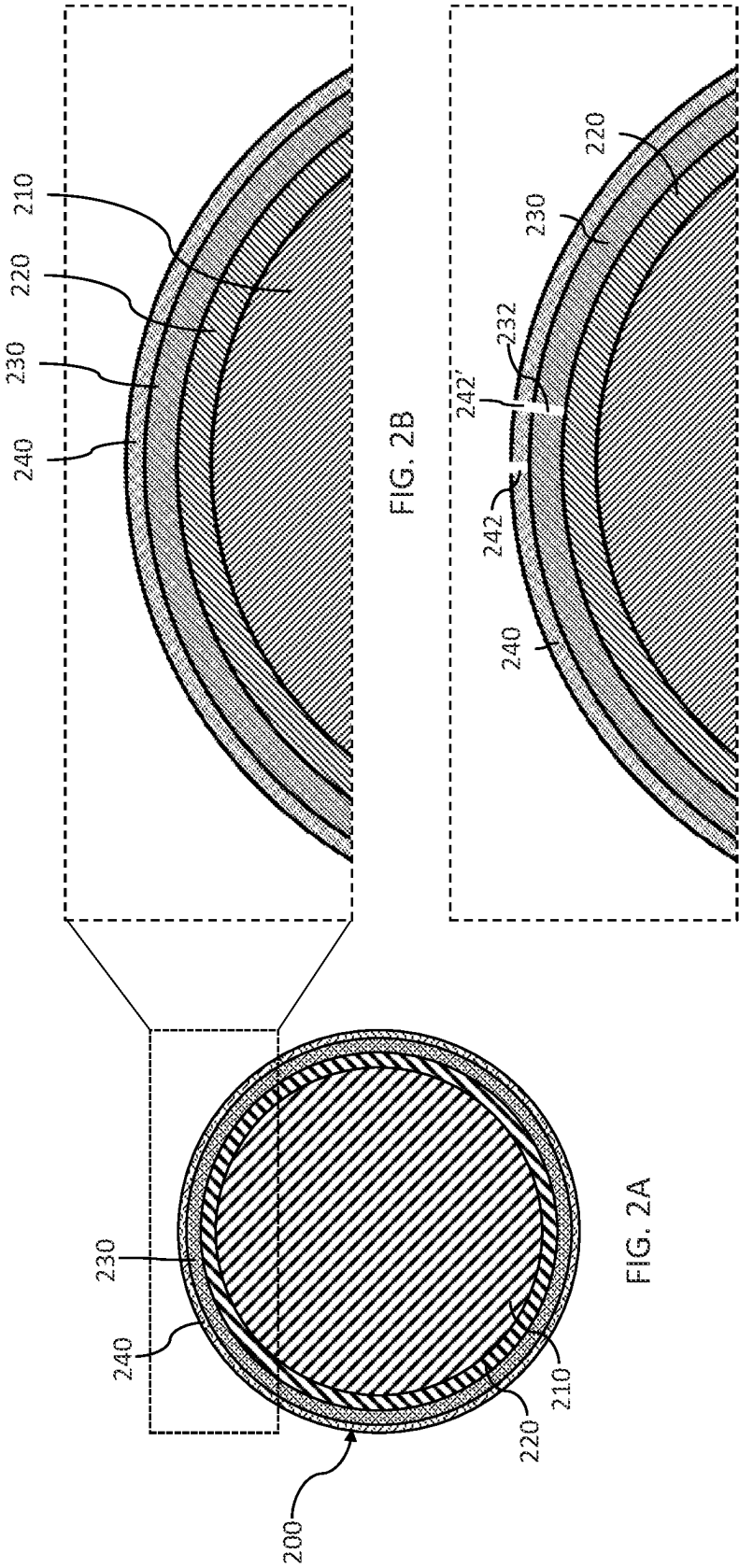


FIG. 2B

FIG. 2C

FIG. 2A

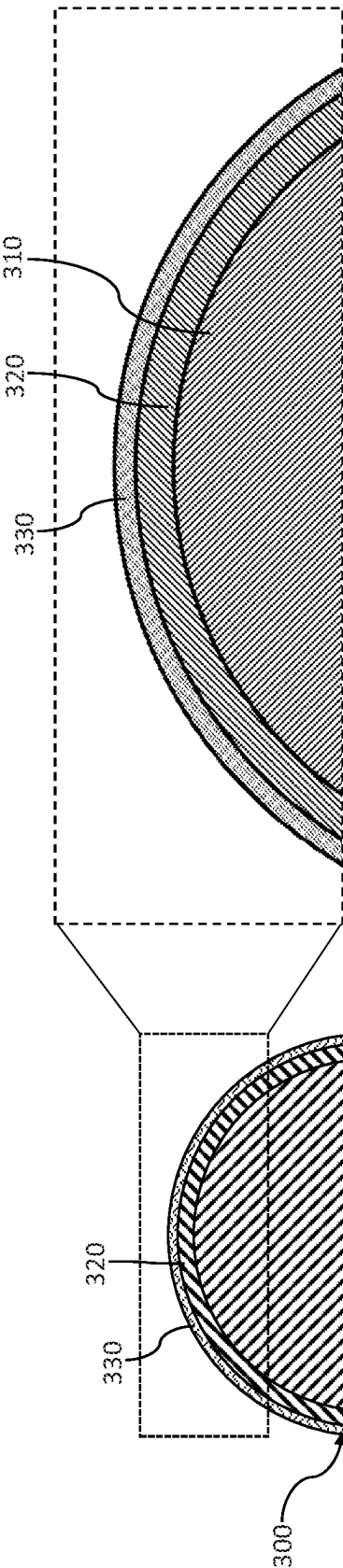


FIG. 3B

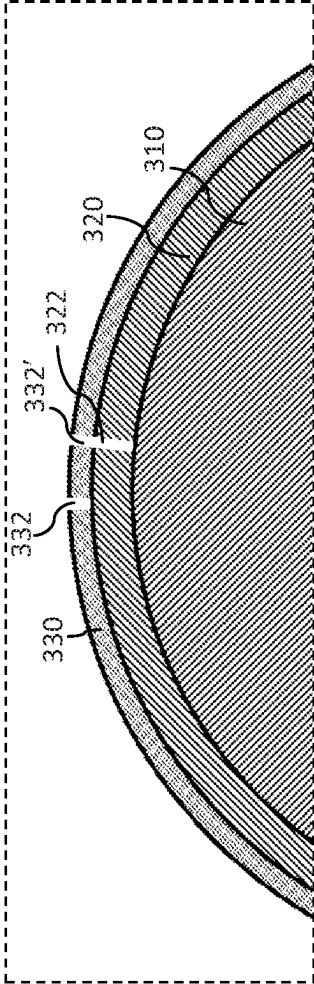
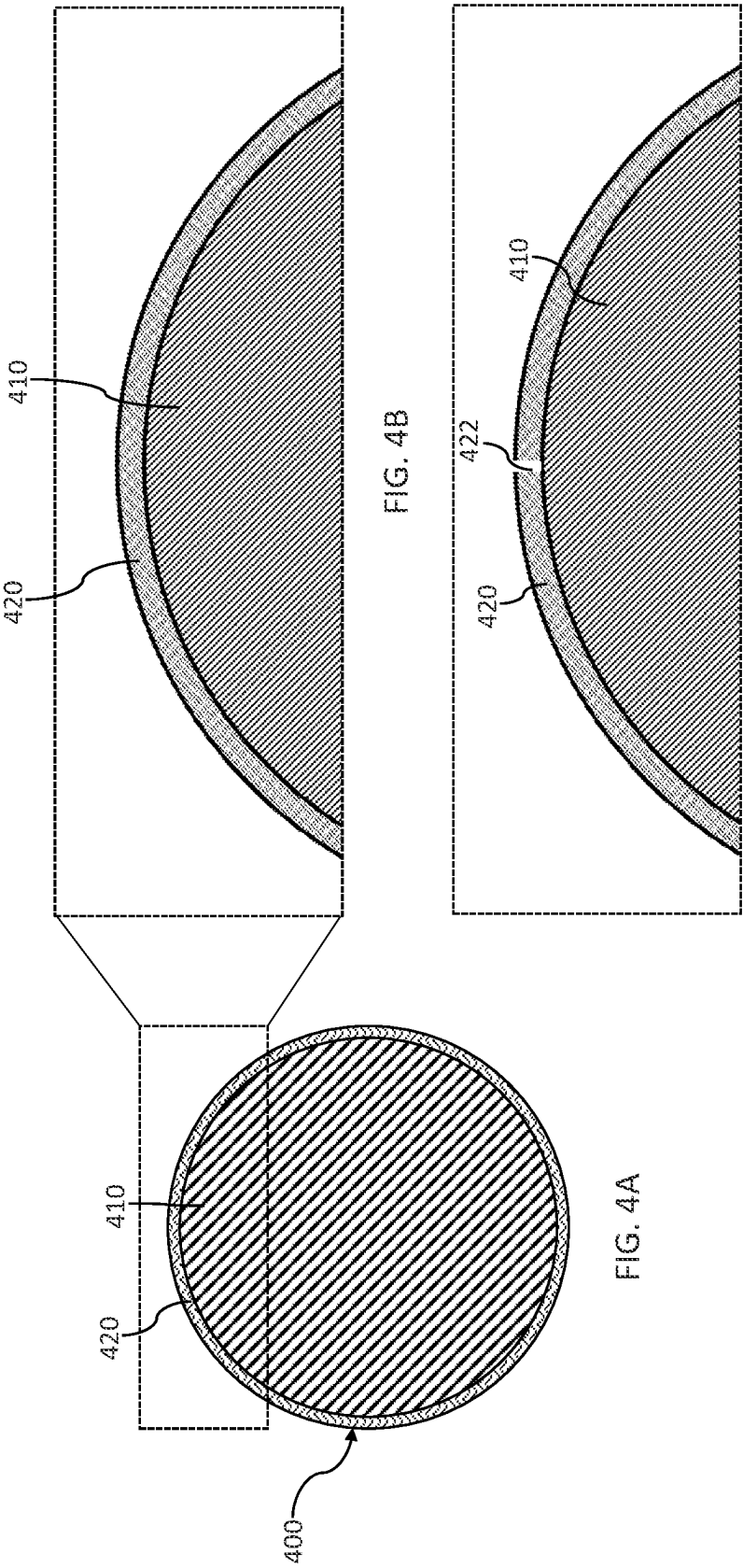
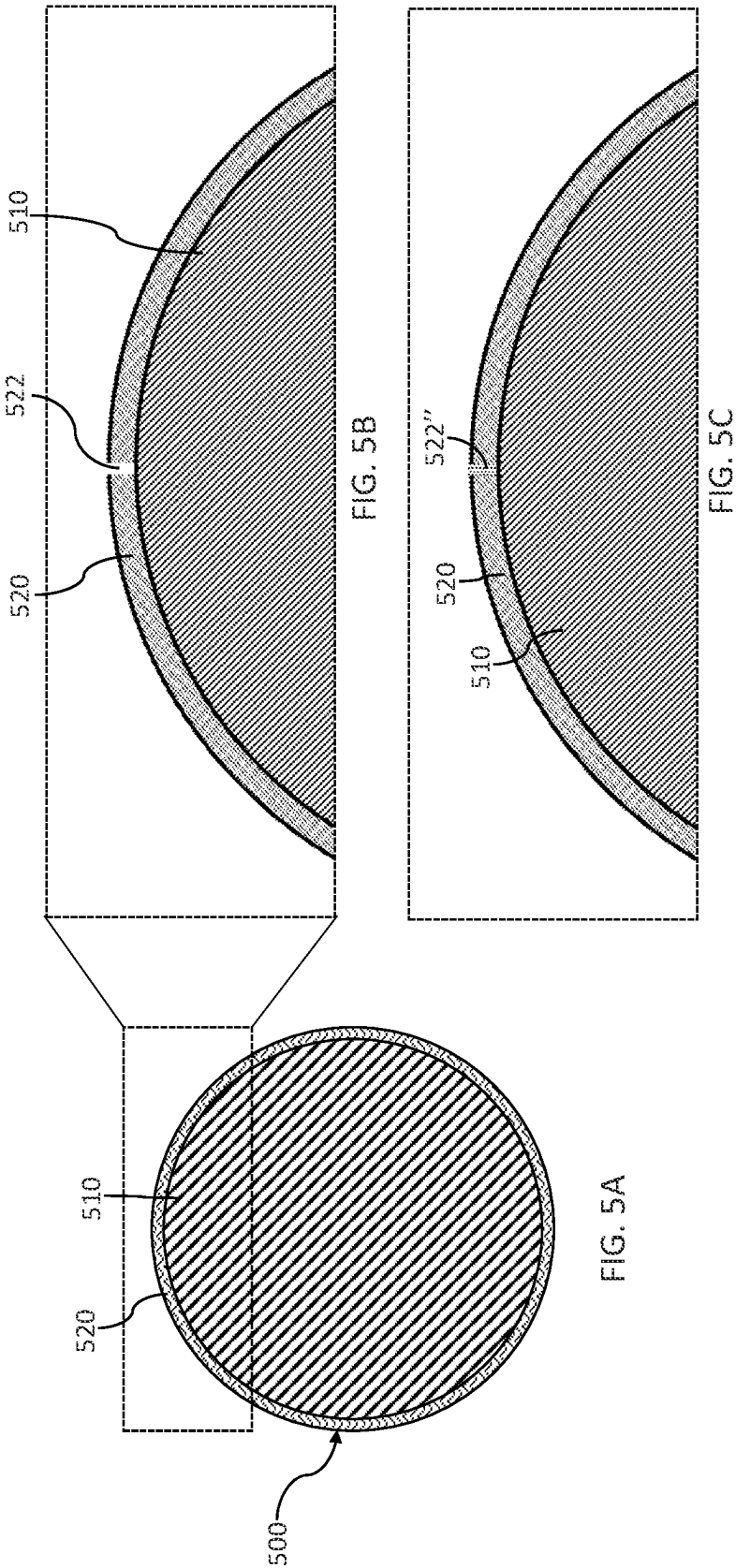


FIG. 3C

FIG. 3A





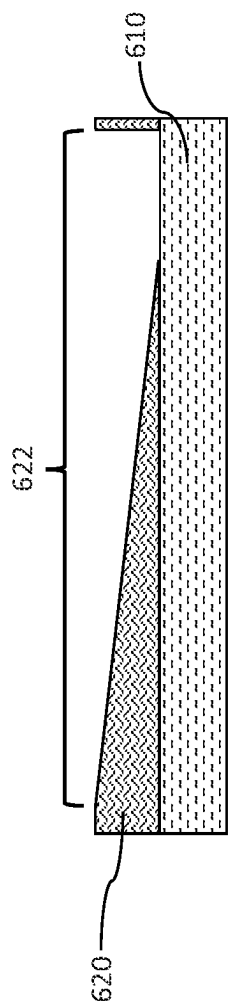


FIG. 6

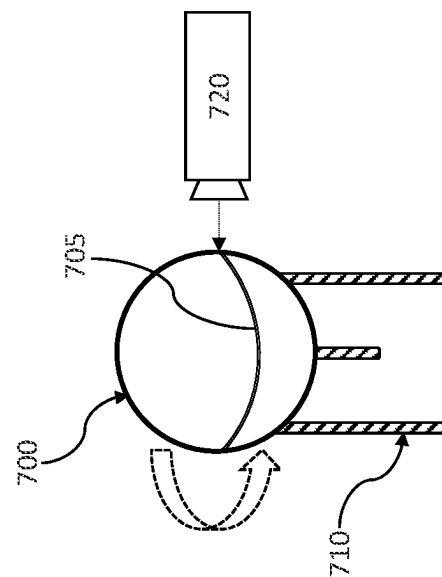


FIG. 7

METHOD OF PROVIDING INDICIA ON GOLF BALLS

FIELD OF THE INVENTION

[0001] This disclosure generally relates to providing a marking, design element, or indicia on a golf ball, and is more particularly directed to using material removal techniques to provide said features on the golf ball.

BACKGROUND OF THE INVENTION

[0002] The use of markings or design elements on golf balls is widely used for many purposes. A golf ball will typically have markings for a company's logo indicating the manufacturer, a play number, and a sidestamp indicating the type of golf ball. Additional markings or design elements, such as alignment aids or ornamental features can also be provided on the golf ball.

[0003] Regardless of the type of markings or design elements, manufacturers typically rely on printing techniques, such as pad printing, to add the markings or design elements to the golf ball. Printing markings or design elements on golf balls is practical, but also inherently introduces variability and complications into the golf ball manufacturing process. For example, pad printing an elongated marking (i.e., a marking that extends over 90 degrees around the golf ball) can require stitching or alignment of various portions of the elongated marking.

[0004] It would be desirable to provide an alternative technique to add markings or design elements to a golf ball.

SUMMARY OF THE INVENTION

[0005] In some aspects, the present disclosure is directed to a method of providing at least one marking, design element, or indicia on a golf ball. The terms marking, design element, design feature, indicia, and other similar terms are used interchangeably herein and generally refer to any type of visually detectable element on a golf ball. Examples can include sidestamps, markings, logos, alignment aids, name plates, numbers, words, phrases, photos, images, etc.

[0006] In one aspect, the method can include providing a golf ball comprising at least a first coating layer or component layer and a second coating layer, and the second coating layer can be arranged radially outward relative to the first coating layer or component layer. In one aspect, the second coating layer envelopes or encases the first coating layer or component layer. The first coating layer or component layer can have a first color (i.e., the first coating layer or component layer can be formed from a material having a first color, or a coating/paint layer of a first color can be applied to the first coating layer or component layer) and the second coating layer can have a second color (i.e., the second coating layer can be formed from a material having a second color, or a coating/paint layer of a second color can be applied to the second coating layer) that is different than the first color. The method can comprise removing at least a portion of the second coating layer to at least partially expose the first coating layer or component layer, such that a marking or visual effect becomes visible on the golf ball.

[0007] In one aspect, the process of removing a portion of the second coating layer can include etching techniques, such as laser etching or chemical etching, or engraving techniques, such as laser engraving.

[0008] The precise position, thickness, composition, and other characteristics of the first and second component layers or coating layers can vary. In one aspect, the first coating layer or component layer and the second coating layer can both be coating or paint layers. In another aspect, the first coating layer or component layer is a casing layer, and the second coating layer is a coating or paint layer applied to the casing layer. The golf ball can further comprise a cover layer disposed over the casing layer. In one aspect, the cover layer is transparent. In another aspect, the first coating layer or component layer is a casing layer, and a second layer or component can be a cover layer.

[0009] The term "component" can be used herein to refer to any element of a golf ball, such as a physical layer contributing to the overall golf ball construction (i.e., a core layer, a casing layer, an intermediate layer, a cover, etc.), or a layer that is applied during finishing (i.e., a paint layer, a coating layer, etc.) For specific constructions and aspects disclosed herein, the term component is further clarified to specifically identify a particular portion of the golf ball.

[0010] The term "component layer" can be used herein to refer to substantive layers to the overall golf ball construction as understood by those of ordinary skill in the art, such as the core and any sub-layers of a core, an intermediate, casing, or mantle layer and any sub-layers of the intermediate, casing, or mantle layer, and the cover and any sub-layers of the cover.

[0011] The term "coating layer" can be used herein to refer to any coating, paint layer, topcoat layer, or any other relatively thinner finishing layers.

[0012] In one aspect, the cover layer is comprised of at least one of: ionomer or urethane. Various other exemplary cover materials are disclosed herein. In one aspect, the first coating layer or component layer is a core, and the second layer or component is a cover layer.

[0013] In one aspect, the golf ball further comprises at least one third coating layer arranged radially outward relative to the second coating layer, and the third coating layer can have a third color that is different than the first and second colors. The method can further comprise removing at least a portion of the third coating layer to at least partially expose the second coating layer. Removal of material from multiple layers or components can include laser etching or laser engraving, or other material removal techniques disclosed herein, to remove material at two different or varying depths.

[0014] The method can further comprise applying a clear topcoat over the portion of the second coating layer that has been removed. This clear topcoat can be used to protect or cover any underlying ink that has been added to the void created by the removal of material.

[0015] In one aspect, the golf ball can be simultaneously moved, rotated, or otherwise positioned while removing material from one of the layers or components of the golf ball.

[0016] Removing material from one of the layers or components of the golf ball can include applying etching, engraving, or other material removal process at a variable intensity, such that the visual effect on the golf ball defines a color gradient between the first color and the second color. In one aspect, varying the amount of material that is removed from one of the layers or components, and adjust-

ing the opacity of any one or more of the layers or components can create variability in the resulting color on the golf ball.

[0017] In one aspect, the marking or visual effect can extend for a circumferential extent of at least 180 degrees around the golf ball. In one aspect, the marking or visual effect can extend for a circumferential extent of at least 270 degrees around the golf ball. In one aspect, the marking or visual effect can extend for a circumferential extent of at least 360 degrees around the golf ball. The elongated marking on the golf ball can be generated or created via a single step in which the golf ball is continuously engaged by the associated marking, removal, engraving, or etching tool or assembly, as opposed to printing techniques that may require various, independent printing tools to cooperate with each other to generate an elongated marking.

[0018] In one aspect, the method can comprise a cooling treatment applied simultaneously while removing material from a portion of a layer or component. One of ordinary skill in the art would appreciate based on this disclosure that temperature control techniques may be used to protect any of the layers or components of the golf ball that are undergoing the etching, engraving, or material removal processes.

[0019] In another aspect, a method of providing a marking or visual effect on a golf ball is provided. The method can comprise providing a golf ball comprising at least a first component or coating layer and a second component or coating layer, wherein the first component or coating layer has a first color and the second component or coating layer has a second color that is different than the first color, and the second component or coating layer is arranged radially outward relative to the first component or coating layer.

[0020] The method can comprise removing at least a portion of the second component or coating layer via laser etching, laser engraving, or chemical etching to at least partially expose the first component or coating layer, such that a marking or visual effect is visible on the golf ball. The golf ball can be simultaneously moved or rotated during removal of the portion of the second component or coating layer, and the marking or visual effect can extend for a circumferential extent of at least 180 degrees around the golf ball. The circumferential extent can be at least 270 degrees or 360 degrees, in some aspects.

[0021] In another aspect, a method of providing at least one marking or visual effect on a golf ball is disclosed that includes (i) providing a golf ball comprising at least a first component or coating layer and a second component or coating layer, wherein the second component or coating layer is arranged radially outward relative to the first component or coating layer; (ii) removing at least a portion of the second component or coating layer; and (iii) at least partially filling in the portion of the second component or coating layer with ink to define the at least one marking or visual effect on the golf ball.

[0022] Additional features and aspects of the present disclosure are described in further detail herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] Further features and advantages of the present disclosure can be ascertained from the following detailed description that is provided in connection with the drawings described below:

[0024] FIG. 1A is a cross-sectional view of a first exemplary construction of a golf ball.

[0025] FIG. 1B is a magnified view of a portion of the golf ball of FIG. 1A.

[0026] FIG. 1C is a magnified view of the portion of the golf ball in FIG. 1B after a material removal process has been applied to the golf ball.

[0027] FIG. 2A is a cross-sectional view of a second exemplary construction of a golf ball.

[0028] FIG. 2B is a magnified view of a portion of the golf ball of FIG. 2A.

[0029] FIG. 2C is a magnified view of the portion of the golf ball in FIG. 2B after a material removal process has been applied to the golf ball.

[0030] FIG. 3A is a cross-sectional view of a third exemplary construction of a golf ball.

[0031] FIG. 3B is a magnified view of a portion of the golf ball of FIG. 3A.

[0032] FIG. 3C is a magnified view of the portion of the golf ball in FIG. 3B after a material removal process has been applied to the golf ball.

[0033] FIG. 4A is a cross-sectional view of a fourth exemplary construction of a golf ball.

[0034] FIG. 4B is a magnified view of a portion of the golf ball of FIG. 4A.

[0035] FIG. 4C is a magnified view of the portion of the golf ball in FIG. 4B after a material removal process has been applied to the golf ball.

[0036] FIG. 5A is a cross-sectional view of a fifth exemplary construction of a golf ball.

[0037] FIG. 5B is a magnified view of a portion of the golf ball of FIG. 5A.

[0038] FIG. 5C is a magnified view of the portion of the golf ball in FIG. 5B after a material removal process has been applied to the golf ball.

[0039] FIG. 6 is a magnified view of an exemplary cross-sectional portion of a golf ball after a material removal process.

[0040] FIG. 7 is an exemplary schematic diagram of a golf ball held via a support assembly and positioned relative to material removal assembly.

DETAILED DESCRIPTION OF THE INVENTION

[0041] In one aspect, the present disclosure is directed to a method of providing a marking on a golf ball via laser etching, or other type of etching, or laser engraving, on an outer surface of a cover, casing layer, or core. In one aspect, the present disclosure is directed to completely removing, vaporizing, or otherwise eliminating a specific portion of a golf ball layer as opposed to discoloring or melting the portion of the golf ball layer. The area which has undergone some form of material removal can be either partially or fully filled with ink, such as UV ink, nitrocellulose ink, glow in the dark ink, or any form of ink to add a design, marking, pattern or other visual feature to a golf ball.

[0042] In the situation in which the material removal process occurs on the core or the casing layer, the outer layer can be clear or translucent to facilitate visibility of the marking. If the material removal process occurs on the surface of the cover, the marking or feature may or may not be protected by a topcoat (i.e., the golf ball can be painted or unpainted).

[0043] Printing indicia, markings, or other design features on a golf ball can bring variability into the golf ball manufacturing process. In one specific aspect, alignment

aides can be configured to extend more than 180 degrees, and more particularly extend at least 270 degrees, and up to 360 degrees around a golf ball. Using traditional printing techniques can require stitching of various portions of the alignment aid in order to produce such elongated markings. In one aspect, the present disclosure provides a method for creating indicia that is highly precise, thereby allowing for very intricate, straight patterns to be created.

[0044] The present disclosure also allows for improved durability of the markings, in one aspect, due to etching or engraving on the outer surface of the golf ball allowing for the marking to be recessed from the outer surface of the golf ball. Additional manufacturing benefits or efficiencies can be realized due to avoiding issues that can be encountered during pad printing, such as disruption of the coating appearance and/or ink durability issues.

[0045] In one aspect, the material removal process can be performed on an otherwise already finished golf ball. In one aspect, the material removal process can be performed on a dimpled cover.

[0046] In one aspect, the material removal process techniques disclosed herein, such as laser engraving, can reach a depth of or penetrate the golf ball up to 0.0001 inches. In one aspect, ink can either partially or fully fill the treated region, and any aerodynamic performance issues associated with removal of material can be minimized due to the relatively small depth of material that has been removed.

[0047] In another aspect, a golf ball can be provided that is comprised of at least two component or coating layers, and one of the component or coating layers can be comprised of a material having a first color, and the component or coating layer can be covered by a paint layer of a second, different color. The component or coating layer can subsequently undergo a material removal process, such as laser etching or engraving, to remove selected portions of the paint layer and thereby provide indicia, a design feature, or other visual element via exposure of the first color of the component or coating layer.

[0048] In one aspect, a method of providing a marking or visual effect on a golf ball is provided. The method can include providing a golf ball comprising at least a first coating layer or component layer and a second coating layer, and the second coating layer can be arranged radially outward relative to the first coating layer or component layer. The first coating layer or component layer can have a first color and the second coating layer can have a second color that is different than the first color. The method can comprise removing at least a portion of the second coating layer to at least partially expose the first coating layer or component layer, such that a marking or visual effect is visible on the golf ball.

[0049] In one aspect, the process of removing a portion of the second coating layer can include laser etching, laser engraving, or chemical etching. One of ordinary skill in the art would understand that various types of etching or material removal techniques can be used. In one aspect, the removal process can include vaporization of substrate material or coating/paint layer material. Wet or dry etching techniques can be used on the golf ball. In one aspect, the material removal process can include cutting or grinding techniques. Any type of lasering techniques can be used in accordance with techniques disclosed herein, including but not limited to laser engraving, laser marking, laser ablation, and laser etching.

[0050] The exact position, thickness, composition, etc., of the first and second component or coating layers can vary. In one aspect, the first coating layer or component layer and the second coating layer are both paint layers. In another aspect, the first coating layer or component layer is a casing layer, and the second coating layer is a paint layer on the casing layer. The golf ball can further comprise a cover layer disposed over the casing layer. In one aspect, the cover layer is transparent. In another aspect, the first coating layer or component layer is a casing layer, and the second layer or component is a cover layer.

[0051] In one aspect, the cover layer is comprised of at least one of: ionomer or urethane. In one aspect, the first coating layer or component layer is a core, and the second layer or component is a cover layer.

[0052] In one aspect, the golf ball further comprises at least one third component or coating layer arranged radially outward relative to the second coating layer, and the third component or coating layer can have a third color that is different than the first and second colors. The method can further comprise removing at least a portion of the third component or coating layer to at least partially expose the second coating layer. Removal of material from multiple layers can include laser etching or engraving to remove material at two different or varying depths.

[0053] The method can further comprise applying a clear topcoat over the portion of the second coating layer that has been removed.

[0054] The golf ball can be simultaneously moved or rotated while removing material from one of the layers or components of the golf ball.

[0055] Removing material from one of the layers or components of the golf ball can include applying etching, engraving, or any other removal process at a variable intensity, such that the visual effect on the golf ball defines a color gradient between the first color and the second color.

[0056] In one aspect, the marking or visual effect can extend for a circumferential extent of at least 180 degrees around the golf ball. In one aspect, the marking or visual effect can extend for a circumferential extent of at least 270 degrees around the golf ball. In one aspect, the marking or visual effect can extend for a circumferential extent of at least 360 degrees around the golf ball.

[0057] In one aspect, the method can comprise a cooling treatment applied simultaneously while removing material from a portion of a component or coating layer.

[0058] In another aspect, a method of providing a marking or visual effect on a golf ball is provided. The method can comprise providing a golf ball comprising at least a first coating layer or component layer and a second coating layer, wherein the first coating layer or component layer has a first color and the second coating layer has a second color that is different than the first color, and the second coating layer is arranged radially outward relative to the first coating layer or component layer. The method can comprise removing at least a portion of the second coating layer via laser etching, laser engraving, or chemical etching to at least partially expose the first coating layer or component layer, such that a marking or visual effect is visible on the golf ball. The golf ball can be simultaneously moved or rotated during removal of the portion of the second coating layer, and the marking or visual effect can extend for a circumferential extent of at least 180 degrees around the golf ball.

[0059] In one aspect, an etched or engraved printing feature can be provided on a golf ball or golf ball sub-assembly or component. The etched or engraved printing feature can be created on the golf ball, golf ball sub-assembly or component via etching, such as laser etching, or engraving, such as laser engraving, and then the treated area can be filled with ink.

[0060] In one example, the material removal process can be performed on a surface of the golf ball and can be as shallow as 0.0001 inches. In another aspect, the depth of material removal can be 0.0005 inches, or 0.001 inches, or 0.005 inches, or any other value. The ink can partially or fully fill the voided region. In one aspect, the ink can then be cured, such as via UV curing or other known curing methods. One of ordinary skill in the art would understand that the ink can include photo initiators, nitrocellulose ink, glow in the dark ink, or any other ink.

[0061] In one aspect, the substrate that is engraved (i.e., a surface of the golf ball or golf ball sub-assembly) can be formed from a material of a first color, and the ink can have a second, different color. In one aspect, engraving of the marking or design element occurs on a surface of an inner layer of the golf ball, i.e., a layer other than the cover or an outer paint layer. The engraving can occur on a layer underneath the final or outermost layer, which can have a transparent and/or translucent cover.

[0062] In one aspect, engraving can be used to remove at least a portion of a coating layer of a particular color to expose a different color on an underlying portion of the golf ball. For example, a golf ball can have a red cover, which can be formed from Surlyn® in one example, and a white paint layer can be applied to the cover. Engraving can then be used to selectively remove portions of the white paint layer to expose the underlying red cover. This type of engraving technique can be used to generate a nameplate, side stamp, or other design element. One of ordinary skill in the art would understand that the parameters for this type of material removal step (i.e., intensity, depth, etc.) can be adjusted to correspond to the thickness of the associated paint layer or coating layer that is being targeted.

[0063] The engraving can occur on any given layer of the ball after a coating is applied. In one example the cover is formed from a material having a first color, the cover is then painted a second color, and the engraving removes the paint or coating layer to expose the first color.

[0064] In another example, a casing layer is molded from a material having a first color, the casing layer is painted a second color, and the engraving removes a portion of the painted layer to expose the first color of the casing layer. In this embodiment the casing layer can have a clear cover molded thereon so the etched or engraved design element on the casing layer is visible.

[0065] In one aspect, a cover or casing is formed from a material of a first color, the cover or casing is then painted a second color, and subsequently painted a third color. After which, the engravings can be adjusted to specific depths to reveal different paint layers. A first engraving can expose the second color in one area of the golf ball and a second engraving can expose the first color in another area of the golf ball. Other engraving techniques can be carried out to expose various color patterns or features on the golf ball. One of ordinary skill in the art would understand that

additional paint layers of different colors can be used, and engraving settings and locations can be adjusted accordingly to expose various colors.

[0066] One of ordinary skill in the art would understand that the techniques disclosed herein can be used to generate, form, or otherwise produce design features, elements, side-stamps, markings, logos, alignment aids, name plates, numbers, words, phrases, photos, images, etc.

[0067] In one example, there can be one or more etchings or engravings on the golf ball. In one aspect, there can be engravings on one or more component layers, coating layers, or components of the golf ball.

[0068] In one aspect, a single engraving can be considered a continuous engraving process, such as laser engraving, that is used to remove a substrate or paint. The engraving technique can create a different color than the color of an adjacent or outermost layer of the golf ball. In one aspect, the engraving setting can be configured to generate a single continuous pattern, or can be configured to generate multiple colors or shades of colors that can be interconnected and/or blended together. In one aspect, this multi-color or shading type of engraving can still be considered a single engraving.

[0069] Regarding the paint layers, exemplary paint layers for use with the golf ball and engraving technique disclosed herein can have an average thickness of 0.0005 inches-0.0020 inches, in one aspect. In another aspect, the average thickness of any paint layers can be at least 0.0001 inches, or at least 0.00005 inches. In another aspect, the average thickness of any paint layers can be greater than 0.0020 inches, or greater than 0.0050 inches. If a single paint color is used in multiple coats to achieve the desired thickness or coverage, then the multiple coats can be considered the same paint layer if the coats are adjacent to each other and have the same color formulation. In one aspect, each coating can be considered a different paint layer.

[0070] In one aspect, the coating layers can be water-borne, solvent-borne, thermoplastic powder coated, UV-cured, dipped, and/or sprayed. In one aspect, coating formulations can be comprised of urethane/urea, epoxy, acrylic, urethane acrylic, etc. In one aspect, coating formulations can be a thermoplastic material dissolved in solvent, or other material. In one aspect, coating layers can be glossy, matte, iridescent, glow in the dark, color shifting, etc.

[0071] In one embodiment, the layer can have a topcoat applied after the engraving process. In another embodiment, the engraving can occur after a topcoat is applied. In this aspect, the engraving can extend through at least a topcoat and/or one additional paint layer. The topcoat can be clear or semi-transparent, in one aspect. The cover can be clear or semi-transparent, in one aspect. Based on the use of an outer component or coating layer, such as a topcoat, paint layer, cover, etc., a shading feature or hazy patterning feature can be present on the golf ball.

[0072] Some exemplary techniques for removing material from a golf ball can include laser etching, laser engraving, plasma etching, or chemical etching. One of ordinary skill in the art would understand that various types of etching or engraving techniques can be used. Exemplary etching or engraving depths can range anywhere from 0.0001 inches-0.0050 inches. Other exemplary etching or engraving depths can be used. In one embodiment the etching or engraving depth can be equal to a thickness of a paint layer on the golf ball. In another embodiment the etch or engraving depth can be equal to the thickness of one, two, three, or more adjacent

paint layers on the golf ball. In another embodiment, the etching or engraving depth can vary to create color gradation or shadowing within the etching or engraving.

[0073] In one aspect, a golf ball is provided that includes a core and a dimpled cover. The cover can have at least one paint layer. The cover material can be a first color and the at least one paint layer can be a second color. The cover can undergo at least one etching or engraving process that removes the paint layer having the second color and exposes the first color of the cover layer beneath.

[0074] In one aspect, the cover can be formed from ionomer or urethane. In one aspect, the cover can be a thermosetting or a thermoplastic material. In one aspect, the cover is formed from any one or more of: thermosetting polyurethanes, thermosetting polyureas, thermosetting hybrids of polyurethane and polyurea, thermoplastic polyurethanes, thermoplastic polyureas, or thermoplastic hybrids of polyurethane and polyurea.

[0075] In one aspect, the golf ball can be covered with a topcoat, and in one aspect the topcoat can be transparent or semi-transparent such that an etched or engraved design is visible.

[0076] In one aspect, the cover also has a clear topcoat and the etching or engraving design extends through at least the clear topcoat and at least one paint layer.

[0077] In one aspect, a plurality of etched or engraved design features are provided on the golf ball. In one aspect, the etched or engraved design features are physically separated from each other on the golf ball surface. In one aspect, the etched or engraved design features are connected to each other. In one aspect, the etched or engraved design feature is a nameplate on the golf ball. In one aspect, the etched or engraved design feature is a sidestamp on the golf ball. In one aspect, the etched or engraved design feature is a play number on the golf ball. In one aspect, the etched or engraved design feature includes a customized phrase or word. In one aspect, the etched or engraved design feature is an alignment aid on the golf ball. The marking can be a pattern that encompasses the entire golf ball, in one aspect. In one aspect, an ombre effect can be provided via etching or engraving a specific portion of the golf ball to reveal various gradations of an underlying color or layer. In one aspect, the etched or engraved design feature includes a repeated pattern feature. For example, various images or pictures can be provided on the golf ball in a particular pattern at any frequency, quantity, and positioning.

[0078] In another example, a golf ball is provided that includes a core, a cover, and at least one intermediate layer. The intermediate layer can have at least one paint layer. The intermediate layer can be formed from a material having a first color and the at least one paint layer can be a second color. The intermediate layer can have at least one etching or engraving that removes the paint layer having the second color and exposes the first color of the intermediate layer.

[0079] One of ordinary skill in the art would understand that the etching or engraving techniques disclosed herein can be used to remove any one or more of a layer of a substrate, prime coating, topcoat, paint layer, or other material from a golf ball.

[0080] In one aspect, portions of the golf ball, such as the cover, casing, or core can include at least two colors, such as a first half of a first color and a second half of a second color. In this manner, an outer layer or outer component of

the golf ball can be etched or engraved in specific regions to reveal two different colors on the finished golf ball.

[0081] In one aspect, the etching or engraving technique disclosed herein can provide a configuration in which an alignment aid can be reliably produced on a golf ball via spinning the golf ball and applying the etching or engraving treatment. The alignment aid can be defined in a perfect straight line along the golf ball via rotation of the golf ball and a stationary laser etching or engraving tool being applied to the golf ball. Alternatively, the golf ball does not need to be rotated and instead the etching or engraving tool can rotate about the golf ball. The golf ball can be simultaneously moved along a manufacturing line while the etching or engraving process is applied, in one example. This provides an improved, in-line configuration that is configured to produce design features on the golf ball. In one aspect, multiple etching or engraving assemblies can be provided such that a majority or an entirety of the golf ball surface can be etched or engraved simultaneously.

[0082] In one aspect, the etching or engraving depths can vary. Some exemplary etching or engraving depth ranges can include 0.0015 inches-0.005 inches, or 0.0001 inches-0.025 inches, or 0.0005 inches-0.0020 inches. The depth of the etching or engraving techniques can vary depending on the desired depth of material that must be removed from the golf ball for a particular design. Similarly, if laser etching or engraving is used, the associated wattage can also vary depending on the type of material that is being treated.

[0083] In one aspect, an etched or engraved design element on the golf ball can include intricate or complex markings in which a visual pattern or effect is incorporated into an overall etched or engraved marking. For example, etching or engraving designs can include patterns within crisscross or lattice markings, grids, dots, etc.

[0084] In one aspect, the etching or engraving techniques disclosed herein can be performed in a temperature-controlled setting. In one aspect, the etching or engraving techniques can be performed in a cool or chilled setting or chamber. Any temperature control aspects can be implemented with the etching or engraving techniques disclosed herein to provide protective measures that may be necessary to ensure the structural integrity of any golf ball layers is maintained, and prevent any burning, melting, etc. In one aspect, a chamber or setting can be cooled or chilled; in another aspect, the workpiece (i.e., the golf ball, golf ball sub-assembly, etc.) can be chilled or cooled. In one aspect, the workpiece can be cooled to at least 40 degrees Fahrenheit, or at least 32 degrees Fahrenheit, or at least 25 degrees Fahrenheit. In one aspect, the cooling chamber can be cooled to at least 40 degrees Fahrenheit, or at least 32 degrees Fahrenheit, or at least 25 degrees Fahrenheit, or at least 5 degrees Fahrenheit. In one aspect, the workpiece is subjected to freezing temperatures or cool temperatures for at least 30 minutes, or 60 minutes or 120 minutes, prior to receiving the etching, engraving, or other material removal process.

[0085] Exemplary laser treatment techniques and configurations are disclosed at least in US Patent Publications 2022/0134192 and 2023/0069946, as well as U.S. Pat. No. 6,462,303, which are each incorporated in their entirety as if fully set forth herein.

[0086] The material removal assembly or tooling (i.e., etching or engraving assembly or tooling) configured to treat the golf balls disclosed herein can include various electrical

components, such as a processor, user interface, monitor, memory, etc. The electrical components can be configured to receive and transmit data or information with the tool that is configured to remove material from the golf ball. In one aspect, the etching tool can include a fiber, CO₂, UV, or other known laser etching configurations. In one aspect, chemical etching or milling can be used to treat the golf ball. In one aspect, the present disclosure provides for an ink-less and non-printing method of providing markings on a golf ball.

[0087] Referring now to the Figures, exemplary constructions of a golf ball are shown in FIGS. 1A-1C, 2A-2C, 3A-3C, 4A-4C, and 5A-5C to illustrate some aspects of using etching, engraving, or other material removal techniques on various golf ball constructions. One of ordinary skill in the art would appreciate based on this disclosure that the configurations shown in the Figures are not exhaustive, and the material removal techniques disclosed herein can be used for golf ball constructions not explicitly illustrated. One of ordinary skill in the art would understand that the components are not drawn to scale and are provided for schematic purposes only.

[0088] FIGS. 1A, 1B, and 1C illustrate a golf ball **100** having five component or coating layers **110**, **120**, **130**, **140**, **150**. In one aspect, a first component layer **110** is an inner core, a second component layer **120** is an outer core, a third component layer **130** is a casing or intermediate layer, a fourth component layer **140** is a cover, and coating layer **150** is a paint or coating layer. Therefore, in one aspect, the golf ball **100** can be considered a four-piece golf ball with a paint or coating layer.

[0089] In another aspect, the first component layer **110** is a core, the second component layer **120** is a casing or intermediate layer, the third component layer **130** is a cover, coating layer **140** is a first paint or coating layer, and coating layer **150** is a second paint or coating layer. In one aspect, the golf ball **100** therefore can be considered a three-piece golf ball with multiple paint or coating layers.

[0090] In another aspect, the first component layer **110** is a core, the second component layer **120** is a cover, coating layer **130** is a first paint or coating layer, coating layer **140** is a second paint or coating layer, and coating layer **150** is a third paint or coating layer. Therefore, in one aspect, the golf ball **100** can be considered a two-piece golf ball with multiple paint or coating layers.

[0091] The first, second, third, fourth, and/or fifth component or coating layers **110**, **120**, **130**, **140**, **150** can each include additional painting layers or coating layers that are not explicitly illustrated.

[0092] Regardless of the specific construction, as shown in FIG. 1C, a portion of the coating layer **150** can be removed, such as via any etching, engraving or material removal technique described herein, thereby leaving a void **152** in the coating layer **150**. A second portion of the coating layer **150** can also be removed to produce a secondary void **152'** in the coating layer **150**. The material removal process associated with this second portion can further penetrate the golf ball to also create a void **142** in the component layer or coating layer **140**.

[0093] In one aspect, the coating layer **150** can be a first color, the coating or component layer **140** can be a second color, and the coating or component layer **130** can be a third color. Based on the configuration shown in FIG. 1C, the second color of the coating or component layer **140** will be

visible due to void **152**, and the third color of the coating or component layer **130** will be visible due to the secondary void **152'** and void **142**. Accordingly, the golf ball **100** will primarily appear to be the first color of the coating layer **150**, but the second and third colors will also be visible. The voids **142**, **152**, **152'** are only shown in cross-section in FIG. 1C, but one of ordinary skill in the art would understand that these voids **142**, **152**, **152'** can be associated with or a portion of a more detailed design element for the golf ball **100**, such as any indicia, marking, etc.

[0094] FIGS. 2A, 2B, and 2C illustrate a golf ball **200** having four components **210**, **220**, **230**, **240**. In one aspect, a first component layer **210** is an inner core, a second component layer **220** is an outer core, a third component layer **230** is a casing or intermediate layer, and a fourth component layer **240** is a cover. Accordingly, in one aspect, the golf ball **200** can be considered a four-piece golf ball.

[0095] In another aspect, the first component layer **210** is a core, the second component layer **220** is a casing or intermediate layer, the third component layer **230** is a cover, and the coating layer **240** is a first paint or coating layer. Based on this configuration, the golf ball **200** can be considered a three-piece golf ball with a single paint or coating layer.

[0096] In another aspect, the first component layer **210** is the core, the second component layer **220** is the cover, the coating layer **230** is a first paint or coating layer, and the coating layer **240** is a second paint or coating layer. Accordingly, the golf ball **200** can be considered a two-piece golf ball with multiple paint or coating layers.

[0097] The first, second, third, and/or fourth component or coating layers **210**, **220**, **230**, **240** can each include additional painting layers or coating layers that are not explicitly illustrated.

[0098] Regardless of the specific construction, as shown in FIG. 2C, a portion of the coating layer **240** is removed, such as via any etching or engraving technique described herein, thereby creating a void **242** in the coating layer **240**. A second portion of the coating layer **240** can also be removed to produce a secondary void **242'** in the coating layer **240**. The material removal process associated with this second portion can further penetrate into the golf ball to create a void **232** in the component or coating layer **230**.

[0099] In one aspect, the coating layer **240** can be a first color, the third component or coating layer **230** can be a second color, and the second component or coating layer **220** can be a third color. Based on the configuration shown in FIG. 2C, the second color of the third component or coating layer **230** will be visible due to the void **242**, and the third color of the second component or coating layer **220** will be visible due to the secondary void **242'** and void **232**. Accordingly, the golf ball **200** will primarily appear to be the first color of the coating layer **240**, but the second and third colors will also be visible. The voids **232**, **242**, **242'** are only shown in cross-section in FIG. 2C, but one of ordinary skill in the art would understand that these voids **232**, **242**, **242'** can be associated with or a portion of a more detailed design element for the golf ball **200**, such as any indicia, marking, etc.

[0100] FIGS. 3A, 3B, and 3C illustrate a golf ball **300** having three components **310**, **320**, **330**. In one aspect, a first component layer **310** is a core, a second component layer **320** is a casing or intermediate layer, and a third component

layer 330 is a cover. Accordingly, the golf ball 300 can be considered a three-piece golf ball.

[0101] In another aspect, the first component layer 310 is an inner core, the second component layer 320 is an outer core, and the third component layer 330 is the cover. Accordingly, the golf ball 300 can be considered a three-piece golf ball.

[0102] In another aspect, the first component layer 310 is the core, the second component layer 320 is the cover, and the coating layer 330 is a first paint or coating layer. Accordingly, the golf ball 300 can be considered a two-piece golf ball with a single paint or coating layer.

[0103] The first, second, and/or third component or coating layers 310, 320, 330 can each include additional painting layers or coating layers that are not explicitly illustrated.

[0104] Regardless of the specific construction, as shown in FIG. 3C, a portion of the coating layer 330 is removed, such as via any etching or engraving technique described herein, thereby creating a void 332 in the coating layer 330. A second portion of the coating layer 330 can also be removed to produce a secondary void 332' in the coating layer 330. The material removal process associated with this second portion can further penetrate the golf ball to create a void 322 of the coating layer 320.

[0105] In one aspect, the coating layer 330 can be a first color, the second component layer 320 can be a second color, and the first component layer 310 can be a third color. Based on the configuration shown in FIG. 3C, the second color of the second component layer 320 will be visible due to void 332, and the third color of the first component layer 310 will be visible due to the secondary void 332' and void 322. Accordingly, the golf ball 300 will primarily appear to be the first color of the coating layer 330, but the second and third colors will also be visible. The voids 322, 332, 332' are only shown in cross-section in FIG. 3C, but one of ordinary skill in the art would understand that these voids 322, 332, 332' can be associated with or a portion of a more detailed design element for the golf ball 300, such as any indicia, marking, etc.

[0106] FIGS. 4A, 4B, and 4C illustrate a golf ball 400 having two components 410, 420. In one aspect, a first component layer 410 is a core, and a second component layer 420 is a cover. Accordingly, the golf ball 400 can be considered a two-piece golf ball. The first and/or second components layers 410, 420 can include additional painting layers or coating layers that are not explicitly illustrated. Regardless of the specific construction, as shown in FIG. 4C, a portion of the second component layer 420 is removed, such as via any etching or engraving technique described herein, thereby creating a void 420 in the second component layer 420.

[0107] In one aspect, the second component layer 420 can be a first color, and the first component layer 410 can be a second color. Based on the configuration shown in FIG. 4C, the second color of the first component layer 410 will be visible due to void 422. Accordingly, the golf ball 400 will primarily appear to be the first color of the second component layer 420, but the second color will also be visible. The void 422 is only shown in cross-section in FIG. 4C, but one of ordinary skill in the art would understand that the void 422 can be associated with or a portion of a more detailed design element for the golf ball 400, such as any indicia, marking, etc.

[0108] FIGS. 5A, 5B, and 5C illustrate a similar configuration as has been described with respect to FIGS. 4A-4C except for the following distinctions. As shown in FIG. 5C, the golf ball 500 has a first component or coating layer 510 and a second component or coating layer 520, and a void 522 is defined in the second component or coating layer 520. The void 522 in the second component or coating layer 520 (as shown in FIG. 5B) can subsequently be filled any one or more of paint, a coating, a clear coating, or other material 522".

[0109] Referring to FIG. 6, an exemplary material removal pattern is shown in which a variable pattern has been applied to a second component or coating layer 620 overlaying a first component or coating layer 610. The first component or coating layer 610 can be a first color and the second component or coating layer 620 can be a second color. As shown in FIG. 6, etching, engraving, or other material removal process is performed on the second component or coating layer 620 to create void 622, which has a varying depth. Due to the varying depth, the color at one edge of the void 622 will be different to the color at the opposite edge of the void 622.

[0110] Accordingly, an ombre or gradient effect can be provided. One of ordinary skill in the art would understand that the first and second component or coating layers 610, 620 could be different colors, shades, intensities, or have other different visual characteristics, and are not necessarily different colors. In one aspect, the intensity of the etching, engraving, or other material removal technique used at the left edge of the second component or coating layer 620 is less than the intensity of the technique used at the right edge of the second component or coating layer 620. In one aspect, the duration of the etching, engraving, or other material removal technique used at the left edge of the second component or coating layer 620 is less than the duration of the technique used at the right edge of the second component or coating layer 620.

[0111] Referring to FIG. 7, an exemplary system or configuration for supporting the golf ball 700 relative to an etching, engraving, or other material removal assembly 720 (referred to herein as a material removal assembly) is illustrated. As shown in FIG. 7, a support assembly 710, which can be a spindle assembly, can be provided to position the golf ball 700 relative to the material removal assembly 720. A dashed arrow is shown in FIG. 7 to show one possible movement of the golf ball 700 relative to the material removal assembly 720. The golf ball 700 can be rotated about its axis via the support assembly 710, in one example. Based on this configuration, the material removal assembly 720 can be held stationary and can be configured to generate a perfectly straight line or pattern on the golf ball 700, which is shown via marking 705. In one aspect, the marking 705 can be an alignment aid. In another example, the material removal assembly 720 can be configured to move, rotate, pivot, or otherwise be positioned relative to the golf ball 700, and the golf ball 700 can be held stationary. In another aspect, both the golf ball 700 and the material removal assembly 720 can be configured to be moved or re-positioned during etching or engraving. In one aspect, the support assembly 710 can be configured to transport the golf ball 700 along a manufacturing or assembly line. The material removal assembly 720 can provide an intermittent or constant energy, pulse, laser, or other etching or engraving process to the golf ball 700.

[0112] The present disclosure is not meant to be limited by the material used to form each layer or component of the golf ball. Particularly suitable materials include, but are not limited to, thermosetting materials, such as polybutadiene, styrene butadiene, isoprene, polyisoprene, and trans-isoprene; thermoplastics, such as ionomer resins, polyamides and polyesters; and thermoplastic and thermosetting polyurethane and polyureas.

[0113] Particularly suitable thermosetting materials, include, but are not limited to, thermosetting rubber compositions comprising a base polymer, an initiator agent, a coagent and/or a curing agent, and optionally one or more of a metal oxide, metal fatty acid or fatty acid, antioxidant, soft and fast agent, fillers, and additives. Suitable base polymers include natural and synthetic rubbers including, but not limited to, polybutadiene, polyisoprene, ethylene propylene rubber ("EPR"), styrene-butadiene rubber, styrenic block copolymer rubbers (such as SI, SIS, SB, SBS, SIBS, and the like, where "S" is styrene, "I" is isobutylene, and "B" is butadiene), butyl rubber, halobutyl rubber, polystyrene elastomers, polyethylene elastomers, polyurethane elastomers, polyurea elastomers, metallocene-catalyzed elastomers and plastomers, copolymers of isobutylene and para-alkylstyrene, halogenated copolymers of isobutylene and para-alkylstyrene, acrylonitrile butadiene rubber, polychloroprene, alkyl acrylate rubber, chlorinated isoprene rubber, acrylonitrile chlorinated isoprene rubber, polyalkenamers, and combinations of two or more thereof. Suitable initiator agents include organic peroxides, high energy radiation sources capable of generating free radicals, C—C initiators, and combinations thereof. Suitable coagents include, but are not limited to, metal salts of unsaturated carboxylic acids; unsaturated vinyl compounds and polyfunctional monomers (e.g., trimethylolpropane trimethacrylate); phenylene bismaleimide; and combinations thereof. Suitable curing agents include, but are not limited to, sulfur; N-oxydiethylene 2-benzothiazole sulfenamide; N,N-di-ortho-tolylguanidine; bismuth dimethyldithiocarbamate; N-cyclohexyl 2-benzothiazole sulfenamide; N,N-diphenylguanidine; 4-morpholinyl-2-benzothiazole disulfide; dipentamethylenethiuram hexasulfide; thiuram disulfides; mercaptobenzothiazoles; sulfenamides; dithiocarbamates; thiuram sulfides; guanidines; thioureas; xanthates; dithiophosphates; aldehyde-amines; dibenzothiazyl disulfide; tetraethylthiuram disulfide; tetrabutylthiuram disulfide; and combinations thereof. Suitable types and amounts of base polymer, initiator agent, coagent, filler, and additives are more fully described in, for example, U.S. Pat. Nos. 6,566,483, 6,695,718, 6,939,907, 7,041,721 and 7,138,460, the entire disclosures of which are hereby incorporated herein by reference. Particularly suitable diene rubber compositions are further disclosed, for example, in U.S. Patent Application Publication 2007/0093318, the entire disclosure of which is hereby incorporated herein by reference.

[0114] Particularly suitable materials also include, but are not limited to: a) thermosetting polyurethanes, polyureas, and hybrids of polyurethane and polyurea; b) thermoplastic polyurethanes, polyureas, and hybrids of polyurethane and polyurea, including, for example, Estane® TPU, commercially available from The Lubrizol Corporation; c) E/X- and E/X/Y-type ionomers, wherein E is an olefin (e.g., ethylene), X is a carboxylic acid (e.g., acrylic, methacrylic, crotonic, maleic, fumaric, or itaconic acid), and Y is a softening comonomer (e.g., vinyl esters of aliphatic carboxylic acids

wherein the acid has from 2 to 10 carbons, alkyl ethers wherein the alkyl group has from 1 to 10 carbons, and alkyl alkylacrylates such as alkyl methacrylates wherein the alkyl group has from 1 to 10 carbons), such as Surlyn® ionomer resins and HPF 1000 and HPF 2000, commercially available from The Dow Chemical Company, Iotek® ionomers, commercially available from ExxonMobil Chemical Company, Amplify® IO ionomers of ethylene acrylic acid copolymers, commercially available from The Dow Chemical Company, and Clarix® ionomer resins, commercially available from A. Schulman Inc.; d) polyisoprene; e) polyoctenamer, such as Vestenamer® polyoctenamer, commercially available from Evonik Industries; f) polyethylene, including, for example, low density polyethylene, linear low density polyethylene, and high density polyethylene; polypropylene; g) rubber-toughened olefin polymers; non-ionomeric acid copolymers, e.g., (meth)acrylic acid, which do not become part of an ionomeric copolymer; h) plastomers; i) flexomers; j) styrene/butadiene/styrene block copolymers; k) styrene/ethylene-butylene/styrene block copolymers; l) polybutadiene; m) styrene butadiene rubber; n) ethylene propylene rubber; o) ethylene propylene diene rubber; p) dynamically vulcanized elastomers; q) ethylene vinyl acetates; r) ethylene (meth) acrylates; s) polyvinyl chloride resins; t) polyamides, amide-ester elastomers, and copolymers of ionomer and polyamide, including, for example, Pebax® thermoplastic polyether and polyester amides, commercially available from Arkema Inc; u) crosslinked trans-polyisoprene; v) polyester-based thermoplastic elastomers, such as Hytrel® polyester elastomers, commercially available from E. I. du Pont de Nemours and Company, and Riteflex® polyester elastomers, commercially available from Ticona; w) polyurethane-based thermoplastic elastomers, such as Elastollan® polyurethanes, commercially available from BASF; x) synthetic or natural vulcanized rubber; and y) combinations thereof.

[0115] Compositions comprising an ionomer or a blend of two or more E/X- and E/X/Y-type ionomers are particularly suitable intermediate and cover layer materials. Preferred E/X- and E/X/Y-type ionomeric cover compositions include: (a) a composition comprising a "high acid ionomer" (i.e., having an acid content of greater than 16 wt %), such as Surlyn® 8150; (b) a composition comprising a high acid ionomer and a maleic anhydride-grafted non-ionomeric polymer (e.g., Fusabond® functionalized polymers). A particularly preferred blend of high acid ionomer and maleic anhydride-grafted polymer is a 84 wt %/16 wt % blend of Surlyn® 8150 and Fusabond®. Blends of high acid ionomers with maleic anhydride-grafted polymers are further disclosed, for example, in U.S. Pat. Nos. 6,992,135 and 6,677,401, the entire disclosures of which are hereby incorporated herein by reference; (c) a composition comprising a 50/45/5 blend of Surlyn® 8940/Surlyn® 9650/Nucrel® 960, preferably having a material hardness of from 80 to 85 Shore C; (d) a composition comprising a 50/25/25 blend of Surlyn® 8940/Surlyn® 9650/Surlyn® 9910, preferably having a material hardness of about 90 Shore C; (e) a composition comprising a 50/50 blend of Surlyn® 8940/Surlyn® 9650, preferably having a material hardness of about 86 Shore C; (f) a composition comprising a blend of Surlyn® 7940/Surlyn® 8940, optionally including a melt flow modifier; (g) a composition comprising a blend of a first high acid ionomer and a second high acid ionomer, wherein the first high acid ionomer is neutralized with a different cation than

the second high acid ionomer (e.g., 50/50 blend of Surlyn® 8150 and Surlyn® 9120), optionally including one or more melt flow modifiers such as an ionomer, ethylene-acid copolymer or ester terpolymer; and (h) a composition comprising a blend of a first high acid ionomer and a second high acid ionomer, wherein the first high acid ionomer is neutralized with a different cation than the second high acid ionomer, and from 0 to 10 wt % of an ethylene/acid/ester ionomer wherein the ethylene/acid/ester ionomer is neutralized with the same cation as either the first high acid ionomer or the second high acid ionomer or a different cation than the first and second high acid ionomers (e.g., a blend of 40-50 wt % Surlyn® 8140 or 8150, 40-50 wt % Surlyn® 9120, and 0-10 wt % Surlyn® 6320).

[0116] Surlyn 8150®, Surlyn® 8940, and Surlyn® 8140 are different grades of E/MAA copolymer in which the acid groups have been partially neutralized with sodium ions. Surlyn® 9650, Surlyn® 9910, and Surlyn® 9120 are different grades of E/MAA copolymer in which the acid groups have been partially neutralized with zinc ions. Surlyn® 7940 is an E/MAA copolymer in which the acid groups have been partially neutralized with lithium ions. Surlyn® 6320 is a very low modulus magnesium ionomer with a medium acid content. Nucel® 960 is an E/MAA copolymer resin nominally made with 15 wt % methacrylic acid. Surlyn® ionomers, Fusabond® polymers, and Nucel® copolymers are commercially available from The Dow Chemical Company.

[0117] Suitable E/X- and E/X/Y-type ionomeric cover materials are further disclosed, for example, in U.S. Pat. Nos. 6,653,382, 6,756,436, 6,894,098, 6,919,393, and 6,953,820, the entire disclosures of which are hereby incorporated by reference. Suitable polyurethanes, polyureas, and blends and hybrids of polyurethane/polyurea are further disclosed, for example, in U.S. Pat. Nos. 5,334,673, 5,484,870, 6,506,851, 6,756,436, 6,835,794, 6,867,279, 6,960,630, 8,865,052, 6,734,273, 8,034,873, and 7,105,623; U.S. Patent Application Publication 2009/0011868, and U.S. Patent Application Publication 2007/0117923, the entire disclosures of which are hereby incorporated herein by reference. Suitable UV absorbers that are optionally included in cover layer compositions are further disclosed, for example, in U.S. Pat. Nos. 5,156,405, 5,840,788, and 7,722,483; the entire disclosures of which are hereby incorporated herein by reference.

[0118] Dimensions of each golf ball layer, i.e., thickness/diameter, may vary depending on the desired properties.

[0119] The United States Golf Association specifications limit the minimum size of a competition golf ball to 1.680 inches. There is no specification as to the maximum diameter, and golf balls of any size can be used for recreational play. Golf balls disclosed herein can have an overall diameter of any size, and, typically, have an overall diameter of from 1.680 inches to 1.780 inches.

[0120] Golf balls disclosed herein can have a plurality of dimples on the outer surface thereof, and, typically, have an overall dimple surface coverage of 60% or greater, or 65% or greater, or 75% or greater or 80% or greater.

[0121] While it is apparent that the illustrative embodiments of the present disclosure fulfill the objectives stated above, it is appreciated that numerous modifications and other embodiments may be devised by those skilled in the art. Therefore, it will be understood that the appended claims

are intended to cover all such modifications and embodiments, which would come within the spirit and scope of the present disclosure.

[0122] The terms “first,” “second,” “third,” and the like are used to describe various features, components, or elements, but these features, components, or elements should not be limited by these terms. These terms are only used to distinguish one feature or element from another feature or element. Thus, a first feature, component, or element discussed below could be termed a second feature, component, or element, and similarly, a second feature, component, or element discussed below could be termed a first feature, component, or element without departing from the teachings of the disclosure.

[0123] The golf balls described and claimed herein are not to be limited in scope by the specific embodiments herein disclosed, since these embodiments are intended as illustrations of several aspects of the disclosure. Any equivalent embodiments are intended to be within the scope of this disclosure. Indeed, various modifications of the device in addition to those shown and described herein will be apparent to those skilled in the art from the present description. Such modifications are also intended to fall within the scope of the appended claims. All patents and patent applications cited in the present text are expressly incorporated herein by reference in their entirety.

What is claimed is:

1. A method of providing at least one marking or visual effect on a golf ball, the method comprising:

- (i) providing a golf ball comprising at least a first coating layer or component layer and a second coating layer, wherein the first coating layer or component layer has a first color, and the second coating layer has a second color that is different than the first color, and the second coating layer is arranged radially outward relative to the first coating layer or component layer; and
- (ii) removing at least a portion of the second coating layer to at least partially expose the first coating layer or component layer, and to define at least one marking or visual effect on the golf ball.

2. The method according to claim 1, wherein step (ii) comprises laser engraving.

3. The method according to claim 1, wherein the first coating layer or component layer and the second coating layer are both paint layers.

4. The method according to claim 1, wherein the first coating layer or component layer is a casing layer, and the second coating layer is a paint layer on the casing layer, the golf ball further comprising a cover layer disposed over the casing layer, wherein the cover layer is transparent.

5. The method according to claim 1, wherein the first coating layer or component layer is a cover layer, and the second coating layer is a paint layer.

6. The method according to claim 5, wherein the cover layer is comprised of at least one of: ionomer or urethane.

7. The method according to claim 1, wherein the golf ball further comprises at least one third coating layer arranged radially outward relative to the second coating layer, and the third coating layer has a third color that is different than the first and second colors, wherein the method further comprises:

- (iii) removing at least a portion of the third coating layer to at least partially expose the second coating layer.

8. The method according to claim 7, wherein steps (ii) and (iii) include laser engraving to remove material at two different depths.

9. The method according to claim 1, the method further comprising applying a clear topcoat over the portion of the second coating layer that has been removed.

10. The method according to claim 1, wherein the golf ball is simultaneously moved or rotated during step (ii).

11. The method according to claim 1, wherein step (ii) comprises material removal at a variable intensity, such that the at least one marking or visual effect on the golf ball defines a color gradient between the first color and the second color.

12. The method according to claim 1, wherein the at least one marking or visual effect extends for a circumferential extent of at least 180 degrees around the golf ball.

13. The method according to claim 1, further comprising a cooling treatment applied simultaneously during step (ii), or to the golf ball prior to step (ii).

14. A method of providing a marking or visual effect on a golf ball, the method comprising:

- (i) providing a golf ball comprising at least a first coating layer or component layer and a second coating layer, wherein the first coating layer or component layer has a first color and the second coating layer has a second color that is different than the first color, and the second coating layer is arranged radially outward relative to the first coating layer or component layer; and
- (ii) removing at least a portion of the second coating layer via laser engraving to at least partially expose the first coating layer or component layer and to define at least one marking or visual effect on the golf ball, wherein the golf ball is simultaneously moved, rotated, or re-positioned during removal of the portion of the

second coating layer, and the at least one marking or visual effect circumferentially extends at least 180 degrees around the golf ball.

15. The method according to claim 14, further comprising applying a cooling treatment to the golf ball prior to step (ii).

16. The method according to claim 14, further comprising applying a cooling treatment simultaneously during step (ii).

17. The method according to claim 14, wherein the first coating layer or component layer is a casing layer, and the second coating layer is a paint layer on the casing layer, the golf ball further comprising a cover layer disposed over the casing layer, wherein the cover layer is transparent.

18. The method according to claim 14, wherein the first coating layer or component layer and the second coating layer are both paint layers.

19. The method according to claim 14, wherein step (ii) comprises applying the laser engraving at a variable intensity, such that the at least one marking or visual effect on the golf ball defines a color gradient between the first color and the second color.

20. A method of providing at least one marking or visual effect on a golf ball, the method comprising:

- (i) providing a golf ball comprising at least a first coating layer or component layer and a second coating layer, wherein the second coating layer is arranged radially outward relative to the first coating layer or component layer;
- (ii) removing at least a portion of the second coating layer via laser engraving; and
- (iii) at least partially filling the portion of the second coating layer that has been removed with ink to define the at least one marking or visual effect on the golf ball.

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