US 20190143182A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0143182 A1**

Knuth et al. (43) **Pub. Date: May 16, 2019**

(54) **GOLF CLUB WITH A STRIKING FACE PROVIDING IMPROVED PERFORMANCE FOR GOLF BALLS STRUCK OUTSIDE THE CENTER OF THE FACE**

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(21) Appl. No.: **16/247,914**

(22) Filed: **Jan. 15, 2019**

Related U.S. Application Data

(63) Continuation-in-part of application No. 15/149,126, filed on May 7, 2016.

Publication Classification

(51) **Int. Cl.**
A63B 53/04 (2006.01)

(52) **U.S. Cl.**
CPC .. ***A63B 53/0466*** (2013.01); *A63B 2053/0408* (2013.01); *A63B 2102/32* (2015.10); *A63B 2053/0458* (2013.01); *A63B 2053/0416* (2013.01)

(57) **ABSTRACT**

A golf club with a striking face suitable for use with driver, fairway wood and hybrid type golf clubs providing increased energy transfer to and greater distance traveled for golf balls struck outside the center of the face using a novel, multi face thickness and area configuration.

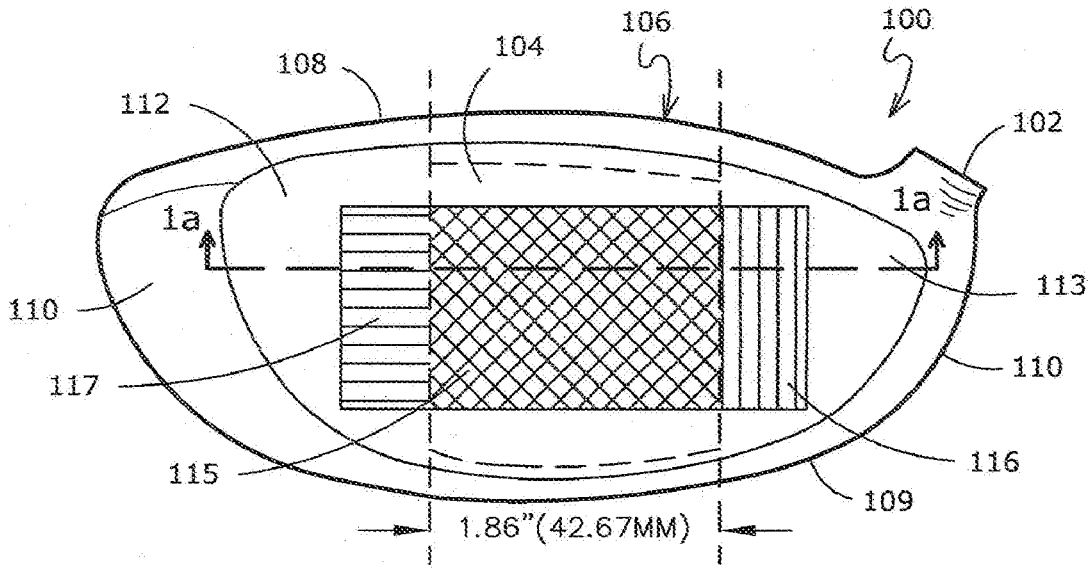

FIG. 1

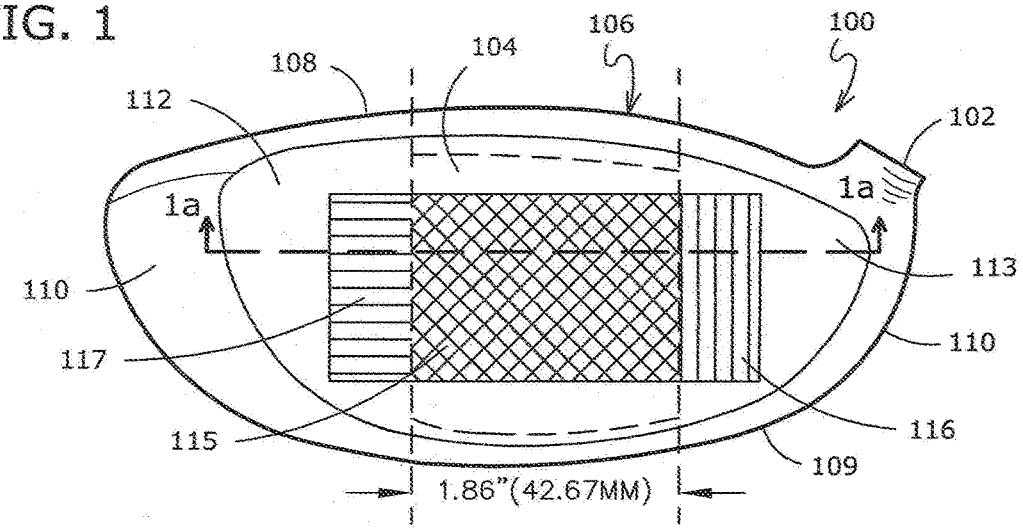

FIG. 1a

FIG. 2

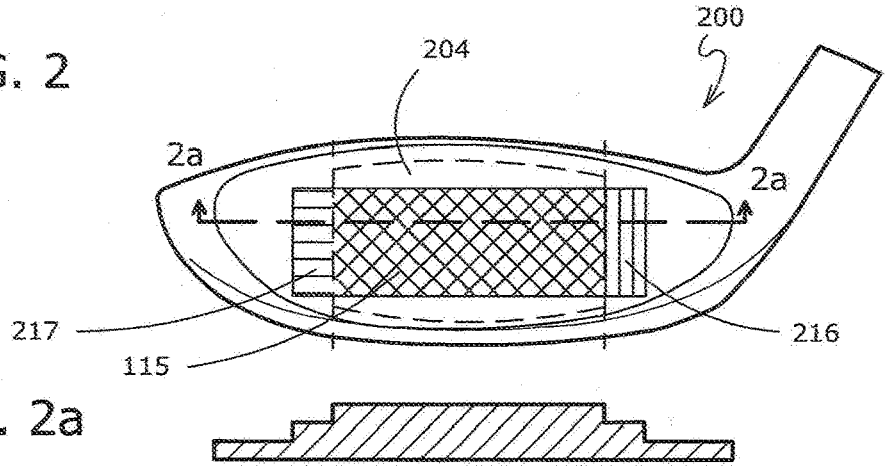

FIG. 2a

FIG. 3

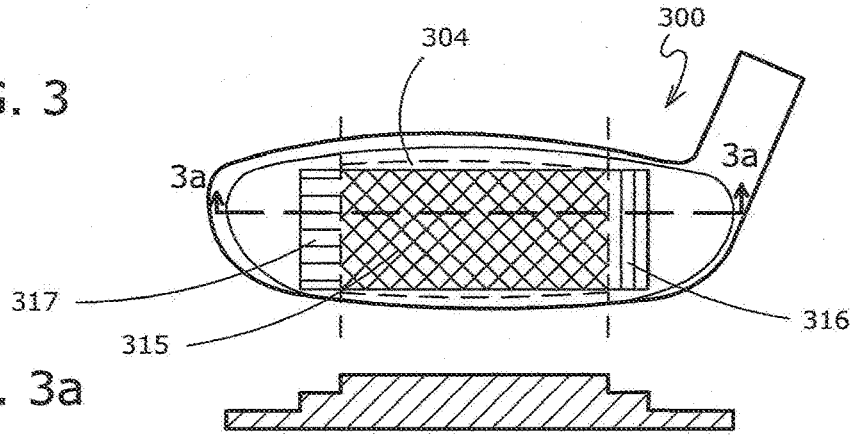

FIG. 3a

GOLF CLUB WITH A STRIKING FACE PROVIDING IMPROVED PERFORMANCE FOR GOLF BALLS STRUCK OUTSIDE THE CENTER OF THE FACE

RELATED APPLICATIONS

[0001] The current application is a continuation in part of U.S. patent application Ser. No. 15/149,126, filed May 7, 2016 titled GOLF CLUB HEAD WITH A STRIKING FACE HAVING IMPROVED CHARACTERISTIC TIME VALUES

BACKGROUND OF THE INVENTION

[0002] The present invention relates to golf clubs and in particular to drivers, fairway woods and hybrids having an improved club striking face configuration.

[0003] A wide variety of club head configurations, weighting structures, and striking face features have been proposed and presented to the golfing marketplace to achieve increased performance with these clubs.

[0004] However, increasing the spring-like or trampoline effect for the club face has focused on making the center or near the center of the face, particularly since tour professionals and better players hit the center or very near center of the face the majority of the time.

[0005] When striking a golf ball, a face performs like a trampoline with the highest spring-like effect occurring in the middle of the face, because the further away from the middle of the face the ball is struck, the spring-like effect is reduced resulting in a loss of ball speed and distance for several reasons, including the twisting of the face on off-center hits, as compared to the distance when the ball is struck at the middle of the face.

[0006] Historically, golf manufacturers have attempted and continue to attempt to reduce the distance lost when the ball was struck away from the center of the face by the use of progressively thinner faces compared to the center of the face or using stepped reduced thicknesses across the face but despite those attempts, golfers consistently lose substantial distances compared to when hit in the center of the face.

[0007] Although most drivers have titanium faces, most other conventional metal wood type golf clubs and hybrid golf clubs are made with steel faces because of lower material and manufacturing costs, and Tour pros do not need the additional distance provided with a titanium face The clubs with steel faces provide less spring-like or trampoline effect and much less distance outside the center of the face as compared to similar clubs with titanium faces.

[0008] Various attempts have been made, as represented in prior art patents, to improve the striking face configuration of golf clubs for better performance. For example, U.S. Pat. Nos. 6,659,884, 6,659,885, 7,131,912, 7,273,421 and 7,481,717 to Knuth are directed to golf club heads having an improved face configuration using different thicknesses and parabolic shaped sections to improve performance on golf balls hit across the face.

[0009] U.S. Pat. Nos. 5,830,084, and 6,319,150 are examples of patents directed solely to striking face configurations for golf clubs. U.S. Pat. Nos. 6,368,234 and 5,954,596, among others, are other examples striking faces with various thicknesses for metal wood golf clubs.

[0010] The United States Golf Association, USGA, is the governing body of golf in the United States and publishes the Rules of Golf that includes equipment standards in order that golf clubs are deemed conforming. Non-conforming clubs may not be used in all professional and most non-professional tournaments or for golfers to obtain and maintain a USGA Handicap Index.

[0011] One of the USGA rules relating to equipment limits the transfer of energy to a golf ball due to the spring-like or trampoline effect of the striking face of a golf club. This rule seeks a limit on this effect to restrict the distance that golf clubs are able to hit a golf ball in order to preserve the challenges of existing golf courses. The limit is embodied in their former Coefficient of Restitution, COR, rule which is a measurement of the energy transfer in a collision of two objects. The USGA established a COR limit of 0.830 on driver, fairway wood and hybrid golf club faces, which means that if more than 83% of the energy is transferred to the golf ball in the collision of the face of the club the club head would be deemed non-conforming with the USGA rules.

[0012] In the early 2000s the USGA established the Characteristic Time, CT, test to determine whether a golf club head conformed to or exceeded the COR limitation. This test measures the "spring-like" or "trampoline" effect of a driver, fairway wood or hybrid face; or more formally as a measurement of the Coefficient of Restitution of the faces of those clubs. The CT test includes positioning the head so a pendulum arm with a sensor strikes the face at a variety of locations at or near the middle and to the right and left of the middle of the face. The speed of the pendulum as it bounces off the face determines the CT value. It was determined a CT measurement of 257 microseconds, 257 u sec, corresponds to a COR of 0.830 and this established the CT limit for anywhere on the face. Any driver, fairway wood or hybrid golf that had a CT measurement in excess of 257 u sec anywhere on the face was non-conforming under the USGA rules.

[0013] Recently the USGA amended the CT rule to identify an area it called the Impact Area (also referred to below as "Central Impact Area") as having a width of 42.67 mm or 1.68 inches in the center of the face of a driver, fairway wood and hybrid and a height from the crown down to the sole with the exception of 6.35 mm within the sole and crown excluded. The remaining face areas to the right and left of the Central Impact Area is defined herein as the "Outside the Central Impact Area." The USGA CT rule further states the prior CT limit of 257 u sec applies only inside the Central Impact Area and permits the CT to be up to 275 u sec in the part of the face designated as Outside the Central Impact Area.

SUMMARY OF THE INVENTION

[0014] The present invention is directed to a unique and novel improved striking face configuration for a golf club head whereby a golf ball struck with a driver, fairway wood and hybrid golf clubs has less loss of energy transfer to the golf ball resulting in the primary objective of providing more distance off the club face when the ball is struck on areas Outside the Central Impact Area than otherwise achieved in existing face designs.

[0015] The present invention incorporates a unique and novel striking face configuration for a driver, fairway wood and hybrid clubs. The face configuration results in increased ball speed and distance traveled for golf balls struck on the face in the areas outside the Central Impact Area that are

close to or nearly the same as the distances when the golf ball is struck in the Central Impact Area. This is accomplished as a result of creating at least three trampoline areas of the face including at least two large percentage, reduced average thickness areas on both sides of the Central Impact Area toward the toe and heel areas as compared to the average thicknesses in the Central Impact Area.

[0016] The club heads of the present invention are formed with the metal club faces that have the highest trampoline effect, preferably titanium or a titanium alloy, but would benefit the performance with those club heads with any metal.

[0017] It will be appreciated that the size of the faces in the drawings as a face insert can be changed to be a cup face by a person of ordinary skill and the sizes of the faces can be made larger or smaller by a person of ordinary skill for the driver, fairway woods and hybrids and still have sufficient size to provide the stated benefits of the invention.

[0018] It will be further appreciated that the face of the present invention may be formed with areas above and below the Central Impact Area and outside the two areas adjacent to the right or left of the Central Impact Area, that have one or more different shapes with uniform or variable thicknesses.

[0019] It will be appreciated the improved striking faces of the present invention may be used with drivers having a variety of different lofts that are typically within a range of 8 to 13 degrees, fairway woods having lofts that are typically within a range of 13 to 21 degrees, and metal hybrid golf clubs that have lofts typically between 15 and 26 degrees.

[0020] It will be further appreciated that a person of ordinary skill will be able to design a face that will achieve the increased ball speed and distance Outside the Central Impact Area without undue experimentation by simply creating three prototypes using the highest, middle and lowest average thicknesses described below throughout the two areas adjacent to the Central Impact Area with the average of the range of average thicknesses of the Central Impact Area presented below and then, and only, if necessary, make adjustments after testing the performance of a golf club with each of those three faces.

[0021] It will be further appreciated that because the size of striking faces vary by virtue of the different sizes and shapes of the bodies that have different size openings for the striking face persons of ordinary skill in the design and drivers, fairway woods and hybrids will not have any difficulty in implementing the invention because average thicknesses are only needed in three areas so that the design of the balance the face is dictated by choice of the person of ordinary skill but most likely they will use the existing thicknesses of their current face design in those area, or use the lowest average thickness of the Outside Impact Area, and then make adjustments, if any, to meet their objectives.

[0022] A primary object of the present invention is the provision of a golf ball striking face for use with drivers, fairway woods and hybrids having average thickness in the toe and heel areas adjacent to the Central Impact Area that are so much lower than the average thickness of the Central Impact Area that in effect they create largely three trampoline areas which improve the energy transfer to a golf ball struck on the face Outside the Central Impact Area for more distance.

[0023] These and other objects will be understood with reference to the following specification and drawings.

DESCRIPTION OF THE DRAWINGS

[0024] FIG. **1** is a frontal view of the striking face of a golf driver in accordance with the present invention.

[0025] FIG. **1***a* is a sectional view taken along lines **1-1** of FIG. **1**.

[0026] FIG. **2** is a frontal view of the striking face of a fairway wood in accordance with the present invention.

[0027] FIG. **2***a* is a sectional view taken along lines **2-2** of FIG. **2**.

[0028] FIG. **3** is a frontal view of the striking face of a hybrid in accordance with the present invention.

[0029] FIG. **3***a* is a sectional view taken along lines **3-3** of FIG. **3**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0030] Referring to FIG. **1**, the drawings illustrate a driver golf club head **100** in accordance with the present invention. The club head **100** includes a hosel **102** for connection to a conventional shaft and upper grip (not shown). The club head **100** includes a frontal ball striking face **104** made with and/or secured to a club head body **106** having an upper crown **108**, bottom sole **109** and sides **110**.

[0031] As with conventional golf club heads, the striking face **104** preferably extends between a toe **112** and a heel **113** of the club head **100**.

[0032] The face **104** of the driver club head **100** has a Central Impact Area **115** that is located approximately an equal distance from the upper edge of the crown **108** and the bottom sole **109**. The Central Impact Area is approximately 10.24 square cm in size with an approximately 4.267 cm width and an approximately a 2.4 cm height. The Central Impact Area **115** has an average thickness between approximately 2.8 mm and approximately 3.4 mm.

[0033] The combined thickness of the face areas above and below the Central Impact Area **115** can have the same, thicker, or thinner average thickness. Preferably, these areas will have an average thickness less than 2.8 mm to increase ball speed and distances when those areas strike a golf ball.

[0034] Immediately to the right and left and outside of the Central Impact Area **115** are additional areas **116** and **117**, preferably rectangular in shape, having a lesser thickness as shown in FIG. **1***a*. These areas **116** and **117** are approximately 3.12 square cm in size and are approximately 2.4 cm high and approximately 1.3 cm wide. These areas have an average thickness between approximately 2.2 mm and approximately 2.6 mm.

[0035] The remaining heel **113** and toe **112** areas of the face **104** can have the same thickness, can be thicker or thinner in an average dimension. Preferably, these areas will have an average thickness less than 2.2 mm, as shown in FIG. **1***a*, to increase the energy of the golf ball struck in these areas for more distance.

[0036] FIG. **2** shows a fairway wood type golf club **200** with a frontal ball striking face **204**. A Central Impact Area **215** is approximately 8.5 square cm in size and is approximately 2.0 cm high and approximately 4.267 cm wide with an average thickness between approximately 2.1 mm and approximately 2.5 mm.

[0037] The Central Impact Area **215** is located approximately an equal distance from the crown and the sole of the club head. The combined thickness of the areas above and below the Central Impact Area **215** can have the same,

thicker, or thinner average thickness, but preferably has an average thickness of 2.1 mm or less to increase energy transfer when striking a golf ball resulting in increased distances that the golf ball will travel.

[0038] The area **216** immediately left and the area **217** immediately right of the Central Impact Area **215** is thinner as shown in FIG. **2***a* and are each approximately 1.4 square cm in size and have a height of approximately 2.0 cm high and a width of approximately 0.7 cm, with an average thickness between approximately 1.3 mm and approximately 1.9 mm. The remaining heel and toe areas can have the same, thicker, or thinner average thickness dimension. Preferably these areas will have an average thickness less than 1.3 mm, as shown in FIG. **2***a* to increase the energy transfer to a golf ball struck in these areas.

[0039] FIG. **3** shows a hybrid type golf club **300** with a frontal ball striking face **304**. A Central Impact Area **315** is approximately 8.5 square cm in size having a height of approximately 2.0 cm and a width of approximately 4.267 cm and has an average thickness between approximately 2.2 mm and approximately 2.6 mm.

[0040] The area **316** immediately left and the area **317** immediately to the right of the Central Impact Area **315** thinner as shown in FIG. **3***a* and each are approximately 1.4 square cm in size and are approximately 2.0 cm high and approximately 0.7 cm wide, with an average thickness between approximately 1.6 mm and approximately 2.0 mm. The remaining heel and toe areas can have the same, thicker, or thinner average thickness dimension. Preferably these areas will have an average thickness less than 1.6 mm, as shown in FIG. **3***a*, to increase the energy transfer to a golf ball struck in these areas.

[0041] It will be appreciated that the above example of a preferred embodiment and the approximate sizes and thicknesses disclosed are not limiting but may be altered in keeping within the concept of the invention for existing metals used for faces or new metals created in the future, or changes to the USGA's Rules of Golf.

1. A ball striking face characterized for use with a driver type metal wood golf head having a ball striking face, an upper crown, heel, toe, and a bottom sole;

said striking face having a central impact area with a surface area of approximately 10.2 cm^2 and an average thickness between approximately 2.8 mm and approximately 3.4 mm; said striking face being further defined by an additional area with a surface area of approximately 3.1 cm^2 located adjacent to the toe side of said central impact area and an additional area with a surface area of approximately 3.1 cm^2 located adjacent to the heel side of said central impact area;

said additional areas on either side of and adjacent said central impact area having an average thickness between approximately 2.2 mm and approximately 2.6 mm;

and, said striking face having remaining areas outside said central impact area and outside said additional areas that are adjacent to said heel and said toe.

2. The ball striking face of claim **1** wherein said central impact area is approximately 4.2 cm wide and approximately 2.4 cm high and said additional adjacent areas on either side of said central impact area are approximately 1.3 cm wide and approximately 2.4 cm high.

3. The striking face of claim **2** wherein said central impact area and said additional adjacent areas on either side of said central impact area are rectangular.

4. The striking face of claim **1** wherein said central impact area is located on said face at an equal distance from said upper crown and said bottom sole.

5. The striking face of claim **1** wherein said two additional adjacent areas located on either side of said central impact area are located at an equal distance from said upper crown and said bottom sole.

6. The striking face of claim **1** being further defined by remaining areas between said central impact area and said upper crown and between said central impact area and said bottom sole having an average thickness that is the same, thicker, or thinner than the average thickness of said central impact area.

7. The striking face of claim **1** being further defined by said all remaining areas to said heel side and to said toe side of said central impact area and said additional adjacent areas located on either side of said central impact area; said remaining areas each having an average thickness the same, thicker, or thinner thickness than the average thickness of said two additional adjacent areas on either side of the central impact area.

8. A ball striking face characterized for use with a fairway type metal wood golf head having a ball striking face, an upper crown, heel, toe, and a bottom sole;

said striking face having a central impact area with a surface area of approximately 8.5 cm^2 and an average thickness between approximately 2.1 mm and approximately 2.5 mm;

said striking face being further defined by an additional area with a surface area of approximately 1.4 cm^2 located adjacent to the toe side of said central impact area and an additional area with a surface area of approximately 1.4 cm^2 located adjacent to the heel side of said central impact area; said additional areas on either side of and adjacent said central impact area having an average thickness between approximately 1.3 mm and approximately 1.7 mm;

and, said striking face having remaining areas outside said central impact area and outside said additional areas adjacent to said toe and said heel.

9. The ball striking face of claim **8** wherein said central impact area is approximately 4.2 cm wide and approximately 2.0 cm high and said additional adjacent areas on either side of said central impact area are approximately 0.7 cm wide and approximately 2.0 cm high.

10. The striking face of claim **9** wherein said central impact area and said additional adjacent areas on either side of said central impact area are rectangular.

11. The striking face of claim **8** wherein said central impact area is located on said face at an equal distance from said upper crown and said bottom sole.

12. The striking face of claim **8** wherein said two additional adjacent areas located on either side of said central impact area are located at an equal distance from said upper crown and said bottom sole.

13. The striking face of claim **8** being further defined by remaining areas between said central impact area and said upper crown and between said central impact area and said bottom sole having an average thickness that is the same, thicker, or thinner than the average thickness of said central impact area.

14. The striking face of claim **8** being further defined by said all remaining areas to said heel side and to said toe side of said central impact area and said additional adjacent areas located on either side of said central impact area; said remaining areas each having an average thickness the same, thicker, or thinner thickness than the average thickness of said two additional adjacent areas on either side of the central impact area.

15. A ball striking face characterized for use with a hybrid type metal wood golf head having a ball striking face, an upper crown, heel, toe, and a bottom sole;

said striking face having a central impact area with a surface area of approximately 8.5 cm^2 and an average thickness between approximately 2.2 mm and approximately 2.6 mm;

said striking face being further defined by an additional area with a surface area of approximately 1.1 cm^2 located adjacent to the toe side of said central impact area and an additional area with a surface area of approximately 1.1 cm^2 located adjacent to the heel side of said central impact area; said additional areas on either side of and adjacent said central impact area having an average thickness between approximately 1.6 mm and approximately 2.0 mm;

and, said striking face having remaining areas outside said central impact area and outside said additional areas adjacent to said heel and said toe.

16. The ball striking face of claim **15** wherein said central impact area is approximately 4.2 cm wide and approximately 2.0 cm high and said additional adjacent areas on either side of said central impact area are approximately 0.7 cm wide and approximately 1.6 cm high.

17. The striking face of claim **16** wherein said central impact area and said additional adjacent areas on either side of said central impact area are rectangular.

18. The striking face of claim **15** wherein said central impact area is located on said face at an equal distance from said upper crown and said bottom sole.

19. The striking face of claim **15** wherein said two additional adjacent areas located on either side of said central impact area are located at an equal distance from said upper crown and said bottom sole.

20. The striking face of claim **15** being further defined by remaining areas between said central impact area and said upper crown and between said impact area and said bottom sole having an average thickness that is the same, thicker, or thinner than the average between approximately 2.1 and approximately 2.5 mm.

21. The striking face of claim **15** being further defined by said all remaining areas to said heel side and to said toe side of said central impact area and said additional adjacent areas located on either side of said central impact area; said remaining areas each having an average thickness the same, thicker, or thinner thickness than the average thickness of said two additional adjacent areas on either side of the central impact area.

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