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Inventor(s)	Spackman; Clayson C. et al.

Golf club head faceplates with lattices

Abstract

Embodiments of golf club head faceplates comprising a lattice to improve the energy storage capabilities and minimize stress concentrations are described herein. The lattice can comprise a plurality of flexure shapes that facilitate in faceplate bending. The flexure shapes of the lattice can comprise a reentrant, concave, or non-convex shape. The lattice can comprise at least one repeating pattern of flexure shapes that can be interconnected or spaced apart. During golf ball impacts, the flexure shapes flex to store energy through linear and torsional bending.

Inventors: **Spackman; Clayson C. (Scottsdale, AZ), Simone; Matthew W. (Phoenix, AZ)**

Applicant: **KARSTEN MANUFACTURING CORPORATION** (Phoenix, AZ)

Family ID: **1000008750359**

Assignee: **Karsten Manufacturing Corporation (Phoenix, AZ)**

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Primary Examiner: Hunter; Alvin A

Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS (1) This claims the benefit of U.S. Provisional No. 63/190,693, filed May 19, 2021, U.S. Provisional No. 63/198,218, filed Oct. 2, 2020, and is a continuation-in-part of U.S. patent application Ser. No. 17/373,603, filed on Jul. 12, 2021, which is a continuation of U.S. patent application Ser. No. 16/880,865, filed on May 21, 2020, and is issued as U.S. Pat. No. 11,058,929 on Jul. 13, 2021, which is a continuation of U.S. patent Ser. No. 16/510,737, filed on Jul. 12, 2019, and is issued as U.S. Pat. No. 10,675,517 on Jun. 9, 2020, which claims the benefit of U.S. Provisional No. 62/697,304, filed Jul. 12, 2018. The contents of all the above-described disclosures are incorporated fully herein by reference in their entirely.

FIELD OF THE INVENTION
(1) This invention generally relates to golf club head faceplates with lattices.
BACKGROUND
(2) Golf club design takes into account several performance characteristics, such as ball speed. Typically, golf club designs aim to increase ball speed by increasing the deflection or flexibility capabilities of the faceplate. However, current designs are limited due to manufacturing or structural considerations. Therefore, there is a need in the art for a club head with a faceplate that further increases ball speed while minimizing stress concentrations.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** illustrates a front view of a golf club head faceplate according to an embodiment.
(2) FIG. **2** illustrates a cross sectional view of the golf club head of FIG. **1**.
(3) FIG. **3** illustrates a front view of a golf club head faceplate subdivided into different faceplate regions.
(4) FIG. **4** illustrates a front view of a golf club head faceplate subdivided into different faceplate regions.
(5) FIG. **5** illustrates a front view of a golf club head faceplate subdivided into different faceplate regions.
(6) FIG. **6** illustrates a front view of a golf club head faceplate subdivided into different faceplate regions.
(7) FIG. **7** illustrates a portion of a sunburst groove faceplate lattice.
(8) FIG. **8** illustrates a portion of a chiral groove faceplate lattice.
(9) FIG. **9** illustrates a portion of a windmill groove faceplate lattice.
(10) FIG. **10** illustrates a portion of a Evan flexure shape recess faceplate lattice.
(11) FIG. **11** illustrates a portion of a arrowhead flexure shape recess faceplate lattice.
(12) FIG. **12** illustrates a portion of a four-pointed star flexure shape recess faceplate lattice.
(13) FIG. **13** illustrates a portion of a six-pointed star flexure shape recess faceplate lattice.
(14) FIG. **14** illustrates a portion of a three-pointed star flexure shape recess faceplate lattice.
(15) FIG. **15** illustrates a portion of a faceplate lattice comprising land portions forming triangule shapes.
(16) FIG. **16** illustrates a portion of a faceplate lattice comprising land portions forming quadrilateral shapes.

(17) FIG. **17** illustrates a portion of a faceplate lattice comprising land portions forming hexagonal shapes.
(18) FIG. **18** illustrates a rear surface of a golf club head faceplate comprising a sunburst groove faceplate lattice according to an embodiment.
(19) FIG. **19** illustrates a portion of a bone flexure shape recess faceplate lattice.
(20) FIG. **20** illustrates a detailed view of the bone flexure shape recess faceplate lattice of FIG. **19**.
(21) FIG. **21** illustrates a rear surface of a golf club faceplate comprising a bone flexure shape recess faceplate lattice according to an embodiment.
(22) FIG. **22** illustrates a front perspective view of a iron golf club head.
(23) FIG. **23** illustrates a toe view of the iron golf club head of FIG. **22**.
(24) FIG. **24** illustrates a rear surface of the iron golf club head faceplate comprising a bone flexure shape recess faceplate lattice.
(25) For simplicity and clarity of illustration, the drawing figures illustrate the general manner of construction, and descriptions and details of well-known features and techniques may be omitted to avoid unnecessarily obscuring the golf clubs and their methods of manufacture. Additionally, elements in the drawing figures are not necessarily drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated relative to other elements to help improve understanding of embodiments of the golf club heads with lattices. The same reference numerals in different figures denote the same elements.

DETAILED DESCRIPTION

(26) The present embodiments discussed below are directed to golf club head faceplates comprising a lattice. The lattice comprises a plurality of flexure shapes that facilitate faceplate bending. The flexure shapes of the lattice comprise a reentrant shape (i.e. shape that points inward), a concave shape, or a non-convex shape. The lattice comprises a repeating pattern of flexure shapes that can be interconnected or spaced apart from one another. The dimensions, the shape, and the pattern of the lattice affects the bending of the faceplate during golf ball impacts. During golf ball impacts, the flexure shapes of the lattice act as tiny springs that store energy through linear and torsional bending. Storing energy through two modes of bending provides greater energy storage in the faceplate, which allows for greater ball speeds during golf ball impacts. Further, the flexure shapes of the lattice reduce the largest stresses concentrated in a small volume of the faceplate material (i.e. impact area of the faceplate) by displacing the reduced stress over a greater volume of the faceplate material. This allows the largest stresses to be moved away from an impact area of the faceplate thereby increasing the faceplate durability. The combination of spreading the stress over a larger volume of faceplate material and the two modes of bending leads to a 1 to 3 mph increase in ball speed.
(27) Further, the lattice comprising the plurality of flexure shapes can adjust the characteristic time (CT) of the faceplate. The lattices described in this disclosure controls CT or reduces CT variability within the United States Golf Association (USGA) regulations. In one example, controlling CT can be accomplished by designing the faceplate lattice with flexure shapes oriented in a low-heel to high-toe direction, or in a low-toe to high-heel direction. The faceplate comprising the lattice with flexure shapes reduces characteristic time while maintaining similar ball speed performance when compared to a similar faceplate devoid of the lattice with flexure shapes. In some examples, the faceplate comprising the lattice with the flexure shapes decreases the center CT by about 1 to 10 μs, or 1 to 5 μs when compared to a similar faceplate devoid of the lattice with flexure shapes. The faceplate comprising the lattice with flexure shapes maintains similar ball speed performance compared to the similar faceplate devoid of the lattice with flexure shapes. The faceplates comprising the lattice with flexure shapes provides desirable, lower characteristic time values while not sacrificing high ball speed performance.
(28) The terms "first," "second," "third," "fourth," and the like in the description and in the claims, if any, are used for distinguishing between similar elements and not necessarily for describing a

particular sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances such that the embodiments described herein are, for example, capable of operation in sequences other than those illustrated or otherwise described herein. Furthermore, the terms "include," and "have," and any variations thereof, are intended to cover a non-exclusive inclusion, such that a process, method, system, article, device, or apparatus that comprises a list of elements is not necessarily limited to those elements, but may include other elements not expressly listed or inherent to such process, method, system, article, device, or apparatus.

(29) The terms "left," "right," "front," "back," "top," "bottom," "over," "under," and the like in the description and in the claims, if any, are used for descriptive purposes and not necessarily for describing permanent relative positions. It is to be understood that the terms so used are interchangeable under appropriate circumstances such that the embodiments of the apparatus, methods, and/or articles of manufacture described herein are, for example, capable of operation in other orientations than those illustrated or otherwise described herein.

(30) The term characteristic time "CT" is used herein to mean a measurement used to determine the amount of time, measured in microseconds (μs), that a golf ball contacts the club face at the moment of impact. The characteristic time is measured by impacting a specific spot on the striking surface several times using a small steel pendulum. The characteristic time measurement is for wood-type club heads such as drivers, fairway woods, or hybrids. A computer program measures the amount of time the steel pendulum contacts the club face at the moment of impact. CT values were based on the method outlined in the USGA's Procedure for Measuring the Flexibility of a Golf Clubhead. For example, Section 2 of the USGA's Procedure for Measuring the Flexibility of a Golf Clubhead (USGA-TPX3004, Rev. 2.0, Apr. 9, 2019) (the "Protocol For Measuring The Flexibility of A Golf Club Head").

(31) The terms "loft" or "loft angle" of a golf club, as described herein, refers to the angle formed between the club face and the shaft, as measured by any suitable loft and lie machine.

(32) "Driver golf club heads" as used herein comprise a loft angle less than approximately 16 degrees, less than approximately 15 degrees, less than approximately 14 degrees, less than approximately 13 degrees, less than approximately 12 degrees, less than approximately 11 degrees, or less than approximately 10 degrees. "Driver golf club heads" as used herein comprise a volume greater than approximately 400 cc, greater than approximately 425 cc, greater than approximately 445 cc, greater than approximately 450 cc, greater than approximately 455 cc, greater than approximately 460 cc, greater than approximately 475 cc, greater than approximately 500 cc, greater than approximately 525 cc, greater than approximately 550 cc, greater than approximately 575 cc, greater than approximately 600 cc, greater than approximately 625 cc, greater than approximately 650 cc, greater than approximately 675 cc, or greater than approximately 700 cc. In other embodiments, the volume of drivers can be approximately 400 cc-600 cc, 425 cc-500 cc, approximately 500 cc-600 cc, approximately 500 cc-650 cc, approximately 550 cc-700 cc, approximately 600 cc-650 cc, approximately 600 cc-700 cc, or approximately 600 cc-800 cc.

(33) "Fairway wood golf club heads" as used herein comprise a loft angle of less than approximately 35 degrees, less than approximately 34 degrees, less than approximately 33 degrees, less than approximately 32 degrees, less than approximately 31 degrees, or less than approximately 30 degrees. Further, in other embodiments, the loft angle of fairway woods can be greater than approximately 12 degrees, greater than approximately 13 degrees, greater than approximately 14 degrees, greater than approximately 15 degrees, greater than approximately 16 degrees, greater than approximately 17 degrees, greater than approximately 18 degrees, greater than approximately 19 degrees, or greater than approximately 20 degrees. In other embodiments still, the loft angle of fairway woods can be between 12 degrees and 35 degrees, between 15 degrees and 35 degrees, between 20 degrees and 35 degrees, or between 12 degrees and 30 degrees.

(34) Further, "fairway wood golf club heads" as used herein comprise a volume less than

approximately 400 cc, less than approximately 375 cc, less than approximately 350 cc, less than approximately 325 cc, less than approximately 300 cc, less than approximately 275 cc, less than approximately 250 cc, less than approximately 225 cc, or less than approximately 200 cc. In other embodiments, the volume of the fairway woods can be approximately 150 cc-200 cc, approximately 150 cc-250 cc, approximately 150 cc-300 cc, approximately 150 cc-350 cc, approximately 150 cc-400 cc, approximately 300 cc-400 cc, approximately 325 cc-400 cc, approximately 350 cc-400 cc, approximately 250 cc-400 cc, approximately 250-350 cc, or approximately 275-375 cc.

(35) “Hybrid golf club heads” as used herein comprise a loft angle less than approximately 40 degrees, less than approximately 39 degrees, less than approximately 38 degrees, less than approximately 37 degrees, less than approximately 36 degrees, less than approximately 35 degrees, less than approximately 34 degrees, less than approximately 33 degrees, less than approximately 32 degrees, less than approximately 31 degrees, or less than approximately 30 degrees. Further, in other embodiments, the loft angle of hybrids can be greater than approximately 16 degrees, greater than approximately 17 degrees, greater than approximately 18 degrees, greater than approximately 19 degrees, greater than approximately 20 degrees, greater than approximately 21 degrees, greater than approximately 22 degrees, greater than approximately 23 degrees, greater than approximately 24 degrees, or greater than approximately 25 degrees.

(36) Further, “hybrid golf club heads” as used herein comprise a volume less than approximately 200 cc, less than approximately 175 cc, less than approximately 150 cc, less than approximately 125 cc, less than approximately 100 cc, or less than approximately 75 cc. In some embodiments, the volume of the hybrid-type club head can be approximately 100 cc-150 cc, approximately 75 cc-150 cc, approximately 100 cc-125 cc, or approximately 75 cc-125 cc.

(37) “Iron golf club heads” as used herein comprise a loft angle greater than approximately 17 degrees, greater than approximately 18 degrees, greater than approximately 19 degrees, greater than approximately 20 degrees, greater than approximately 21 degrees, greater than approximately 22 degrees, greater than approximately 23 degrees, greater than approximately 24 degrees, greater than approximately 25 degrees, greater than approximately 26 degrees, greater than approximately 27 degrees, greater than approximately 28 degrees, greater than approximately 29 degrees, greater than approximately 30 degrees, greater than approximately 31 degrees, greater than approximately 32 degrees, greater than approximately 33 degrees, greater than approximately 34 degrees, greater than approximately 35 degrees, greater than approximately 36 degrees, greater than approximately 37 degrees, greater than approximately 38 degrees, greater than approximately 39 degrees, greater than approximately 40 degrees, greater than approximately 41 degrees, greater than approximately 42 degrees, greater than approximately 43 degrees, greater than approximately 44 degrees, greater than approximately 45 degrees, greater than approximately 46 degrees, greater than approximately 47 degrees, greater than approximately 48 degrees, greater than approximately 49 degrees, greater than approximately 50 degrees, greater than approximately 51 degrees, greater than approximately 52 degrees, greater than approximately 53 degrees, greater than approximately 54 degrees, greater than approximately 55 degrees, greater than approximately 56 degrees, greater than approximately 57 degrees, greater than approximately 58 degrees, greater than approximately 59 degrees, or greater than approximately 60 degrees.

(38) In other embodiments, the loft angle of irons can range from 17 degrees to 60 degrees. In other embodiments still, the loft angle of the irons can range from 17 degrees to 50 degrees, or 17 degrees to 40 degrees. For example, the loft angle of irons can be 60 degrees, 59 degrees, 58 degrees, 57 degrees, 56 degrees, 55 degrees, 54 degrees, 53 degrees, 52 degrees, 51 degrees, 50 degrees, 49 degrees, 48 degrees, 47 degrees, 46 degrees, 45 degrees, 46 degrees, 45 degrees, 44 degrees, 43 degrees, 42 degrees, 41 degrees, 40 degrees, 39 degrees, 38 degrees, 37 degrees, 36 degrees, 35 degrees, 34 degrees, 33 degrees, 32 degrees, 31 degrees, 30 degrees, 29 degrees, 28 degrees, 27 degrees, 26 degrees, 25 degrees, 24 degrees, 23 degrees, 22 degrees, 21 degrees, 20

degrees, 19 degrees, 18 degrees, or 17 degrees.
(39) For ease of discussion and understanding, and for purposes of description only, the following detailed description illustrates a golf club head as a driver. It should be appreciated that the driver is provided for purposes of illustration of the faceplate lattices with the purpose of increasing ball speed. As described above, the disclosed faceplate with lattices can be used in association with any desired driver, fairway wood, hybrid, iron, wood generally, or iron generally.
(40) Other features and aspects will become apparent by consideration of the following detailed description and accompanying drawings. Before any embodiments of the disclosure are explained in detail, it should be understood that the disclosure is not limited in its application to the details or embodiment and the arrangement of components as set forth in the following description or as illustrated in the drawings. The disclosure is capable of supporting other embodiments and of being practiced or of being carried out in various ways. It should be understood that the description of specific embodiments is not intended to limit the disclosure from covering all modifications, equivalents and alternatives falling within the spirit and scope of the disclosure. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.
Golf Club Head Faceplates with Lattice
(41) Described herein is a golf club head faceplate comprising a lattice. The lattice comprises a plurality of flexure shapes that facilitate in faceplate bending. During golf ball impacts, the flexure shapes of the faceplate lattice act as tiny springs that store energy through linear and torsional bending. Storing energy through two modes of bending allows for greater faceplate energy storage, which results in greater ball speeds during golf ball impacts. Further, the flexure shapes of the lattice reduce the largest stresses that occur over a small volume of the faceplate material and displaces the reduced stress over a greater volume of the faceplate material.
(42) Referring to the drawings, wherein like reference numerals are used to identify like or identical components in various views, FIG. **1** schematically illustrates a front view of a golf club head **100**. The golf club head **100** includes a faceplate **130** and a body **110** that are secured together to define a substantially closed/hollow interior volume. The club head **100** includes a crown **114**, a sole **118** opposite the crown **114**, a heel **122**, and a toe **126** opposite the heel **122**.
(43) As illustrated in FIGS. **1** and **2**, the faceplate **100** includes a strike face **134** intended to impact a golf ball, and a back face **138** opposite the strike face **134**. The faceplate **130** further comprises a center **132** located at a geometric center of the faceplate **130**, and a perimeter **136** that extends entirely around the faceplate **130** near the crown **114**, toe **126**, sole **118**, and heel **122** of the club head **100**.
(44) To withstand the impact stresses that occur when club head **100** strikes a golf ball, the faceplate **130** is formed from a metal, or metal alloy, and preferably a light-weight metal alloy, such as, for example, a stainless steel or steel alloy, for example, but not limited to, C300, C350, Ni (Nickel)-Co(Cobalt)-Cr(Chromium)-Steel Alloy, 565 Steel, AISI type 304 or AISI type 630 stainless steel, a titanium alloy, for example, but not limited to Ti-6-4, Ti-3-8-6-4-4, Ti-10-2-3, Ti 15-3-3-3, Ti 15-5-3, Ti185, Ti 6-6-2, Ti-7s, Ti-9s, Ti-92, or Ti-8-1-1 Titanium alloy, an amorphous metal alloy, or other similar metals.
(45) The faceplate of the club head **100** further includes a lattice **140** having a plurality of flexure shapes recessed into the faceplate **130**. The lattice **140** can be recessed into the back face **138** of the faceplate **130**. The lattice **140** can be located within the closed/hollow interior volume of the club head **100**, where the lattice **140** is not exposed or visible to an exterior surface of the club head **100**.
(46) As illustrated in FIGS. **3-5**, the lattice **140** can be positioned in a region of the faceplate **130**. The faceplate **130** can comprise a center region **150** located near the faceplate center **132** of the faceplate **130**, a toe region **158** located near the toe **126** of the club head **100**, a heel region **162** located near the heel **162** of the club head **100**, a bottom region **166** located near the sole **118** of the club head **100**, and a top region **170** located near the crown **114** of the club head **100**. The lattice

140 can be positioned on the center region **150**, the toe region **158**, the heel region **162**, the bottom region **166**, the top region **170**, or any combination thereof.

(47) In other embodiments, as illustrated in FIG. **6**, the faceplate **130** can further comprise a high-toe region **174**, a low-toe region **178**, a high-heel region **182**, a low-heel region **186**. The lattice **140** can be positioned on the high-toe region **174**, the low-toe region **178**, the high-heel region **182**, the low-heel region **178**, or any combination thereof. In some embodiments, the lattice **140** can cover a circular region, an elliptical region, or a combination thereof, centered around the geometric center of the faceplate. In some examples, the elliptical region is aligned from the low heel towards the high toe. For example, moving ahead, FIGS. **18** and **21** illustrate lattice patterns aligned approximately from the low heel towards the high toe. The lattice illustrated in FIGS. **18** and **21** covers both a circular region and an elliptical region. The location of the lattice **140** on the faceplate **130** can affect how the faceplate **130** bends during golf ball impacts.

(48) In some embodiments, the lattice **140** can provide a faceplate **130** that has asymmetric bending to achieve different golf ball shot shapes such as draw, fade, or straight. In one example, the lattice **140** can be positioned in the high-toe region **174** and the low-heel region **186** to provide a draw bias shot shape (i.e. right-to-left ball flight). In another example, the lattice **140** can be positioned in the high-heel region **182** and low-toe region **178** to provide a fade bias shot shape (i.e. left-to-right ball flight).

(49) In other embodiments, the lattice **140** can be positioned on an exterior surface of the club head **100** or an interior surface of the club head **100** located adjacent the closed/interior volume. More specifically, the lattice **140** can be positioned on the crown **114**, the sole **118**, the toe **126**, the heel **122**, or any combination thereof. In other embodiments still, the lattice **140** can be positioned in the faceplate **130** and at least one of the crown **114**, the sole **118**, the toe **126**, or the heel **122**. In other embodiments, a portion of the crown **114** or sole **118** can be formed as an insert that can be attached to the club head **100**, where the lattice **140** is formed on the insert. In other embodiments still, the club head **100** can be integrally formed as one component or piece, where the lattice **140** can be integrally formed along with the club head **100** on at least one of the crown **114**, the sole **118**, the toe **126**, or the heel **122**. The lattice **140** positioned in at least one of the crown **114** or the sole **118** can minimize the stress concentrations and move the largest stress concentrations away from the thinnest portions of the crown **114** or sole **118**.

(50) The lattice **140** can comprise a percentage of a surface area of the back face. In some embodiments, the lattice **140** can comprise greater than 40%, greater than 45%, greater than 50%, greater than 55%, greater than 60%, greater than 65%, greater than 70%, or greater than 75% of the back face surface area. In other embodiments, the lattice **140** can comprise 10% to 100% of the back face surface area. In some embodiments, the lattice **140** can comprise 10% to 95%, 10% to 90%, 10% to 85%, 10% to 80%, 10% to 75%, 10% to 70%, 10% to 65%, 10% to 60%, 10% to 55%, or 10% to 50% of the back face surface area. In some embodiments, the lattice **140** can comprise 10% to 25%, 25% to 40%, 40% to 55%, 55% to 70%, 70% to 85%, or 85% to 100% of the back face surface area. For example, the lattice **140** can comprise 10%, 20%, 30%, 40%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%, or 100% of the back face surface area.

(51) The lattice **140** can comprise at least one repeating pattern. In some embodiments, the lattice **140** can comprise a plurality of repeating patterns. For example, the lattice **140** can comprise one, two, three, four, or five repeating patterns. In other embodiments, the at least one repeating pattern can be a radial pattern, where the pattern repeats in a direction of a radius (i.e. from the faceplate center to the faceplate perimeter).

(52) In some embodiments, the lattice **140** can comprise a plurality of rows. Adjacent rows can be staggered or offset from each other. The plurality of rows can be aligned linearly, radially, curvilinear, or arcuately. The plurality of rows can be angled in a low-heel to high-toe direction, a low-toe to high-heel direction, a horizontal direction, a vertical direction, or any combination thereof.

(53) The number of flexure shapes of the lattice **140** can influence how the lattice **140** stores energy in the faceplate. In some embodiments, the number of flexure shapes can increase, decrease, or remain constant towards the center region **150**, the toe region **158**, the heel region **162**, the bottom region **166**, the top region **170**, the high-toe region **174**, the low-toe region **178**, the high-heel region **182**, or the low-heel region **178**. For example, the number of flexure shapes can decrease towards the toe region **158** of the faceplate **130**. In another example, the number of flexure shapes can decrease towards the bottom region **166** of the faceplate **130**. In other example, the number of flexure shapes can decrease towards the heel region **162** of the faceplate **130**. In another example, the number of flexure shapes can decrease towards the top region **170** of the faceplate **130**.
(54) The size (i.e. volume) of the flexure shapes of the lattice **140** can influence how the lattice **140** stores energy in the faceplate. In some embodiments, the size of the flexure shapes can increase, decrease, or remain constant towards the center region **150**, the toe region **158**, the heel region **162**, the bottom region **166**, the top region **170**, the high-toe region **174**, the low-toe region **178**, the high-heel region **182**, or the low-heel region **178**. For example, the size of the flexure shapes can be greater at the toe region **158** than the heel region **162** to facilitate in toe bending of the faceplate **130**. In another example, the size of the flexure shapes can be greater at the bottom region **166** than the top region **170** to facilitate in sole bending of the faceplate **130**. In another example, the size of the flexure shapes can be greater at heel region **162** than the toe region **158** to facilitate in heel bending of the faceplate **130**. In another example, the size of the flexure shapes can be greater at the top region **170** than the bottom region **166** to facilitate in crown bending of the faceplate **130**.
(55) The number of flexure shapes can correspond with the size of the flexure shapes. The number of flexure shapes can have an inverse relationship with the size of the flexure shapes. As the size of the flexure shapes increases, the number of flexure shapes decreases. Stated another way, as the size of the flexure shapes decreases, the number of flexure shapes increases. The size and the number of flexure shapes along with the positioned of the flexure shapes on the faceplate **130** can further enhance a desirable golf ball shot shape such as draw, fade, or straight.
(56) The plurality of flexure lattice **140** shapes facilitate faceplate bending. The flexure shapes of the lattice **140** can comprise a reentrant (i.e. shape pointing inward), concave, or non-convex shape. As illustrated in FIGS. **7-9**, the flexure shapes of the lattice **140** can comprise a series of interconnected grooves. The series of interconnected grooves can comprise a base groove, and a plurality of ligament grooves connected to the base groove. The series of interconnected grooves can comprise a repeating pattern of base grooves, and a repeating pattern of ligament grooves, where the repeating pattern of base grooves and ligament grooves are interconnected to from the flexure shapes. The flexure shapes can be formed from a portion of the base groove and the ligament grooves, where portions of the flexure shape are either concave or convex relative to a center of the flexure shape. As described in more detail below, the series of interconnected grooves can be arranged in a sunburst pattern, a chiral pattern, or a windmill pattern.
(57) In some embodiments, as illustrated in FIGS. **10-14**, the flexure shapes of the lattice **140** can be formed from a plurality of land portions, where the plurality of land portions form a plurality of flexure shape recesses. The flexure shape recess can comprise at least two vertices that define acute interior angles and at least one vertex defining a reflex angle on a perimeter of the flexure shape recess. The at least one reflex angle vertex is positioned between the at least two acute interior angle vertices. The at least one reflex angle vertex does not define an acute interior angle. The acute interior angle can define an angle less than 90 degrees, and the reflex angle can define an angle greater than 180 degrees and less than 360 degrees. The at least one reflex angle vertex of the flexure shape recess can define the reentrant, concave, or non-convex shape of the flexure shape recess. As described in more detail below, the flexure shape recesses formed from the land portions can comprise a plurality of Evan, arrowhead, four-pointed star, six-pointed star, three-pointed star, or bone flexure shape recesses.
(58) In other embodiments, as illustrated in FIGS. **15-17**, the flexure shapes can be formed from a

plurality of land portions, where the plurality of land portions form a plurality of flexure shape recesses. In these embodiments, the land portions can comprise a geometric shape between adjacent flexure shape recesses. The geometric shape of the land portions can comprise a triangle, a square, a rectangle, a rhombus, a parallelogram, or a hexagon. The plurality of land portions can comprise a plurality of interconnected shapes, where each land portion geometric shape can define a portion of one or more flexure shape recesses. As described in more detailed below, the flexure shapes recesses formed from the land portions with geometric shapes can comprise a plurality of triad, diamond, or slot flexure shape recesses.

(59) Further, in some embodiments, the faceplate lattice **140** can exhibit auxetic behavior. Auxetic behavior can be define as structures that have a near zero or negative Poisson's ratio. In other words, as the auxetic structure is stretched or a tension force is applied, the structure tends to become thicker (as opposed to thinner) or expand in a direction perpendicular to the applied force. In contrast, materials with a positive Poisson's ratio that are not near zero, contract in a direction perpendicular to the applied force. Auxetic structures are advantageous for club head faceplates because the expansive property of auxetic structures when stretched in tension increases the flexibility of the faceplate and the faceplate energy storage. Increasing the faceplate energy storage results in increases in ball speed during golf ball impacts.

(60) Based on finite element simulations measuring the internal energy of the faceplate **130** during golf ball impacts, the faceplate **130** comprising a lattice **140** increases the internal energy storage by 10% to 20% compared to a faceplate devoid of the lattice **140**. In some embodiments, the internal energy storage can increase by 10% to 15%, or 15% to 20%. This increase in internal energy storage equates to approximately a 1.0 to 3.0 mph increase in ball speed compared to a faceplate devoid of the lattice **140**. In some embodiments, the ball speed increases by 1.0 to 2.0 mph, or 2.0 to 3.0 mph. In some embodiments, the ball speed increases by 1.0 to 1.5 mph, 1.5 to 2.0 mph, 2.0 to 2.5 mph, or 2.5 to 3.0 mph. This increase in ball speed equates to approximately a 5 to 15 yard increase in ball distance compared to a faceplate devoid of the lattice **140**. In some embodiments, the ball distance increases by 5 to 10 yards, or 10 to 15 yards. In some embodiments, the ball distance increases by 5 to 7 yards, 7 to 9 yards, 9 to 11 yards, 11 to 13 yards, or 13 to 15 yards. The advantages of the faceplate **130** comprising the lattice **140** are described in more detail below.

(61) Based on coefficient of restitution (COR) faceplate tests measuring the faceplate **130** during golf ball impacts, the faceplate **130** comprising the lattice **140** increases the COR by 2% to 10% compared to a faceplate devoid of the lattice **140**. In some embodiments, the COR can increase by 2% to 5%, or 5% to 10% compared to a faceplate devoid of the lattice **140**. For example, the COR of the faceplate **130** having the lattice **140** can increase by 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, or 10% compared to a faceplate devoid of the lattice **140**.

(62) The dimensions of the lattice **140** can influence how the lattice stores energy in the faceplate. For example, the lattice **140** can comprise a depth measured as a distance from the back face **138** to a bottom surface of the lattice **140** in a direction perpendicular to the back face **138**. The lattice **140** depth can range from 0.025 inch to 0.075 inch. The lattice **140** depth can range from 0.025 inch to 0.05 inch, or 0.05 inch to 0.075 inch. For example, the lattice **140** depth can be 0.025, 0.03, 0.035, 0.04, 0.045, 0.05, 0.055, 0.06, 0.065, 0.07, or 0.075 inch. In one example, the lattice **140** depth can be 0.05 inch.

(63) In other embodiments, the lattice **140** depth can range from 0.005 inch to 0.025 inch. In other embodiments, the lattice **140** depth can range from 0.005 inch to 0.015 inch, or 0.015 to 0.025 inch. In other embodiments, the lattice **140** depth can range from 0.005 inch to 0.01 inch, 0.01 inch to 0.015 inch, 0.015 inch to 0.020 inch, or 0.020 to 0.025 inch. In other embodiments still, the lattice **140** depth can range from 0.006 inch to 0.011 inch, 0.007 inch to 0.012 inch, 0.008 inch to 0.013 inch, 0.009 inch to 0.014 inch, 0.01 inch to 0.015 inch, 0.011 to 0.016 inch, 0.012 to 0.017 inch, 0.013 to 0.018 inch, 0.014 inch to 0.019 inch, or 0.015 inch to 0.02 inch. For example, the lattice

140 depth can be 0.005, 0.006, 0.007, 0.008, 0.009, 0.01, 0.011, 0.012, 0.013, 0.014, 0.015, 0.016, 0.017, 0.018, 0.019, 0.02, 0.021, 0.022, 0.023, 0.024, or 0.025 inch.

(64) The dimensions of the faceplate **130** can influence how the lattice stores energy in the faceplate. For example, the faceplate **130** comprises a thickness measured from the strike face **134** to the back face **138** in a direction perpendicular to the strike face **134**. The faceplate **130** comprises a variable thickness profile extending between the faceplate center **132** and the faceplate perimeter **136**. The faceplate **130** thickness varies from the faceplate center **132** to the faceplate perimeter **136**. The variable thickness profile can comprise a thickened center region that encompasses the faceplate center **132**, a thinned perimeter region adjacent the faceplate perimeter **136**, and a transition region that varies the faceplate thickness between the thickened center region and the thinned perimeter region. The faceplate thickness can facilitate in reducing the weight of the faceplate and allow the weight to be moved to other portions of the club head (e.g. sole) to facilitate in center of gravity location or moment of inertia.

(65) A thicker faceplate **130** can minimize the energy storage capabilities of the lattice **140** by restricting the flexing of the faceplate **130**. A thinner faceplate **130** can increase the energy storage capabilities of the lattice **140** by allowing the faceplate **130** to freely flex. For example, the faceplate thickness near the faceplate center **132** can range from 0.075 inch to 0.2 inch. For example, the face thickness near the faceplate center **132** can range from 0.10 inch to 0.20, or 0.10 to 0.15 inch. In some embodiments, the faceplate thickness near the faceplate center **132** can range from 0.075 inch to 0.175 inch, or 0.075 inch to 0.15 inch. In other embodiments, the faceplate thickness near the faceplate center **132** can range from 0.08 inch to 0.175 inch, 0.08 inch to 0.15 inch, 0.09 inch to 0.175 inch, 0.09 inch to 0.15 inch. For example, the faceplate thickness near the faceplate center **132** can be 0.075, 0.08, 0.085, 0.09, 0.095, 0.097, 0.10, 0.102, 0.11, 0.12, 0.13, 0.135, 0.137, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, or 0.20 inch.

(66) In another example, the faceplate thickness near the faceplate perimeter **136** can range from 0.06 inch to 0.14 inch. In some embodiments, the faceplate thickness near the faceplate perimeter **136** can range from 0.06 inch to 0.10 inch, 0.06 inch to 0.12 inch, 0.07 inch to 0.10 inch, or 0.07 inch to 0.12 inch. In some embodiments, the faceplate thickness near the faceplate perimeter **136** can range from 0.06 inch to 0.08 inch, 0.08 inch to 0.10 inch, 0.10 inch to 0.12 inch, or 0.12 inch to 0.14 inch. For example, the faceplate thickness near the faceplate perimeter **136** can be 0.06, 0.07, 0.075, 0.077, 0.08, 0.085, 0.09, 0.095, 0.10, 0.11, 0.12, 0.13, or 0.14 inch.

Lattice with Series of Interconnected Grooves

(67) As discussed above, the lattice can comprise a plurality of flexure shapes. These flexure shapes can further comprise a series of interconnected grooves. The series of interconnected grooves can comprise a base groove and a plurality of ligament grooves extending outward from the base groove. The plurality of ligament grooves can be connected or integral with the base groove. The plurality of ligament grooves can be equally spaced along the base groove or unequally spaced. The series of interconnected grooves can comprise a repeating pattern of base grooves, and a repeating pattern of ligament grooves, where the repeating pattern of base grooves and ligament grooves are interconnected to from the flexure shapes. The flexure shapes can be formed from a portion of the base groove and the ligament grooves, where portions of the flexure shape are either concave or convex relative to a center of the flexure shape. The lattice having the flexure shapes formed from the series of interconnected grooves facilitates in storing greater energy in the faceplate to allow for greater ball speed during golf ball impacts. Described below are three examples of lattices comprising interconnected base grooves and ligament grooves.

Sunburst Grooves

(68) In one example, as illustrated in FIG. **7**, the faceplate **130** can comprise a lattice **240**. The lattice **240** can be similar to lattice **140** as described above, but can differ in size, shape, or dimensions. The lattice **240** can comprise a plurality of sunburst grooves. Stated another way, the lattice **240** can comprise a plurality of grooves arranged in a sunburst pattern. Each sunburst groove

can comprise a base groove **244**, and six ligament grooves **248** extending from the base groove **244**. The base groove **244** can be circular, and the ligament grooves **248** can be curved. The ligament grooves **248** can extend non-linearly outward or away from the base groove **244**.
(69) The ligament grooves **248** can comprise a first curve **252**, a second curve **256**, and an inflection point **260** positioned between the first curve **252** and the second curve **256**. The position of the inflection point **260** indicates the change in direction of the ligament groove **248** curvature. In some embodiments, the first curve **252** and the second curve **256** of the ligament groove **248** can comprise similar widths. In other embodiments, the first curve **252** and the second curve **256** of the ligament groove **248** can comprise different widths.
(70) The first curve **252** and the second curve **256** can comprise an outer radius. The outer radius of the first curve **252** and the second curve **256** can be similar or different. The outer radius of the first curve **252** and the second curve **256** can range from 0.08 to 0.16 inch. In some embodiments, the outer radius of the first curve **252** and the second curve **256** can range from 0.08 to 0.12 inch, or 0.12 to 0.16 inch. In some embodiments, the outer radius of the first curve **252** and the second curve **256** can range from 0.08 to 0.1 inch, 0.1 to 0.12 inch, 0.12 to 0.14 inch, or 0.14 to 0.16 inch. For example, the outer radius of the first curve **252** and the second curve **256** can be 0.05, 0.06, 0.07, 0.08, 0.09, 0.1, 0.11, 0.12, 0.13, 0.14, or 0.15 inch.
(71) The first curve **252** and the second curve **256** can comprise an inner radius. The inner radius is less than the outer radius. Stated another way, the outer radius is greater than the inner radius. The inner radius of the first curve **252** and the second curve **256** can be similar or different. The inner radius of the first curve **252** and the second curve **256** can range from 0.03 to 0.09 inch. In some embodiments, the inner radius of the first curve **252** and the second curve **256** can range from 0.03 to 0.06 inch, or 0.06 to 0.09 inch. For example, the inner radius of the first curve **252** and the second curve **256** can be 0.03, 0.04, 0.05, 0.06, 0.07, 0.075 0.08, or 0.09 inch.
(72) As illustrated in FIG. **7**, at least three sunburst grooves form a flexure shape **268**. The flexure shape **268** can comprise a portion of at least three base grooves **244** and at least three ligament grooves **248**. A portion of the circular base groove **244** and the curved ligament grooves **248** form the reentrant shape of the flexure shape **268**, where portions of the flexure shape **268** are concave or convex relative to a center of the flexure shape **268**. Further, adjacent flexure shapes **268** can share at least one ligament groove **248**, where the shared ligament groove **248** forms a portion of two flexure shapes **268**.
(73) As illustrated in FIG. **7**, the lattice **240** can comprise a repeating pattern of sunburst grooves, where the flexure shapes **268** are interspersed with circular shapes (i.e. base grooves **244**). Stated another way, the lattice **240** can comprise a first repeating pattern of flexure shapes **268**, and a second repeating pattern of circular shapes, where the first repeating pattern is interspersed in the second repeating pattern. Further, stated another way, the lattice **240** can comprise a repeating pattern of interconnected flexure shapes **268**.
(74) The dimensions of the lattice **240** can influence how the lattice stores energy in the faceplate **130**. For example, the base groove **244** can comprise an outer diameter. The outer diameter of the base groove **244** can range from 0.1 to 0.3 inch. In some embodiments, the outer diameter of the base groove **244** can range from 0.1 to 0.2 inch, or 0.2 to 0.3 inch. For example, the outer diameter of the base groove **244** can be 0.10, 0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, 0.2, 0.25, or 0.30 inch.
(75) The base groove **244** can comprise an inner diameter. The inner diameter of the base groove **244** can range from 0.05 to 0.2 inch. In some embodiments, the inner diameter of the base groove **244** can range from 0.05 to 0.125 inch, or 0.125 to 0.2 inch. For example, the inner diameter of the base groove **244** can be 0.05, 0.1, 0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, or 0.2 inch.
(76) Referring to FIG. **18**, the lattice **240** can be aligned in a low-toe to high-heel direction, a low-heel to high-toe direction, a horizontal direction, a vertical direction, or any combination thereof. As illustrated in FIG. **18**, the lattice **240** can be aligned or oriented in the low-heel to high-toe

direction. The alignment direction of the lattice **240** can impact the characteristic time of the face within the center region **150**, the peripheral region **154**, the toe region **158**, the heel region **162**, the bottom region **166**, the top region **170**, the high-toe region **174**, the low-toe region **178**, the high-heel region **182**, and/or the low-heel region **186**. Furthermore, in some embodiments, the lattice **240** is aligned to match the average shot dispersion across a faceplate. The lattice **240** location can correspond to regions of the face that endure the most impacts. The ability of the lattice to distribute stress can result in greater durability, particularly within area that experiences the greatest number of hits. Thus, the lattice alignment direction can be selected to increase the uniformity of the characteristic time response across the face **130** and to increase durability.

(77) As illustrated in FIG. **18**, in some embodiments, the lattice **240** can formed as a circular region, an elliptical region, or a combination thereof, centered around the geometric center **132** of the faceplate **130**. As illustrated in FIG. **18**, the lattice **240** can also be formed as a elliptical region aligned in the low-heel to high-toe direction. Further, the lattice **240** can be formed as a circular and elliptical region aligned in the low-heel to high-toe direction.

(78) The faceplate **130** comprising lattice **240** can adjust characteristic time within USGA regulations. The faceplate **130** comprising the lattice **240** reduces characteristic time while maintaining similar ball speed performance when compared to a similar faceplate devoid of the lattice **240**. In some examples, the faceplate **130** comprising the lattice **240** decreases center CT by about 1 to 10 μs, or 1 to 5 μs when compared to a similar faceplate devoid of the lattice **240**. The faceplate **130** comprising the lattice **240** maintains similar ball performance compared to the similar faceplate devoid of the lattice **240**. The faceplate **130** comprising the lattice **240** provides desirable, lower characteristic time values while not sacrificing high ball speed performance.

Chiral Grooves

(79) In another example, as illustrated in FIG. **8**, the faceplate **130** can comprise a lattice **340**. The lattice **340** can be similar to lattice **140** as described above, but can differ in size, shape, or dimensions. The lattice **340** can comprise a plurality of chiral grooves. Stated another way, the lattice **340** can comprise a plurality of grooves arranged in chiral pattern. Each chiral groove can comprise a base groove **344**, and six ligament grooves **348** extending from the base groove **344**. Lattice **340** can be similar to lattice **240**, but differ in ligament groove geometry. The base groove **344** can be circular, and the ligament grooves **348** can be linear. The ligament grooves **348** can extend linearly outward from the base groove **344**, where the ligament grooves **348** can be tangent to the circular base groove **348**.

(80) As illustrated in FIG. **8**, three chiral grooves form a flexure shape **368**. The flexure shape **368** can comprise a portion of at least three base grooves **344** and at least three ligament grooves **348**. A portion of the circular base groove **344** forms the reentrant shape of the flexure shape **368**, where portions of the flexure shape **368** are concave relative to a center of the flexure shape **368**. Further, adjacent flexure shapes **368** can share at least one ligament groove **348**, where the shared ligament groove **348** forms a portion of two flexure shapes **368**.

(81) The dimensions of the lattice **340** can influence how the lattice stores energy in the faceplate **130**. For example, the base groove **344** can comprise an outer diameter. The outer diameter of the base groove **344** can range from 0.1 to 0.3 inch. In some embodiments, the outer diameter of the base groove **344** can range from 0.1 to 0.2 inch, or 0.2 to 0.3 inch. For example, the outer diameter of the base groove **344** can be 0.10, 0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, 0.2, 0.25, or 0.30 inch.

(82) The base groove **344** can comprise an inner diameter. The inner diameter of the base groove **344** can range from 0.05 to 0.2 inch. In some embodiments, the inner diameter of the base groove **344** can range from 0.05 to 0.125 inch, or 0.125 to 0.2 inch. For example, the inner diameter of the base groove **344** can be 0.05, 0.1, 0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, or 0.2 inch.

Windmill Grooves

(83) In another example, as illustrated in FIG. **9**, the faceplate **130** can comprise a lattice **440**. The

lattice **440** can be similar to lattice **140** as described above, but can differ in size, shape, or dimensions. The lattice **440** can comprise a plurality windmill grooves. Stated another way, the lattice **440** can comprise a plurality of grooves arranged in a windmill pattern. Each windmill groove can comprise four ligament grooves **448** that meet or converge at a base point **444**. The ligament grooves **448** can extend away from the base point **444**, where a right angle (i.e. approximately 90 degrees) forms between adjacent ligament grooves **448**. Each ligament groove **448** extends away from the base point **444** to an inflection point **460**, where each ligament groove **448** changes direction at the inflection point **460**.

(84) Each ligament groove **448** can comprise a first segment **452**, a second segment **456**, and the inflection point **460** positioned between the first segment **452** and the second segment **456**. The position of the inflection point **460** indicates the change in direction of the ligament groove **448**. The inflection point **460** can define a right angle (i.e. approximately 90 degrees) between the first segment **452** and the second segment **456** of the ligament groove **448**. In some embodiments, the first segment **452** and the second segment **456** of the ligament groove **448** can comprise similar widths. In other embodiments, the first segment **452** and the second segment **456** of the ligament groove **448** can comprise different widths.

(85) As illustrated in FIG. **9**, four windmill grooves can form a flexure shape **468**. The flexure shape **468** can comprise eight ligament grooves **448**. The ligament grooves **448** form the reentrant shape of the flexure shape **468**, where portions of the flexure shape **468** are concave or convex relative to a center of the flexure shape **468**. Further, adjacent flexure shapes **468** can share at least two ligament grooves **448**, where the shared ligament grooves **448** form a portion of two flexure shapes **468**.

(86) The dimensions of the lattice **240**, **340**, and **440** can influence how the lattice stores energy in the faceplate **130**. For example, as illustrated in FIGS. **7** and **8**, the base grooves **244** and **344** can comprise a width (hereafter “base groove width”). The base groove width can range from 0.01 inch to 0.1 inch. In some embodiments, the base groove width can range from 0.01 inch to 0.05 inch, or 0.05 inch to 0.1 inch. In some embodiments, the base groove width can range from 0.01 to 0.03 inch, 0.01 to 0.04 inch, 0.01 to 0.05 inch, 0.01 to 0.06 inch, 0.01 to 0.07 inch, 0.01 to 0.08 inch, or 0.01 to 0.09 inch. For example, the base groove width can be 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09, or 0.1 inch.

(87) In another example, as illustrated in FIG. **7-9**, the ligament grooves **248**, **348**, and **448** can comprise a width (hereafter “ligament groove width”). The ligament groove width can be the same or different than the base groove width. For example, the ligament groove width can be greater than the base groove width. In another example, the ligament groove width can be less than the base groove width. In some embodiments, the base groove width can range from 0.01 inch to 0.05 inch, or 0.05 inch to 0.1 inch. In some embodiments, the ligament groove width can range from 0.01 to 0.03 inch, 0.01 to 0.04 inch, 0.01 to 0.05 inch, 0.01 to 0.06 inch, 0.01 to 0.07 inch, 0.01 to 0.08 inch, or 0.01 to 0.09 inch. For example, the ligament groove width can be 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09, or 0.1 inch.

(88) The dimensions, the shape, and the pattern of the lattice **240**, **340**, and **440** (hereafter “the lattice”) formed from a series of interconnected grooves affects faceplate bending during golf ball impacts. During golf ball impacts, the flexure shapes of the lattice resemble springs storing energy through tension and torsion loads. As the golf ball impacts the faceplate, the strike face is in compression and the back face is in tension. As tension is applied to the back face, the convex and concave curves of the flexure shape ligament grooves flex and act as springs that store energy in the faceplate through linear and torsional bending (i.e. similar to a spring storing energy through tension and torsion). Storing energy through two modes of bending is advantageous over conventional club head faceplates that store energy through one mode of bending (i.e. linear bending). Storing energy though two modes of bending allows for greater ball speeds during golf ball impacts.

(89) Further, the flexure shapes of the lattice reduce the largest stresses concentrated in a small volume of the faceplate material (i.e. impact area of the faceplate) by displacing the reduced stress over a greater volume of the faceplate material. For example, the reduced stress can be displaced over 3 to 8 base grooves or ligament grooves in a direction from near the faceplate center **132** to near the faceplate perimeter **136** in the lattice **240**, **340**, or **440**. In some embodiments, the reduced stress can be displaced over 3 to 5, 4 to 6, 5 to 7, or 6 to 8 base grooves or ligament grooves in a direction from near the faceplate center **132** to near the faceplate perimeter **136**. This reduction of stress does not occur in a faceplate devoid of the lattice **240**, **340**, or **440**.

Lattice with Flexure Shape Recesses

Flexure Shape Recesses with Vertices

(90) As discussed above, the lattice can comprise a plurality of flexure shapes that are formed from a plurality of land portions. The plurality of land portions can form a plurality of flexure shape recesses, where the land portions separate the flexure shape recesses. The land portions are interconnected with one another and define the portions of the club head **100** that are devoid of the flexure shape recesses. The land portions form a perimeter of the flexure shape recesses.

(91) The land portions can comprise a width between adjacent flexure shape recesses. The land portion width can be measured from a flexure shape recess perimeter to an adjacent flexure shape recess perimeter. The land portion width can vary or remain constant between adjacent flexure shape recesses. Adjacent land portion widths can be similar or different from each other. For example, the land portion width can remain constant along one portion of the flexure shape recess perimeter, and the land portion width can vary along another portion of the flexure shape recess perimeter.

(92) In some embodiments, the land portion width can be greater than 0.02 inch, greater than 0.05 inch, greater than 0.1 inch, greater than 0.15 inch, or greater than 0.2 inch. In some embodiments, the land portion width can range from 0.02 to 0.2 inch. In some embodiments, the land portion width can range from 0.02 to 0.1 inch, or 0.1 to 0.2 inch. In some embodiments, the land portion width can range from 0.02 to 0.05 inch, 0.05 to 0.08 inch, 0.08 to 0.11 inch, 0.11 to 0.14 inch, 0.14 to 0.17 inch, or 0.17 to 0.2 inch. For example, the land portion width can be 0.02, 0.03, 0.04, 0.05, 0.06, 0.08, 0.09, 0.1, 0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, or 0.2 inch.

(93) The flexure shape recess can comprise a width. The flexure shape recess width can be greater than 0.08 inch, greater than 0.1 inch, greater than 0.12 inch, greater than 0.14 inch, greater than 0.16 inch, greater than 0.18 inch, or greater than 0.2 inch. In some embodiments, the flexure shape recess width can range from 0.1 to 0.3 inch. In some embodiments, the flexure shape recess width can range from 0.1 to 0.2, or 0.2 to 0.3 inch. For example, the flexure shape recess width can be 0.1, 0.11, 0.12, 0.125, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, 0.2, 0.25, or 0.3 inch.

(94) The perimeter of the flexure shape recess can comprise at least two vertices that define acute interior angles, and at least one vertex defining a reflex angle. The at least one reflex angle vertex is positioned between the at least two acute interior angle vertices. The at least one reflex angle vertex does not define an acute interior angle. The acute interior angle can define an angle less than 90 degrees, and the reflex angle can define an angle greater than 180 degrees and less than 360 degrees. In some embodiments, the reflex angle can define an angle greater than 180 degrees and less than 270 degrees, or greater than 270 degrees and less 360 degrees. In other embodiments, the reflex angle can define an angle greater than 180 degrees and less than 225 degrees, greater than 225 degrees and less than 270 degrees, greater than 270 degrees and less than 315 degrees, or greater than 315 degrees and less than 360 degrees. The at least one reflex angle vertex on the flexure shape recess perimeter can define the reentrant, concave, or non-convex shape.

(95) In some embodiments, the flexure shape recess can comprise one, two, three, four, five, or six vertices defining the reflex angle greater than 180 degrees and less than 360 degrees. The number of reflex angle vertices can correspond with the concavity of the flexure shape recess. For example, a flexure shape recess comprising two reflex angle vertices can comprise two concave portions

along the flexure shape recess perimeter. In another example, a flexure shape recess comprising one reflex angle vertex can comprise one concave portion along the flexure shape recess perimeter. In another example, the flexure shape recess comprising three reflex angle vertices can comprise three concave portions along the flexure shape recess perimeter. In another example, the flexure shape recess comprising four reflex angle vertices can comprise four concave portions along the flexure shape recess perimeter. Further, in another example, the flexure shape recess comprising six reflex angle vertices can comprise six concave portions along the flexure shape recess perimeter.

(96) The lattice comprising the flexure shape recesses formed from the plurality of land portions facilitates in storing greater energy in the faceplate to allow for greater ball speed during golf ball impacts. Described below are a few examples of lattices comprising land portions and flexure shape recesses. The flexure shape recess examples described below are in reference to one orientation, but it would be appreciated that the flexure shape recesses can be oriented in several different configurations to achieve greater faceplate energy storage and greater ball speed during golf ball impacts. Further, it would be appreciated that the vertices on the flexure shape recess perimeter can be rounded or comprise a small radius to round off any sharp edges on the flexure shape recess perimeter to minimize stress concentrations in the faceplate **130**.

Evan Flexure Shape Recess

(97) In one example, as illustrated in FIG. **10**, the faceplate **130** can comprise a lattice **540**. The lattice **540** can be similar to lattice **140** as described above, but can differ in size, shape, or dimensions. A plurality of land portions **564** can form a plurality of Evan flexure shape recesses **568**. Each Evan flexure shape recess **568** can comprise four vertices **552** that define acute interior angles, and two vertices **556** that define reflex angles.

(98) As illustrated in FIG. **10**, the Evan flexure shape recesses **568** can comprise a bow tie shape, where a width of the Evan flexure shape recess **568** decreases from the acute interior angle vertices **552** to the reflex angle vertices **556**. Stated another way, the width of the Evan flexure shape recess **568** is greater between opposite acute interior angle vertices **552** than between opposite reflex angle vertices **556**. A minimum width of the Evan flexure shape recess **568** can measured across opposite reflex angle vertices **556**. As described above, the width of the Evan flexure shape recess **568** can be greater than 0.08 inch, greater than 0.1 inch, greater than 0.12 inch, greater than 0.14 inch, greater than 0.16 inch, greater than 0.18 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the Evan flexure shape recess **568** can range from 0.1 to 0.3 inch. In one example, the width of the Evan flexure shape recess **568** can be 0.125 inch.

(99) The width of the land portions **564** can correspond with the width of the Evan flexure shape recess **568**. In this example, the width of the land portions **564** can vary along a portion of the perimeter of the Evan flexure shape recess **568**. More specifically, the width of the land portions **564** between adjacent Evan flexure shape recesses **568** increases from the acute interior angle vertices **552** to the reflex angle vertices **556**. Stated another way, the width of the land portions **564** between adjacent Evan flexure shape recesses **568** is greater at the reflex angle vertices **556** than at the acute interior angle vertices **552**. Further, stated another way, the width of the land portions **564** between adjacent Evan flexure shape recesses **568** is less at the acute interior angle vertices **552** than at the reflex angle vertices **556**. In this example, the width of the land portions **564** along another portion of the perimeter of the Evan flexure shape recess **568** can remain constant.

(100) Further, as described above, the width of the land portion **564** can be greater than 0.02 inch, greater than 0.05 inch, greater than 0.1 inch, greater than 0.15 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the land portion **564** can range from 0.02 to 0.2 inch.

Arrowhead Flexure Shape Recess

(101) In another example, as illustrated in FIG. **11**, the faceplate **130** can comprise a lattice **640**. The lattice **640** can be similar to lattice **140** as described above, but can differ in size, shape, or dimensions. A plurality of land portions **664** can from a plurality of arrowhead flexure shape

recesses **668**. Each arrowhead flexure shape recess **668** can comprise three vertices **652** that define acute interior angles, and one vertex **656** that defines a reflex angle.

(102) As illustrated in FIG. **11**, the arrowhead flexure shape recess **668** can comprise a substantially triangular shape or arrowhead shape. A minimum width of the arrowhead flexure shape recess **668** can be measured between the reflex angle vertex **656** and an acute interior angle vertex **652** directly opposite the reflex angle vertex **656** (i.e. an acute interior angle vertex **652** that is not adjacent the reflex angle vertex **656**). As described above, the width of the arrowhead flexure shape recess **668** can be greater than 0.08 inch, greater than 0.1 inch, greater than 0.12 inch, greater than 0.14 inch, greater than 0.16 inch, greater than 0.18 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the arrowhead flexure shape recess **668** can range from 0.1 to 0.3 inch. In one example, the width of the arrowhead flexure shape recess **668** can be 0.125 inch.

(103) The width of land portions **664** can correspond with the width of the arrowhead flexure shape recess **668**. In this example, the width of the land portions **664** can remain constant along a portion of the perimeter of the arrowhead flexure shape recess **668**, and the width of the land portions **664** can vary along another portion of the perimeter of the arrowhead flexure shape recess **668**.

(104) Further, as described above, the width of the land portion **664** can be greater than 0.02 inch, greater than 0.05 inch, greater than 0.1 inch, greater than 0.15 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the land portion **664** can range from 0.02 to 0.2 inch.

Four-Pointed Star Flexure Shape Recess

(105) In another example, as illustrated in FIG. **12**, the faceplate **130** can comprise a lattice **740**. The lattice **740** can be similar to lattice **140** as described above, but can differ in size, shape, or dimensions. A plurality of land portions **764** can form a plurality of four-pointed star flexure shape recesses **768**. Each four-pointed star flexure shape recess **768** can comprise four vertices **752** that define acute interior angles, and four vertices **756** that define reflex angles.

(106) As illustrated in FIG. **12**, the four-pointed star flexure shape recess **768** can comprise a star shape or a concave square shape. A minimum width of the four-pointed star flexure shape recess **768** can be measured between opposite reflex angle vertices **756**. A maximum width of the four-pointed star flexure shape recess **768** can be measured between opposite acute interior angle vertices **752** (i.e. acute interior angle vertices **752** having the recess or void between them). As described above, the width of the four-pointed flexure shape recess **768** can be greater than 0.08 inch, greater than 0.1 inch, greater than 0.12 inch, greater than 0.14 inch, greater than 0.16 inch, greater than 0.18 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the four-pointed flexure shape recess **768** can range from 0.1 to 0.3 inch. In one example, the width of the four-pointed flexure shape recess **768** can be 0.125 inch.

(107) The width of the land portions **764** can correspond with the width of the four-pointed star flexure shape recess **768**. In this example, the width of the land portions **764** can vary along a portion of the perimeter of the four-pointed star flexure shape recess **768**. More specifically, the width of the land portions **764** between adjacent four-pointed star flexure shape recesses **768** increases from the acute interior angle vertices **752** to the reflex angle vertices **756**. Stated another way, the width of the land portions **764** is greater at the reflex angle vertices **756** than at the acute interior angle vertices **752**. Further, stated another way, the width of the land portions **764** is less at the acute interior angle vertices **752** than at the reflex angle vertices **756**.

(108) Further, as described above, the width of the land portion **764** can be greater than 0.02 inch, greater than 0.05 inch, greater than 0.1 inch, greater than 0.15 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the land portion **764** can range from 0.02 to 0.2 inch.

Six-Pointed Star Flexure Shape Recess

(109) In another example, as illustrated in FIG. **13**, the faceplate **130** can comprise a lattice **840**. The lattice **840** can be similar to lattice **140** as described above, but can differ in size, shape, or

dimensions. A plurality of land portions **864** can form a plurality of six-pointed star flexure shape recesses **868**. Each six-pointed star flexure shape recess **768** can comprise six vertices **852** that define acute interior angles, and six vertices **856** that define reflex angles.

(110) As illustrated in FIG. **13**, the six-pointed star flexure shape recess **868** can comprise a star shape. A minimum width of the six-pointed star flexure shape recess **868** can be measured between opposite reflex angle vertices **856** (i.e. reflex angle vertices **856** having the recess or void between them). A maximum width of the six-pointed star flexure shape recess **868** can be measured between opposite acute interior angle vertices **852** (i.e. acute interior angle vertices **852** having the recess or void between them). As described above, the width of the six-pointed star flexure shape recess **868** can be greater than 0.08 inch, greater than 0.1 inch, greater than 0.12 inch, greater than 0.14 inch, greater than 0.16 inch, greater than 0.18 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the six-pointed star flexure shape recess **868** can range from 0.1 to 0.3 inch. In one example, the width of the six-pointed star flexure shape recess **868** can be 0.125 inch.

(111) The width of the land portions **864** can correspond with the width of the six-pointed star flexure shape recess **868**. In this example, the width of the land portions **864** can vary along a portion of the perimeter of the six-pointed star flexure shape recess **868**. More specifically, the width of the land portions **864** between adjacent six-pointed star flexure shape recesses **868** increases from the acute interior angle vertices **852** to the reflex angle vertices **856**. Stated another way, the width of the land portions **864** between adjacent six-pointed star flexure shape recesses **868** is greater at the reflex angle vertices **856** than at the acute interior angle vertices **852**. Further, stated another way, the width of the land portions **864** between adjacent six-pointed star flexure shape recesses **868** is less at the acute interior angle vertices **852** than at the reflex angle vertices **856**.

(112) Further, as described above, the width of the land portion **864** can be greater than 0.02 inch, greater than 0.05 inch, greater than 0.1 inch, greater than 0.15 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the land portion **864** can range from 0.02 to 0.2 inch.

Three-Pointed Star Flexure Shape Recess

(113) In another example, as illustrated in FIG. **14**, the faceplate **130** can comprise a lattice **940**. The lattice **940** can be similar to lattice **140** described above, but can differ in size, shape, or dimensions. A plurality of land portions **964** can form a plurality of three-pointed star flexure shape recesses **968**. Each three-pointed star flexure shape recess **968** can comprise three vertices **952** that define acute interior angles, and three vertices **756** that define reflex angles.

(114) As illustrated in FIG. **14**, the three-pointed star flexure shape recess **968** can comprise a substantially triangular shape, star shape, or Y-shape. A minimum width of the three-pointed star flexure shape recess **968** can be measured between opposite reflex angle vertices **956** (i.e. reflex angle vertices **956** having the recess or void between them). A maximum width of the three-pointed star flexure shape recess **968** can be measured between an acute interior angle vertex **952** and a reflex angle vertex **956** (i.e. between an acute interior angle vertex **952** and a reflex angle vertex **956** having the recess or void between them). As described above, the width of the three-pointed star flexure shape recess **968** can be greater than 0.08 inch, greater than 0.1 inch, greater than 0.12 inch, greater than 0.14 inch, greater than 0.16 inch, greater than 0.18 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the three-pointed flexure shape recess **968** can range from 0.1 to 0.3 inch. In one example, the width of the three-pointed flexure shape recess **968** can be 0.125 inch.

(115) The width of the land portions **964** can correspond with the width of the three-pointed star flexure shape recess **968**. In this example, the width of the land portions **964** can vary along a portion of the perimeter of the three-pointed star flexure shape recess **968**. More specifically, the minimum width of the land portions **964** can be measured between the reflex angle vertex **956** on a

flexure shape recess **968** and the acute interior angle vertex **952** on an adjacent flexure shape recess **968**.

(116) Further, as described above, the width of the land portion **964** can be greater than 0.02 inch, greater than 0.05 inch, greater than 0.1 inch, greater than 0.15 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the land portion **964** can range from 0.02 to 0.2 inch.

Bone Flexure Shape Recess

(117) In another example, as illustrated in FIGS. **19-21**, the faceplate **130** can comprise a lattice **1340**. The lattice **1340** can be similar to lattice **140** described above, but can differ in size, shape, or dimensions. A plurality of land portions **1364** can form a plurality of bone flexure shape recesses **1368**. The plurality of bone flexure shape recesses **1368** are separate and not connected with adjacent bone flexure shape recesses **1368**. Each bone flexure shape recess **1368** can comprise a perimeter edge having a plurality of concave and convex edges relative to a center of the bone flexure shape recess **1368**. Further, each bone flexure shape recess **1368** can comprise a plurality of concave and convex edges relative to a centerline **1342**. The centerline **1342** is defined as extending through a center of the bone flexure shape recess **1368** or extending between two central vertices of the bone flexure shape recess **1368**.

(118) Referring to FIGS. **19** and **20**, the bone flexure shape recess **1368** can comprise a plurality of vertices along the perimeter edge of the bone flexure shape recess **1368**. In one example, each bone flexure shape recess **1368** can comprise two vertices **1352** that define nadirs of two concave edges, and two vertices **1356** that define apexes of two convex edges. Described another way, the two vertices **1356** can define end points of the bone flexure shape recess **1368**, wherein the centerline **1342** intersects the two end vertices **1356**. In many embodiments, at least one vertex **1352** can be located closest to the centerline **1342**. In other embodiments, two vertices **1352** can be located closest to the centerline **1342**. Each bone flexure shape recess **1368** can further comprise four inflection vertices **1360**, **1362** located at the transitions between the concave and convex edges.

(119) As illustrated in FIGS. **19** and **20**, the bone flexure shape recess **1368** can comprise a substantially bone, barbell, drum stick, or extended water droplet shape. Each bone flexure shape recess **1368** can comprise a major end nodule **1370**, a minor end nodule **1376**, and an isthmus **1382**. The isthmus **1382** connects the major end nodule **1370** to the minor end nodule **1376**. The major end nodule **1370** can comprise a convex edge. The minor end nodule **1376** can comprise a convex edge. The isthmus **1382** can comprise at least one concave edge, wherein at least one concave edge of the isthmus **1382** connects with the convex edge of the major end nodule **1370** and the convex edge of the minor end module **1370**. The isthmus **1382** can comprise two concave edges, wherein the concave edges of the isthmus **1382** connect with the convex edge of the major end nodule **1370** and the convex edge of the minor end module **1370**. The major end nodule **1370** can be larger than the minor end nodule **1376**. The major end nodule **1370** can comprise a major diameter and the minor end nodule **1376** can comprise a minor diameter, wherein the major diameter can be larger than the minor diameter. The major and minor end nodules can also be called depressions, depressed pools, epiphyses, knobs, or knots. The isthmus **1382** can also be called a strait, canal, shaft, channel, bridge, or narrowed portion.

(120) Referring to FIG. **20**, the bone flexure shape recess **1368** can be symmetric about the centerline **1342**. The edges of the bone flexure shape recess **1368** on opposing sides of the centerline **1342** can be mirror images of each other. Further, a vertical axis (not shown) can intersect the nadir vertices **1352**. The bone flexure shape recess **1368** may not be symmetric about the vertical axis intersecting the nadair vertices **1352**.

(121) The bone flexure shape recess **1368** can further be described as having two circular shapes being connected by the isthmus, bridge, or narrowed portion **1382**. The circular shapes of the bone flexure shape recess **1368** can be described with respect to major and minor reference circles. The major reference circle **1372** can larger than the minor reference circle **1378**. The bone flexure shape

recess **1368** can be described as having the major reference circle **1372** and the minor reference circle **1378** connected by a narrowed portion **1382**. The major reference circle **1372** can have a radius inclusively between about 0.025 inch and about 0.06 inch. The minor reference circle **1378** can have a radius inclusively between about 0.02 inch and 0.05 inch. In one example, the radius of the major reference circle **1372** can be 0.04 inch, and the radius of the minor reference circle **1378** can be 0.03 inch. Further, the concave edges of the narrowed portion **1382** can comprise a radius ranging from 0.10 inch to 0.25 inch. In one example, the convex edge radius of the narrowed portion **1382** can be 0.15 inch.

(122) The major reference circle **1372** can at least partially define a boundary of the major end nodule **1370**. For example, the major reference circle **1372** can coincide with a convex edge of the bone flexure shape recess **1368**. In other words, the major reference circle **1372** can coincide with an edge of the bone flexure shape recess **1368**, between two major end inflection vertices **1360**, located on the major end nodule **1370**. The major end nodule **1370** can comprise the major end vertex **1356**, where the major reference circle **1372** coincides with the major end vertex **1356**. A major nodule angle **1374** can be defined between the two major end inflection vertices **1360**, around the major end nodule **1370**. The major nodule angle **1374** can range, inclusively, between 135 degrees and 180 degrees, between 180 degrees and 225 degrees, or between 225 degrees and 270 degrees.

(123) The minor reference circle **1378** can at least partially define a boundary of the minor end nodule **1376**. For example, the minor reference circle **1378** can coincide with a convex edge of the bone flexure shape recess **1368**. In other words, the minor reference circle **1378** can coincide with an edge of the bone flexure shape recess **1368**, between two minor end inflection vertices **1362**, located on the minor end nodule **1376**. The minor end nodule **1376** can comprise the minor end vertex **1356**, where the minor reference circle **1378** coincides with the minor end vertex **1356**. A minor nodule angle **1380** can be measured between the two minor end inflection vertices **1362**, around the minor end nodule **1376**. The minor nodule angle **1380** can range, inclusively, between 135 degrees and 180 degrees, between 180 degrees and 225 degrees, or between 225 degrees and 270 degrees.

(124) The isthmus **1382** can extend between the two major end inflection vertices **1360** and the two minor end inflection vertices **1362**. The isthmus **1382** can comprise two concave edges. The two vertices **1352** can be located on the concave edges of the isthmus **1382**, wherein the vertices **1352** can be located on the nadir or point located closest to the centerline **1342**. The ends of the isthmus **1382** connect to the major and minor end nodules **1370**, **1376**. The transitions between the isthmus **1382** and the end nodules **1370**, **1376** can be smooth such that no sharp edges form between the isthmus **1382** and the end nodules **1370**, **1376**. In other words, the perimeter edges of the bone flexure shape recess **1368** can smoothly or seamlessly transition between the end nodules **1370**, **1376** and the isthmus **1382**. The perimeter edges of the bone flexure shape recess **1368** are devoid of sharp edges or edges that converge to a point to minimize stress risers within the faceplate.

(125) The minimum width of the bone flexure shape recess **1368** can be measured between opposing vertices **1352** on the concave edges of the bone flexure shape recess **1368**. The minimum width of the bone flexure shape recess **1368** can be measured across the isthmus or narrowed portion **1382**. The minimum width of the bone flexure shape recess **1368** can be inclusively between 0.02 inch and 0.03 inch, 0.03 inch and 0.04 inch, 0.04 inch and 0.05 inch, or 0.05 inch and 0.06 inch. In some embodiments, the minimum width of the bone flexure shape recess **1368** can be approximately 0.02 inch, 0.025 inch, 0.03 inch, 0.035 inch, 0.04 inch, 0.045 inch, or 0.05 inch.

(126) A maximum length of the bone flexure shape recess **1368** can be measured between opposing vertices **1356** of the convex edges of the bone flexure shape recess **1368**. The maximum length of the bone flexure shape recess **1368** can be measured between the vertices **1356** parallel to the centerline **1342**. The maximum length can be inclusively between 0.25 inch and 0.50 inch. In some embodiments, the maximum length can be inclusively between 0.25 inch and 0.30 inch, 0.30 inch

and 0.35 inch, 0.35 inch and 0.40 inch, 0.40 inch and 0.45 inch, or 0.45 inch and 0.50 inch. The isthmus **1382** can span between 40% and 80% of the bone flexure shape recess **1368** length.

(127) Referring to FIGS. **19-21**, in some embodiments, the lattice **1340** can comprise linear rows of bone flexure shape recesses **1368**. Adjacent rows of bone flexure shape recesses **1368** can be oriented in different directions, wherein the major end nodules **1370** of a first row of bone flexure shape recesses **1368** point in a first direction, and the major end nodules **1370** of a second row of bone flexure shape recesses **1368** point in a second direction opposite the first direction. In other embodiments, adjacent rows of bone flexure shape recesses **1368** can be oriented in the same direction, wherein each row of bone flexure shape recesses **1368** can be oriented with the major end nodules **1370** pointing in the same direction. Further, adjacent rows of bone flexure shape recesses **1368** extending in the same direction can be staggered or offset from each other. When comparing adjacent rows of bone flexure shape recesses **1368** extending in the same direction, the major end nodules **1370** and the minor end nodules **1376** of adjacent bone flexure shape recesses **1368** can be offset or not aligned with each other.

(128) The lattice **1340** can be aligned in a low-toe to high-heel direction, a low-heel to high-toe direction, a heel to toe direction, a crown to sole direction, a horizontal direction, a vertical direction, or any combination thereof. For example, as illustrated in FIG. **21**, the lattice **1340** can be aligned in a low-heel to high-toe direction, wherein a plurality of first bone flexure shape recess **1368** rows have the major end nodules **1370** point toward the high-toe, and a plurality of second bone flexure shape recess **1368** rows have the major end nodules **1370** point toward the low-heel. In another example, as illustrated in FIG. **24**, the lattice **1340** can be aligned in a low-toe to high-heel direction, wherein a plurality of first bone flexure shape recess **1368** rows have the major end nodules **1370** point toward the low-toe, and a plurality of second bone flexure shape recess **1368** rows have the major end nodules **1370** point toward the high-heel.

(129) The alignment direction of the lattice **1340** can impact the characteristic time of the faceplate within the center region **150**, the peripheral region **154**, the toe region **158**, the heel region **162**, the bottom region **166**, the top region **170**, the high-toe region **174**, the low-toe region **178**, the high-heel region **182**, and/or the low-heel region **186**. Furthermore, in some embodiments, the lattice **1340** is aligned to match the average shot dispersion across a faceplate. The lattice **1340** location can correspond to regions of the face that endure the most impacts. The ability of the lattice **1340** to distribute stress can result in greater durability, particularly within the area that experiences the greatest number of hits. Thus, the lattice **1340** alignment direction can be selected to increase the uniformity of the characteristic time response across the faceplate **130** and to increase durability.

(130) The faceplate **130** comprising lattice **1340** can adjust characteristic time within USGA regulations. The faceplate **130** comprising the lattice **1340** reduces characteristic time while maintaining similar ball speed performance when compared to a similar faceplate devoid of the lattice **1340**. In some examples, the faceplate **130** comprising the lattice **1340** decreases center CT by about 1 to 10 μs, or 1 to 5 μs when compared to a similar faceplate devoid of the lattice **1340**. In other examples, the faceplate **130** comprising the lattice **1340** decreases center CT by about 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 μs when compared to a similar faceplate devoid of the lattice **1340**. The faceplate **130** comprising the lattice **1340** maintains similar ball performance compared to the similar faceplate devoid of the lattice **1340**. The faceplate **130** comprising the lattice **1340** provides desirable, lower characteristic time values while not sacrificing high ball speed performance.

(131) As illustrated in FIG. **21**, the lattice **1340** can be aligned along a reference direction **1384**. Each row of flexure shape recesses **1368** can comprise the centerline **1342** extending through the end vertices **1356**, wherein each flexure shape recess **1368** is aligned along the centerline **1342**. The centerline **1342** of each row of flexure shape recesses **1368** can be parallel with the reference direction **1384**. The lattice **1340** can be aligned such that the reference direction **1384** is offset from a ground plane **105** by an angle **1346** between 0 degrees and 179 degrees. In some embodiments, the angle **1346** can be inclusively between 0 degrees and 30 degrees, 30 degrees and 60 degrees, 60

degrees and 90 degrees, 90 degrees and 120 degrees, 120 degrees and 150 degrees, or 150 degrees and 179 degrees. In embodiments where the lattice **1340** is oriented in a low-heel to high-toe direction, the angle **1346** can be less than 90 degrees, less than 80 degrees, less than 70 degrees, less than 60 degrees, less than 50 degrees, less than 40 degrees, less than 30 degrees, or less than 20 degrees. In embodiments where the lattice **1340** is oriented in a low-heel to high-toe direction, the angle **1346** can range between 5 degrees and 60 degrees, 10 degrees to 70 degrees, 15 degrees to 80 degrees, or 20 degrees to 85 degrees. For example, in embodiments where the lattice **1340** can be oriented in a low-heel to high-toe direction, the angle **1346** can be approximately 5 degrees, 10 degrees, 15 degrees, 20 degrees, 25 degrees, 30 degrees, 35 degrees, 40 degrees, 45 degrees, 50 degrees, 55 degrees, 60 degrees, 65 degrees, 70 degrees, 75 degrees, 80 degrees, or 85 degrees.
(132) Furthermore, similar to lattice **140**, the lattice **1340** can be positioned on the center region **150**, the high-toe region **174**, the low-toe region **178**, the high-heel region **182**, the low-heel region **178**, or any combination thereof. The lattice **1340** can be formed as a circular region, an elliptical region, or a combination thereof, centered around the geometric center of the faceplate. As illustrated in FIG. **21**, the lattice **1340** can be formed as a elliptical region aligned in the low-heel to high-toe direction. Further, the lattice **1340** can be formed as a combination of a circular region and a elliptical region aligned in the low-heel to high-toe direction.
(133) The plurality of flexure shape recesses of the lattice **540**, **640**, **740**, **840**, **940**, and **1340** (hereafter "the lattice") formed from the plurality of land portions affects the faceplate bending during golf ball impacts. During golf ball impacts, the flexure shape recesses of the lattice resemble springs storing energy through tension and torsion loads. As the golf ball impacts the faceplate, the strike face is in compression and the back face is in tension. As tension is applied to the back face, the flexure shape recesses expand at the reflex angle vertices (i.e. the flexure shape recesses increase in size or volume). This expansion allows the flexure shape recesses to store energy in the faceplate through linear and torsional bending (i.e. similar to a spring storing energy through tension and torsion). Storing energy through two modes of bending is advantageous over conventional club head faceplates that store energy through one mode of bending (i.e. linear bending). Storing energy though two modes of bending allows for greater ball speeds during golf ball impacts.
(134) Further, the flexure shapes of the lattice reduce the largest stresses concentrated in a small volume of the faceplate material (i.e. impact area of the faceplate) by displacing the reduced stress over a greater volume of the faceplate material. For example, the reduced stress can be displaced over 3 to 8 flexure shape recesses in a direction from near the faceplate center **132** to near the faceplate perimeter **136** in the lattice **540**, **640**, **740**, **840**, **940**, or **1340**. In some embodiments, the reduced stress can be displaced over 3 to 5, 4 to 6, 5 to 7, or 6 to 8 flexure shape recesses in a direction from near the faceplate center **132** to near the faceplate perimeter **136**. This reduction in stress does not occur in a faceplate devoid of lattice **540**, **640**, **740**, **840**, **940**, or **1340**.
(135) Additionally, inclusion of the lattice on the rear surface of the faceplate can result in a more uniform characteristic time response across the face. Faceplates including the lattice **540**, **640**, **740**, **840**, **940**, **1040**, **1140**, **1240**, or **1340** can maintain the characteristic time within the USGA regulations. In some embodiments, the faceplates including the lattice **540**, **640**, **740**, **840**, **940**, **1040**, **1140**, **1240**, or **1340** can reduce the center characteristic time while maintaining similar ball speed performance when compared to a similar faceplate devoid of the lattices **540**, **640**, **740**, **840**, **940**, **1040**, **1140**, **1240**, or **1340**. Reducing center characteristic time is desirable to conform with the USGA's regulations.
Flexure Shape Recesses Defined by Land Portions with Geometric Shapes
(136) As discussed above, the lattice can comprise a plurality of flexure shapes that are formed from a plurality of land portions. The plurality of land portions can form a plurality of flexure shape recesses, where the plurality of land portions separate the plurality of flexure shape recesses. The land portions are interconnected with one another and define the portions of the club head **100**

that are devoid of the flexure shape recesses. The land portions form a perimeter of the flexure shape recesses. In some embodiments, the perimeter of the flexure shape recess can comprise a reentrant, concave, or non-convex shape. In other embodiments, the perimeter of the flexure shape recess can be devoid of a reentrant, concave, non-convex shape.

(137) The land portions can comprise a geometric shape between adjacent flexure shape recesses. The geometric shape of the land portions can comprise a triangle, a square, a rectangle, a rhombus, a parallelogram, a quadrilateral, a polygon, or a hexagon. The geometric shape of the land portions can be interconnected with one another, where the land portions form a series of interconnected geometric shapes between the flexure shape recesses.

(138) The geometric shape of the land portion can form a portion of one or more flexure shape recesses. For example, a land portion can comprise a triangular shape that forms a portion of three flexure shape recesses. In another example, a land portion can comprise a quadrilateral shape that forms a portion of four flexure shape recesses.

(139) The land portions can comprise a width between adjacent flexure shape recesses. The land portion width can be measured from a flexure shape recess perimeter to an adjacent flexure shape recess perimeter. The land portion width can vary or remain constant between adjacent flexure shape recesses. Adjacent land portion widths can be similar or different from each other. For example, the land portion width can remain constant along one portion of the flexure shape recess perimeter, and the land portion width can vary along another portion of the flexure shape recess perimeter.

(140) In some embodiments, the land portion width can be greater than 0.02 inch, greater than 0.05 inch, greater than 0.1 inch, greater than 0.15 inch, or greater than 0.2 inch. In some embodiments, the land portion width can range from 0.02 to 0.2 inch. In some embodiments, the land portion width can range from 0.02 to 0.1 inch, or 0.1 to 0.2 inch. In some embodiments, the land portion width can range from 0.02 to 0.05 inch, 0.05 to 0.08 inch, 0.08 to 0.11 inch, 0.11 to 0.14 inch, 0.14 to 0.17 inch, or 0.17 to 0.2 inch. For example, the land portion width can be 0.02, 0.03, 0.04, 0.05, 0.06, 0.08, 0.09, 0.1, 0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, or 0.2 inch.

(141) The flexure shape recess can comprise a width. The flexure shape recess width can be greater than 0.08 inch, greater than 0.1 inch, greater than 0.12 inch, greater than 0.14 inch, greater than 0.16 inch, greater than 0.18 inch, or greater than 0.2 inch. In some embodiments, the flexure shape recess width can range from 0.1 to 0.3 inch. In some embodiments, the flexure shape recess width can range from 0.1 to 0.2, or 0.2 to 0.3 inch. For example, the flexure shape recess width can be 0.1, 0.11, 0.12, 0.125, 0.13, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, 0.2, 0.25, or 0.3 inch.

(142) The lattice comprising the flexure shape recesses formed from the plurality of land portions facilitates in storing greater energy in the faceplate to allow for greater ball speed during golf ball impacts. Described below are four examples of lattices comprising land portions with geometric shapes and flexure shape recesses. The flexure shape recess examples described below are in reference to one orientation, but it would be appreciated that the flexure shape recesses can be oriented in several different configurations to achieve greater faceplate energy storage and greater ball speed during golf ball impacts.

Land Portions with Triangle Shapes

(143) In one example, as illustrated in FIG. **14** and as described above, the faceplate **130** can comprise the lattice **940**. The lattice **940** can be similar to lattice **140** described above, but can differ in size, shape, or dimensions. The plurality of land portions **964** can form a plurality of three-pointed star flexure shape recesses **968**. The three-pointed star flexure shape recesses **968** can comprise a reentrant, concave, or non-convex shape. The land portions **964** can comprise a triangular shape. In this example, six land portions **964** having the triangular shape can form one flexure shape recess **968**. The land portions **964** can comprise a series of interconnected triangular shapes.

(144) In another example, as illustrated in FIG. **15**, the faceplate **130** can comprise a lattice **1040**.

The lattice **1040** can be similar to lattice **140** described above, but can differ in size, shape, or dimensions. The lattice **1040** can be similar to lattice **940** described above but differ in shape geometry. A plurality of land portions **1064** can form a plurality of triad flexure shape recesses **1068**. The triad flexure shape recesses **1068** can comprise a reentrant, concave, or non-convex shape. The triad flexure shape recesses **1068** can comprise a substantially triangular shape with rounds (i.e. the perimeter of the triad flexure shape recess **1068** is more rounded than flexure shape recess **968**).

(145) The land portions **1064** can comprise a substantially triangular shape. In this example, six land portions **1064** having the substantially triangular shape can form one flexure shape recess **1068**. The land portions **1064** can comprise a series of interconnected triangular shapes, similar to the lattice **940** described above. As described above, the width of the land portions **1064** can be greater than 0.02 inch, greater than 0.05 inch, greater than 0.1 inch, greater than 0.15 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the land portions **1064** can range from 0.02 to 0.2 inch.

(146) As described above, the width of the triad flexure shape recess **1068** can be greater than 0.08 inch, greater than 0.1 inch, greater than 0.12 inch, greater than 0.14 inch, greater than 0.16 inch, greater than 0.18 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the triad flexure shape recess **1068** can range from 0.1 to 0.3 inch. In one example, the width of the triad flexure shape recess **1068** can be 0.125 inch.

(147) The triad flexure shape recess **1068** can comprise a radius. The radius of the triad flexure shape recess **1068** can range from 0.01 to 0.05 inch. In some embodiments, the radius of the triad flexure shape recess **1068** can range from 0.01 to 0.025 inch, or 0.025 to 0.05 inch. For example, the radius of the triad flexure shape recess **1068** can be 0.01, 0.011, 0.02, 0.03, 0.04, or 0.05 inch. In one example, the triad flexure shape recess **1068** can comprise three radii with a value of 0.011 inch.

Land Portions with Quadrilateral Shapes

(148) In another example, as illustrated in FIG. **16**, the faceplate **130** can comprise a lattice **1140**. The lattice **1140** can be similar to lattice **140** described above, but differ in size, shape, or dimensions. A plurality of land portions **1164** can form a plurality of diamond flexure shape recesses **1168**. The diamond flexure shape recesses **1168** can have a convex shape. More specifically, the diamond flexure shape recesses **1168** can comprise a diamond, a rectangle, a rhombus, a parallelogram, or any quadrilateral shape. The land portions **1164** can comprise a square shape. In other embodiments, the land portions **1164** can comprise a rectangle, a rhombus, a parallelogram, or any quadrilateral shape.

(149) In this example, four land portions **1164** having the square shape can form one flexure shape recess **1168**. The land portions **1164** can comprise a series of interconnected square shapes.

(150) The width of the land portions **1164** can correspond with the width of the diamond flexure shape recesses **1168**. The width of the land portions **1164** can remain constant between adjacent diamond flexure shape recesses **1168**. As described above, the width of the land portions **1164** can be greater than 0.02 inch, greater than 0.05 inch, greater than 0.1 inch, greater than 0.15 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the land portions **1164** can range from 0.02 to 0.2 inch.

(151) As described above, the width of the diamond flexure shape recess **1168** can be greater than 0.08 inch, greater than 0.1 inch, greater than 0.12 inch, greater than 0.14 inch, greater than 0.16 inch, greater than 0.18 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the diamond flexure shape recess **1168** can range from 0.1 to 0.3 inch. In one example, the width of the diamond flexure shape recess **1168** can be 0.125 inch.

Land Portions with Hexagon Shapes

(152) In another example, as illustrated in FIG. **17**, the faceplate **130** can comprise a lattice **1240**. The lattice **1240** can be similar to lattice **140** described above, but differ in size, shape, or

dimensions. A plurality of land portions **1264** can form a plurality of slot flexure shape recesses **1268**. The slot flexure shape recesses **1268** can comprise a shape that resembles a slot, or a rectangle with rounded ends. The slot flexure shape recesses **1268** can comprise a convex shape. The land portions **1264** can comprise a hexagon shape.

(153) In this example, five slot flexure shape recesses **1268** can be arranged to form one land portion **1264** with the hexagon shape. The slot flexure shape recesses **1268** can be arranged to form a plurality of interconnected land portions **1264** that have a hexagon shape.

(154) As described above, the width of the land portions **1264** can be greater than 0.02 inch, greater than 0.05 inch, greater than 0.1 inch, greater than 0.15 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the land portions **1264** can range from 0.02 to 0.2 inch.

(155) As described above, the width of the slot flexure shape recess **1268** can be greater than 0.08 inch, greater than 0.1 inch, greater than 0.12 inch, greater than 0.14 inch, greater than 0.16 inch, greater than 0.18 inch, or greater than 0.2 inch. In some embodiments, as described above, the width of the slot flexure shape recess **1268** can range from 0.1 to 0.3 inch. In one example, the width of the slot flexure shape recess **1268** can be 0.125 inch.

(156) The plurality of flexure shape recesses of the lattice **940**, **1040**, **1140**, or **1240** (hereafter “the lattice”) formed from the plurality of land portions with geometric shapes affects the faceplate bending during golf ball impacts. During golf ball impacts, the land portions of the lattice resemble springs storing energy through tension and torsion loads. As the golf ball impacts the faceplate **130**, the strike face **134** is in compression and the back face **138** is in tension. As tension is applied to the back face **138**, the land portions deflect linearly and rotational. This linear and rotational movement allows the land portions to store energy in the faceplate **130** through linear and torsional bending (i.e. similar to a spring storing energy through tension and torsion). Storing energy through two modes of bending is advantageous over conventional club head faceplates that store energy through one mode of bending (i.e. linear bending). Storing energy though two modes of bending allows for greater ball speeds during golf ball impacts.

(157) Further, the flexure shapes of the lattice reduce the largest stresses concentrated in a small volume of the faceplate material (i.e. impact area of the faceplate) by displacing the reduced stress over a greater volume of the faceplate material. For example, the reduced stress can be displaced over 3 to 8 land portions in a direction from near the faceplate center **132** to near the faceplate perimeter **136** in the lattice **1040**, **1140**, or **1240**. In some embodiments, the reduced stress can be displaced over 3 to 5, 4 to 6, 5 to 7, or 6 to 8 land portions in a direction from near the faceplate center **132** to near the faceplate perimeter **136**. This reduction in stress does not occur in a faceplate devoid of lattice **1040**, **1140**, or **1240**.

Iron Golf Club Head

(158) Referring to FIGS. **22-24**, wherein like reference numerals are used to identify like or identical components in various views, FIG. **22** illustrates a front perspective view of a iron golf club head **1400**. The iron club head **1400** includes a faceplate **1430** and a body **1410** that are secured together to define a substantially closed/hollow interior volume. The club head **1400** includes a top rail **1414**, a sole **1418** opposite the top rail **1414**, a heel **1422**, and a toe **1826** opposite the heel **1422**.

(159) As illustrated in FIGS. **22-24**, the faceplate **1430** includes a strike face **1434** intended to impact a golf ball, and a back face **1438** opposite the strike face **1434**. The strike face **1434** can comprise a variable thickness profile as described above for the club head **100**. The club head **1400** can comprise similar faceplate regions as described above for the club head **100**. The club head **1400** can be similar to the club head **100** described above, but differ in volume, size, and faceplate dimensions. The club head **1400** is a smaller club head when compared to the wood type club head **100**, and can comprise smaller or lower numerical values for volume, club head dimensions, and faceplate dimensions.

(160) The faceplate **1430** of the club head **1400** further includes a lattice **1440** having a plurality of flexure shapes recessed into the faceplate **1430**. The lattice **1440** can be recessed into the back face **1438** of the faceplate **1430**. The lattice **1440** can be located within the closed/hollow interior volume of the club head **1400**, where the lattice **1440** is not exposed or visible to an exterior surface of the club head **1400**. The lattice **1440** can comprise the faceplate lattices as described in this disclosure. It would be appreciated the lattice **1440** of the club head **1400** can be modified in terms of size, shape, and/or number to accommodate the smaller faceplate **1430** dimensions of the club head **1400**.

(161) In one example, as illustrated in FIG. **24**, the faceplate **1430** can comprise the lattice **1340** having the plurality of bone flexure shape recesses **1368** as described above. As illustrated in FIG. **24**, the bone flexure shape recesses **1368** can be aligned in rows, wherein each row of bone flexure shape recesses **1368** is aligned in a low-toe to high-heel direction. A plurality of bone flexure shape recesses **1368** rows can have the major end nodules **1370** point toward the low-toe, and a plurality of bone flexure shape recess **1368** rows can have the major end nodules **1370** point toward the high-heel. Further, the bone flexure shape recesses **1368** can be aligned in rows, wherein each row of bone flexure shape recesses **1368** is aligned in a high-toe to low-heel direction. When comparing adjacent rows of bone flexure shape recesses **1368** extending in the low-toe to high-heel direction, the major end nodules **1370** of a first row can be aligned with the minor end nodules **1376** of a second row. The alignment direction of the bone flexure shape recess **1368** rows improves faceplate bending thereby improving ball performance for off center hits.

Method of Manufacturing Golf Club Head Faceplates with Lattices

(162) A method of manufacturing a club head **100** having a faceplate **130** with a lattice described in this disclosure is provided. The method includes providing a body **110** and a faceplate **130**, where the faceplate **130** is coupled with the body **110** to define a substantially hollow/closed structure. The body **110** can be created or formed by casting, forging, machining, additive manufacturing, 3D printing, or any suitable method or combination thereof. In some embodiments, the body **110** can be altered by electro-discharging machining (EDM) or chemical etching. Similarly, the faceplate **130** can be created or formed by casting, forging, machining, additive manufacturing, 3D printing, or any suitable method or combination thereof, and can be altered by electro-discharging machining (EDM) or chemical etching. In some embodiments, the faceplate **130** can be welded onto the body **110**. In other embodiments, the faceplate **130** and the body **110** can be formed together as one integral piece.

(163) In one embodiment, the faceplate **130** can be formed from additive manufacturing methods such as powdered metal sintering. The powdered metal sintering system involves a bed of metal powder that is sintered or melted layer by layer by a heated source such as a laser. The layer by layer technique forms a three-dimensional faceplate **130** with the lattice from the layered metal. The lattice **540**, **640**, **740**, **840**, **940**, **1040**, **1140**, **1240**, or **1340** can be integrally formed into the faceplate **130** during the powdered metal sintering process.

(164) In another embodiment, the faceplate **130** can be formed through a forging process. In some iterations of the method, the lattice **540**, **640**, **740**, **840**, **940**, **1040**, **1140**, **1240**, or **1340** can be integrally formed into the faceplate **130** during the initial forging process. In other iterations of the method, the lattice **540**, **640**, **740**, **840**, **940**, **1040**, **1140**, **1240**, or **1340** can be formed into the faceplate **130** during a secondary forging step. In some embodiments, the faceplate **130** is further heat treated after the forging process is completed.

(165) The advantages of using these methods to form the faceplate **130** lattice is to minimize large stress concentrations in the faceplate **130** during golf ball impacts. In particular, these methods provide small fillets (e.g. 0.015 to 0.05 inch) on the edges of the lattice rather than squared or sharp edges. Methods such as milling or end milling are not advantageous in forming the lattice because these methods form square or sharp edges, which creates a high degree of stress concentration within the lattice and leads to failures of the faceplate **130** during golf ball impacts.

EXAMPLES

Example 1—Coefficient of Restitution (COR) Faceplate Test

(166) An exemplary faceplate **130** comprising a lattice and a variable face thickness was compared to a similar control faceplate, but devoid of a lattice. The exemplary faceplate **130** comprises a variable faceplate thickness including a faceplate perimeter thickness of 0.09 inch, a faceplate center thickness of 0.20 inch, a lattice depth of 0.05 inch, and the lattice **1040** with the triad flexure shape recesses **1068**. The control faceplate comprises a variable faceplate thickness including a faceplate perimeter thickness of 0.09 inch, a faceplate center thickness of 0.20 inch. The exemplary faceplate **130** and the control faceplate comprise a titanium alloy (i.e. Ti-6-4).

(167) A test was conducted to compare the coefficient of restitution (COR) between the exemplary faceplate **130** and the control faceplate. The coefficient of restitution (COR) is the ratio of the final to initial velocity between the collision of the golf ball and the faceplate. The test used an air cannon that fired golf balls at each faceplate. The distance the air cannon was positioned from each faceplate was held constant, and each faceplate was held in a fixed position. The test resulted in the exemplary faceplate **130** averaging a COR value of 0.827 and the control faceplate averaging a COR value of 0.795. The results show that the exemplary faceplate **130** had on average a 3.54% increase in COR over the control faceplate. The lattice of the exemplary faceplate **130** allows for energy storage through two modes of bending (i.e. linear and torsional) thereby increasing the COR to provide greater ball speeds during golf ball impacts.

Example 2—Internal Energy Faceplate Test

(168) An exemplary faceplate **130** comprising a lattice **240** with sunburst grooves and a variable face thickness was compared to a similar control faceplate, but devoid of a lattice and a variable face thickness. The exemplary faceplate **130** comprises a variable faceplate thickness including a faceplate perimeter thickness of 0.09 inch, a faceplate center thickness of 0.20 inch, a lattice depth of 0.05 inch. The control faceplate comprises a constant faceplate thickness of 0.115 inch (USGA standard faceplate).

(169) A test was conducted to compare the internal energy between the exemplary faceplate **130** and the control faceplate. The test used finite element simulations that modeled an impact of a golf ball on the striking surface with a ball speed ranging from 90 to 115 mph. The internal energy is measured in lbf-inch. The test resulted in the exemplary faceplate **130** having an internal energy of 80 to 82 lbf-inch and the control faceplate having an internal energy of 71 lbf-inch. The results show that the exemplary faceplate **130** having the lattice **240** with sunburst grooves had a 10% to 15% increase in internal energy. This internal energy increase equates to a ball speed increase of approximately 1 to 3 mph. The lattice **240** of the exemplary faceplate **130** allows for greater energy storage by storing energy through two modes of bending (i.e. linear and torsional), which allows for greater ball speeds during golf ball impacts.

Example 3—Coefficient of Restitution (COR) Faceplate Test

(170) A comparison was done between a first exemplary faceplate **130** comprising a first lattice, a second exemplary faceplate **130** comprising a second lattice, and a control faceplate. The control faceplate lacked a lattice but was otherwise similar to the first and second exemplary faceplates. All three faceplates comprised a similar variable face thickness and were formed from the same metal material. The lattices of the first and second exemplary faceplates **130** were formed by electro-discharging machining (EDM).

(171) The first exemplary faceplate **130** comprised a lattice **240** with sunburst grooves. The second exemplary faceplate **130** comprised a lattice **1040** with triad flexure shape recesses **1068**. The control faceplate was devoid of a lattice. The lattices **240**, **1040** measured a uniform depth of approximately 0.05 inch and had groove widths of approximately 0.04 inch.

(172) A test was conducted to compare the coefficient of restitution (COR) between the exemplary faceplates **130** and the control faceplate. The test used an air cannon that fired golf balls at each faceplate. The distance the air cannon was positioned from each faceplate was held constant, and

each faceplate was held in a fixed position. The test resulted in the first exemplary faceplate **130**, having the lattice **240** with the sunburst grooves, averaging a COR value of 0.761. The second exemplary faceplate **130**, with the triad flexure shape recesses **1068**, averaged a COR value of 0.765. The control faceplate averaged a COR value of 0.758. The results show that the first exemplary faceplate **130** had on average a 0.4% increase in COR over the control faceplate, and the second exemplary faceplate **130** had on average a 0.9% increase in COR over the control faceplate.
(173) The lattice of the first and second exemplary faceplates **130** allows for energy storage through two modes of bending (i.e. linear and torsional) thereby increasing the COR to provide greater ball speeds during golf ball impacts.
Example 4—Stat Area Tests
(174) An exemplary faceplate **130** comprising a lattice **1340** with bone flexure shape recesses **1368** was compared to a similar control faceplate devoid of a lattice feature. The exemplary faceplate **130** comprised a forged faceplate, the bone shaped recesses **1368**, and a lattice depth of 0.01 inch. The control faceplate **130** comprised similar faceplate dimensions (i.e. thickness, height, and width, material) as the exemplary faceplate **130**, but was devoid of the lattice feature.
(175) A test was conduced to compare the stat area (i.e. standard deviation of a collection of golf ball carry distances multiplied by the standard deviation of a collection of golf ball offline distances) between the exemplary faceplate **130** and the control faceplate. The golf ball carry distance is a distance the golf ball travels in the air. The golf ball offline distance is a distance the golf ball is offset from a line extending from the player to the desired target. The golf ball offline distance is measured perpendicular to the line extending from the player to the desired target. The stat area determines the precision of the grouping or dispersion for a collection of golf ball shots, where a tighter dispersion indicates a lower stat area, and a larger dispersion indicates a higher stat area. The test resulted in the exemplary faceplate **130** averaging about a 33% decrease in stat area compared to the control faceplate (i.e. less ball dispersion). The exemplary faceplate **130** comprising the lattice **1340** with bone shaped recesses **1368** reduces the difference in ball carry distance between center and off-center hits, or provides similar ball carry distance for center and off-center hits. The exemplary faceplate **130** comprising the lattice **1340** with bone shaped recesses **1368** provides a desirable lower stat area to allow for a greater precision in golf ball shot dispersion over a club head devoid of the lattice feature.
Example 5—Golf Ball Offline Distance Tests
(176) An exemplary faceplate **130** comprising a lattice **1340** with bone flexure shape recesses **1368** was compared to a similar control faceplate devoid of a lattice feature. The exemplary faceplate **130** comprised a forged faceplate, the bone shaped recesses **1368**, and a lattice depth of 0.01 inch. The control faceplate **130** comprised similar faceplate dimensions (i.e. thickness, height, and width, material) as the exemplary faceplate **130**, but was devoid of the lattice feature.
(177) A test was conducted to compare the amount of offline distance the golf ball traveled for various hits across the faceplate. The various hits were measured at the center of the faceplate, and within a one inch offset from the faceplate center in a direction extending towards the heel, the toe, the crown, and the sole on the faceplate. The golf ball offline distance is a distance the golf ball is offset from a line extending from the player to the desired target. The line extending from the player to the desired target is the golf flight path the player wants to achieve. The golf ball offline distance is measured perpendicular to the line extending from the player to the desired target. The test resulted in the exemplary faceplate **130** averaging less than 10 yards of offline distance for hits within 0.5 inch from the faceplate center, and the control faceplate averaging 10 yards or more in a direction left of the player for hits within 0.5 inch from the faceplate center. In some examples, the exemplary faceplate **130** average approximately 8 yards of offline distance, and the control faceplate averaging 11 yards of offline distance. In these examples, the exemplary faceplate **130** provides a 4 yard decrease in offline distance, or approximately a 30% decrease in offline distance.
(178) The exemplary faceplate **130** comprising the lattice **1340** with the bone shaped recesses **1368**

provided consistent ball flight for impacts at the center, and within 0.5 inch from the center in all directions. The exemplary faceplate **130** comprising the lattice **1340** with the bone shaped recesses **1368** provides similar straight ball flight for center hits, low heel hits, and high toe hits (i.e. low heel and high toe hits see the largest bend in shot shape). The control faceplate **130** requires hitting lower on the faceplate to achieve a straighter golf ball path, which requires more precision and is harder to achieve. The exemplary faceplate **130** achieves improved ball flight for hits higher on the faceplate **130**, which requires less precision and is easier to achieve.

Example 6—Characteristic Time Test

(179) An exemplary faceplate **130** comprising a lattice **1340** with bone flexure shape recesses **1368** was compared to a similar control faceplate devoid of a lattice feature. The exemplary faceplate **130** comprised a forged faceplate and the bone flexure shape recesses **1368** arranged in a low-heel to high-toe direction. The control faceplate **130** comprised similar faceplate dimensions (i.e. thickness, height, and width, material) as the exemplary faceplate **130**, but was devoid of the lattice feature.

(180) A test was conducted to measured the characteristic time and the ball speed between the exemplary faceplate **130** and the control faceplate. The characteristic time was measured using the standard USGA test described in this disclosure. The ball speed measurements were collected from a collection of golf player's shots. The test resulted in the exemplary faceplate **130** having a characteristic time at a faceplate center of 228 μs, and a average ball speed of approximately 160.1 mph. The test resulted in the control faceplate having a characteristic time at a faceplate center of 237 μs, and an average ball speed of approximately 160.7 mph. The test resulted in the exemplary faceplate **130** having the center characteristic time 9 μs less than the center characteristic time of the control faceplate. In other embodiments, the center characteristic time of the exemplary faceplate **130** can be 1 to 10 μs, or 1 to 5 μs less than the center characteristic time of the control faceplate. Further, the test resulted in the exemplary faceplate **130** having a similar ball speed as the control faceplate. The exemplary faceplate **130** comprising the lattice **1340** with bone flexure shape recesses **1368** provided a desirable, lower center characteristic time value while not sacrificing high ball speed performance.

(181) Replacement of one or more claimed elements constitutes reconstruction and not repair. Additionally, benefits, other advantages, and solutions to problems have been described with regard to specific embodiments. The benefits, advantages, solutions to problems, and any element or elements that may cause any benefit, advantage, or solution to occur or become more pronounced, however, are not to be construed as critical, required, or essential features or elements of any or all of the claims.

(182) As the rules to golf may change from time to time (e.g., new regulations may be adopted or old rules may be eliminated or modified by golf standard organizations and/or governing bodies such as the United States Golf Association (USGA), the Royal and Ancient Golf Club of St. Andrews (R&A), etc.), golf equipment related to the apparatus, methods, and articles of manufacture described herein may be conforming or non-conforming to the rules of golf at any particular time. Accordingly, golf equipment related to the apparatus, methods, and articles of manufacture described herein may be advertised, offered for sale, and/or sold as conforming or non-conforming golf equipment. The apparatus, methods, and articles of manufacture described herein are not limited in this regard.

(183) Moreover, embodiments and limitations disclosed herein are not dedicated to the public under the doctrine of dedication if the embodiments and/or limitations: (1) are not expressly claimed in the claims; and (2) are or are potentially equivalents of express elements and/or limitations in the claims under the doctrine of equivalents. Clause 1. A golf club head comprising: a faceplate comprising a lattice, the lattice comprises a plurality of grooves arranged in a sunburst pattern, each sunburst groove comprises: a base groove; and a plurality of ligament grooves, the plurality of ligament grooves connected to the base groove and extending outward from the base

groove; wherein the base groove comprises a circular shape; wherein the ligament groove comprises at least one curve; and wherein at least three sunburst grooves form a flexure shape, the flexure shape comprises a portion of at least three base grooves and at least three ligament grooves to form a series of convex and concave curves relative to a center of the flexure shape; and wherein the series of convex and concave curves of the flexure shape flex during golf ball impacts to store energy through linear and torsional bending. Clause 2. The golf club head of clause 1, wherein the plurality of sunburst grooves comprises a repeating pattern of flexure shapes interspersed in a repeating pattern of circular shapes. Clause 3. The golf club head of clause 1, wherein the flexure shape comprises a reentrant shape. Clause 4. The golf club head of clause 2, wherein the plurality of flexure shapes are positioned on a faceplate region selected from the group consisting of a center region, a toe region, a heel region, a top region, a bottom region, a high-toe region, a low-toe region, a high-heel region, and a low-heel region. Clause 5. The golf club head of clause 1, wherein the plurality of ligament grooves are equally spaced along the base groove. Clause 6. The golf club head of clause 1, wherein the base groove comprises a width ranging from 0.01 inch to 0.05 inch. Clause 7. The golf club head of clause 1, wherein the ligament groove comprises a width ranging from 0.01 inch to 0.05 inch. Clause 8. The golf club head of clause 1, wherein a depth of the plurality of grooves ranges from 0.025 inch to 0.075 inch. Clause 9. A golf club head comprising: a faceplate comprising a lattice, the lattice comprises a plurality of grooves arranged in a sunburst pattern, each sunburst groove comprises: a base groove; and a plurality of ligament grooves, the plurality of ligament grooves connected to the base groove and extending outward from the base groove; wherein the base groove comprises a circular shape; wherein the ligament grooves comprise at least one curve; wherein at least three sunburst grooves form a flexure shape, the flexure shape comprises a portion of at least three base grooves and at least three ligament grooves to form a series of convex and concave curves relative to a center of the flexure shape; wherein the plurality of sunburst grooves comprises a repeating pattern of interconnected flexure shapes; and wherein the series of convex and concave curves of the flexure shape flex during golf ball impacts to store energy through linear and torsional bending. Clause 10. The golf club head of clause 9, wherein the plurality of flexure shapes are positioned on a faceplate region selected from the group consisting of a center region, a toe region, a heel region, a top region, a bottom region, a high-toe region, a low-toe region, a high-heel region, and a low-heel region. Clause 11. The golf club head of clause 9, wherein the flexure shapes comprise a reentrant shape. Clause 12. The golf club head of clause 9, wherein adjacent flexure shapes share at least one ligament groove. Clause 13. The golf club head of clause 9, wherein the ligament grooves comprise a width ranging from 0.01 inch to 0.05 inch. Clause 14. The golf club head of clause 9, wherein a depth of the plurality of grooves ranges from 0.025 inch to 0.075 inch. Clause 15. A golf club head comprising: a faceplate comprising a lattice, the lattice comprises a plurality of grooves arranged in a sunburst pattern, each sunburst groove comprises: a base groove; and a plurality of ligament grooves, the plurality of ligament grooves connected to the base groove and extending outward from the base groove; wherein the base groove comprises a circular shape; wherein the ligament groove comprises a first curve, a second curve, and an inflection point positioned between the first curve and the second curve; wherein at least three sunburst grooves form a flexure shape, the flexure shape comprises a portion of at least three base grooves and at least three ligament grooves to form a series of convex and concave curves relative to a center of the flexure shape; wherein the flexure shape comprises a reentrant shape; and wherein the series of convex and concave curves of the flexure shape flex during golf ball impacts to store energy through linear and torsional bending. Clause 16. The golf club head of clause 15, wherein the plurality of sunburst grooves comprises a repeating pattern of flexure shapes interspersed in a repeating pattern of circular shapes. Clause 17. The golf club head of clause 15, wherein the plurality of flexure shape recesses are positioned on a faceplate region selected from the group consisting of a center region, a toe region, a heel region, a top region, a bottom region, a high-toe region, a low-toe region, a high-heel region, and a low-heel region.

Clause 18. The golf club head of clause 15, wherein the ligament groove comprises a width ranging from 0.01 inch to 0.05 inch. Clause 19. The golf club head of clause 18, wherein the first curve and the second curve of the ligament groove comprise a similar width. Clause 20. The golf club head of clause 15, wherein a depth of the plurality of grooves ranges from 0.025 inch to 0.075 inch. Clause 21. The golf club head of clause 1, wherein the plurality of flexure shapes increase in size toward a faceplate region selected from the group consisting of a center region, a toe region, a heel region, a top region, a bottom region, a high-toe region, a low-toe region, a high-heel region, and a low-heel region. Clause 22. The golf club head of clause 1, wherein the number of flexure shapes increase toward a faceplate region selected from the group consisting of a center region, a toe region, a heel region, a top region, a bottom region, a high-toe region, a low-toe region, a high-heel region, and a low-heel region. Clause 23. A golf club head comprising: a faceplate comprising a lattice, the lattice comprises a plurality of land portions that form a plurality of flexure shape recesses, the plurality of flexure shape recesses comprises: at least two vertices that define acute interior angles; and at least one vertex defining a reflex angle; wherein: the land portions are interconnected with one another and define portions of the club head that are devoid of the flexure shape recesses; and the land portions separate the flexure shape recesses. Clause 24. The golf club head of clause 23, wherein the reflex angle defines at least one concave portion on the flexure shape recess. Clause 25. The golf club head of clause 23, wherein the flexure shape recess comprises two vertices that define a reflex angle, wherein the two reflex angles defines two concave portions on the flexure shape recess. Clause 26. The golf club head of clause 23, wherein the acute interior angle defines an angle less than 90 degrees, and the reflex angle defines an angle greater than 180 degrees and less than 360 degrees. Clause 26. A golf club head comprising: a faceplate comprising a lattice, the lattice comprises a plurality of land portions that form a plurality of flexure shape recesses, the plurality of land portions comprises: a geometric shape; wherein: the land portions are interconnected with one another, where the land portions separate the flexure shape recesses; and the land portions comprise a series of interconnected geometric shapes between the flexure shape recesses. Clause 27. The golf club head of clause 26, wherein the geometric shape of the land portions is selected form the group consisting of a triangle, a square, a rectangle, a rhombus, a parallelogram, a quadrilateral, a polygon, and a hexagon. Clause 28. A golf club head comprising: a faceplate comprising a lattice, a heel end, a toe end, and a reference direction; wherein the lattice comprises a plurality of recesses arranged in a repeating pattern; and each recess of the plurality of recesses comprises a bone shape, the bone shape comprising a plurality of concave and convex edges relative to a center. Clause 29. The golf club head of clause 28, wherein: each recess of the plurality of recesses comprises two vertices that define apexes of two convex edges; and each recess of the plurality of recesses comprises a centerline that extends between the two vertices; and the reference direction extends in a high heel end to low toe end direction; each recess of the plurality of recesses is aligned such that its centerline is parallel with the reference direction. Clause 30. The golf club head of clause 29, wherein each recess of the plurality of recesses is separate and not connected to adjacent recesses. Clause 31. The golf club head of clause 29, wherein the plurality of recesses are oriented in rows; and wherein adjacent rows of the plurality of recesses are staggered relative to each other. Clause 32. A golf club head comprising: a faceplate comprising a lattice; wherein the lattice comprises a plurality of recesses arranged in a repeating pattern; wherein each recess of the plurality of recesses comprises a bone shape, the bone shape comprising a major end nodule, a minor end nodule, and an isthmus connecting the major end nodule to the minor end nodule; wherein the major end nodule is larger than the minor end nodule; wherein each recess of the plurality of recesses is separate and not connected to adjacent recesses. Clause 33. A golf club head comprising: a crown; a sole; a toe; a heel; a faceplate comprising a lattice, the lattice comprises a plurality of land portions that form a plurality of flexure shape recesses; each flexure shape recess comprises: a major end nodule; a minor end nodule; and a narrowed portion connecting the major end nodule and the minor end nodule; wherein the major end nodule comprises a circular shape with a major diameter; wherein the minor end nodule comprises a circular shape with a minor diameter; wherein the major diameter is larger than the minor diameter; and wherein the plurality of flexure shape recesses are separate and not connected with each other. Clause 34. The golf club head of clause 1, wherein the plurality of flexure shape recesses are oriented in a plurality of linear rows. Clause 35. The golf club head of clause 2, wherein the plurality of linear rows are oriented in a direction selected from the group consisting of a low-toe to high-heel direction, a low-heel to high-toe direction, a heel to toe direction, and a crown to sole direction. Clause 36. The golf club head of clause 1, wherein a perimeter of each flexure shape recess comprises a plurality of concave and convex edges relative to a center of the flexure shape recess. Clause 37. The golf club head of clause 4, wherein the major end nodule comprises a convex edge, the minor end nodule comprises a convex edge, and the narrowed portion comprises at least one concave edge. Clause 38. The golf club head of clause 1, wherein the plurality of flexure shape recesses are positioned on a faceplate region selected from the group consisting of a center region, a toe region, a heel region, a top region, a bottom region, a high-toe region, a low-toe region, a high-heel region, and a low-heel region. Clause 39. The golf club head of clause 1, wherein the faceplate comprising the plurality of land portions and the plurality of flexure shape recesses is formed a forging process. Clause 40. A golf club head comprising: a crown; a sole; a toe; a heel; a faceplate comprising a lattice, the lattice comprises a plurality of land portions that form a plurality of flexure shape recesses; each flexure shape recess comprises: a major end nodule; a minor end nodule; and a narrowed portion connecting the major end nodule and the minor end nodule; wherein the major end nodule comprises a circular shape with a major diameter; wherein the minor end nodule comprises a circular shape with a minor diameter; wherein the major diameter is larger than the minor diameter; wherein a centerline extends through the flexure shape recess intersecting the major end nodule and the minor end nodule; wherein the narrowed portion of each flexure shape recess defines a concave portion of the flexure shape recess relative to the centerline; and wherein the plurality of flexure shape recesses are separate and not connected with each other. Clause 41. The golf club head of clause 8, wherein the plurality of flexure shape recesses are oriented in a plurality of linear rows. Clause 42. The golf club head of clause 9, wherein the plurality of linear rows are oriented in a direction selected from the group consisting of a low-toe to high-heel direction, a low-heel to high-toe direction, a heel to toe direction, and a crown to sole direction. Clause 43. The golf club head of clause 8, wherein a perimeter of each flexure shape recess comprises a plurality of concave and convex edges relative to a center of the flexure shape recess. Clause 44. The golf club head of clause 11, wherein the major end nodule comprises a convex edge, the minor end nodule comprises a convex edge, and the narrowed portion comprises at least one concave edge. Clause 45. The golf club head of clause 8, wherein the plurality of flexure shape recesses are positioned on a faceplate region selected from the group consisting of a center region, a toe region, a heel region, a top region, a bottom region, a high-toe region, a low-toe region, a high-heel region, and a low-heel region. Clause 46. The golf club head of clause 8, wherein the faceplate comprising the plurality of land portions and the plurality of flexure shape recesses is formed by a forging process. Clause 47. A golf club head comprising: a crown; a sole; a toe; a heel; a faceplate comprising a lattice, the lattice comprises a plurality of land portions that form a plurality of flexure shape recesses; each flexure shape recess comprises: a major end nodule; a minor end nodule; and a narrowed portion connecting the major end nodule and the minor end nodule; wherein the major end nodule comprises a circular shape with a major diameter; wherein the minor end nodule comprises a circular shape with a minor diameter; wherein the major diameter is larger than the minor diameter; wherein the major end nodule comprises a major end vertex and the minor end nodule comprises a minor end vertex; wherein a centerline extends through the flexure shape recess intersecting the major end vertex and the minor end vertex; wherein the narrowed end nodule comprises at least one nadir vertex, the nadir vertex being defined as a vertex located closest to the centerline; and wherein the plurality of

flexure shape recesses are separate and not connected with each other. Clause 48. The golf club head of clause 15, wherein the plurality of flexure shape recesses are oriented in a plurality of linear rows. Clause 49. The golf club head of clause 16, wherein the plurality of linear rows are oriented in a direction selected from the group consisting of a low-toe to high-heel direction, a low-heel to high-toe direction, a heel to toe direction, and a crown to sole direction. Clause 50. The golf club head of clause 15, wherein the plurality of flexure shape recesses are positioned on a faceplate region selected from the group consisting of a center region, a toe region, a heel region, a top region, a bottom region, a high-toe region, a low-toe region, a high-heel region, and a low-heel region. Clause 51. The golf club head of clause 15, wherein the narrowed portion defines a concave portion relative to the centerline, and the major end nodule and the minor end nodule define convex portions relative to the centerline. Clause 52. The golf club head of clause 15, wherein the faceplate comprising the plurality of land portions and the plurality of flexure shape recesses is formed by a forging process.
(184) Various features and advantages of the disclosure are set forth in the following claims.

Claims

1. A golf club head comprising: a crown; a sole; a toe; a heel; a faceplate comprising a lattice, the lattice comprises a plurality of land portions that form a plurality of flexure shape recesses; each flexure shape recess comprises: a major end nodule; a minor end nodule; and a narrowed portion connecting the major end nodule and the minor end nodule; wherein the major end nodule comprises a circular shape with a major diameter; wherein the minor end nodule comprises a circular shape with a minor diameter; wherein the major diameter is larger than the minor diameter; and wherein the plurality of flexure shape recesses are separate and not connected with each other.
2. The golf club head of claim 1, wherein the plurality of flexure shape recesses are oriented in a plurality of linear rows.
3. The golf club head of claim 2, wherein the plurality of linear rows are oriented in a direction selected from the group consisting of a low-toe to high-heel direction, a low-heel to high-toe direction, a heel to toe direction, and a crown to sole direction.
4. The golf club head of claim 1, wherein a perimeter of each flexure shape recess comprises a plurality of concave and convex edges relative to a center of the flexure shape recess.
5. The golf club head of claim 4, wherein the major end nodule comprises a convex edge, the minor end nodule comprises a convex edge, and the narrowed portion comprises at least one concave edge.
6. The golf club head of claim 1, wherein the plurality of flexure shape recesses are positioned on a faceplate region selected from the group consisting of a center region, a toe region, a heel region, a top region, a bottom region, a high-toe region, a low-toe region, a high-heel region, and a low-heel region.
7. The golf club head of claim 1, wherein the faceplate comprising the plurality of land portions and the plurality of flexure shape recesses is formed by a forging process.
8. A golf club head comprising: a crown; a sole; a toe; a heel; a faceplate comprising a lattice, the lattice comprises a plurality of land portions that form a plurality of flexure shape recesses; each flexure shape recess comprises: a major end nodule; a minor end nodule; and a narrowed portion connecting the major end nodule and the minor end nodule; wherein the major end nodule comprises a circular shape with a major diameter; wherein the minor end nodule comprises a circular shape with a minor diameter; wherein the major diameter is larger than the minor diameter; wherein a centerline extends through the flexure shape recess intersecting the major end nodule and the minor end nodule; wherein the narrowed portion defines a concave portion of the flexure shape recess relative to the centerline; and wherein the plurality of flexure shape recesses are separate and not connected with each other.

9. The golf club head of claim 8, wherein the plurality of flexure shape recesses are oriented in a plurality of linear rows.
10. The golf club head of claim 9, wherein the plurality of linear rows are oriented in a direction selected from the group consisting of a low-toe to high-heel direction, a low-heel to high-toe direction, a heel to toe direction, and a crown to sole direction.
11. The golf club head of claim 8, wherein a perimeter of each flexure shape recess comprises a plurality of concave and convex edges relative to a center of the flexure shape recess.
12. The golf club head of claim 11, wherein the major end nodule comprises a convex edge, the minor end nodule comprises a convex edge, and the narrowed portion comprises at least one concave edge.
13. The golf club head of claim 8, wherein the plurality of flexure shape recesses are positioned on a faceplate region selected from the group consisting of a center region, a toe region, a heel region, a top region, a bottom region, a high-toe region, a low-toe region, a high-heel region, and a low-heel region.
14. The golf club head of claim 8, wherein the faceplate comprising the plurality of land portions and the plurality of flexure shape recesses is formed by a forging process.
15. A golf club head comprising: a crown; a sole; a toe; a heel; a faceplate comprising a lattice, the lattice comprises a plurality of land portions that form a plurality of flexure shape recesses; each flexure shape recess comprises: a major end nodule; a minor end nodule; and a narrowed portion connecting the major end nodule and the minor end nodule; wherein the major end nodule comprises a circular shape with a major diameter; wherein the minor end nodule comprises a circular shape with a minor diameter; wherein the major diameter is larger than the minor diameter; wherein the major end nodule comprises a major end vertex and the minor end nodule comprises a minor end vertex; wherein a centerline extends through the flexure shape recess intersecting the major end vertex and the minor end vertex; wherein the narrowed portion comprises at least one nadir vertex, the nadir vertex being defined as a vertex located closest to the centerline; and wherein the plurality of flexure shape recesses are separate and not connected with each other.
16. The golf club head of claim 15, wherein the plurality of flexure shape recesses are oriented in a plurality of linear rows.
17. The golf club head of claim 16, wherein the plurality of linear rows are oriented in a direction selected from the group consisting of a low-toe to high-heel direction, a low-heel to high-toe direction, a heel to toe direction, and a crown to sole direction.
18. The golf club head of claim 15, wherein the plurality of flexure shape recesses are positioned on a faceplate region selected from the group consisting of a center region, a toe region, a heel region, a top region, a bottom region, a high-toe region, a low-toe region, a high-heel region, and a low-heel region.
19. The golf club head of claim 15, wherein the narrowed portion defines a concave portion relative to the centerline, and the major end nodule and the minor end nodule define convex portions relative to the centerline.
20. The golf club head of claim 15, wherein the faceplate comprising the plurality of land portions and the plurality of flexure shape recesses is formed by a forging process.