



US 20100234126A1

(19) **United States**

(12) **Patent Application Publication**  
**CAKETT et al.**

(10) **Pub. No.: US 2010/0234126 A1**

(43) **Pub. Date: Sep. 16, 2010**

(54) **GOLF CLUB HEAD WITH ELEVATED FACE**

(21) Appl. No.: **12/405,075**

(75) Inventors: **MATTHEW T. CAKETT, SAN DIEGO, CA (US); ALAN HOCKNELL, CARLSBAD, CA (US)**

(22) Filed: **Mar. 16, 2009**

**Publication Classification**

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

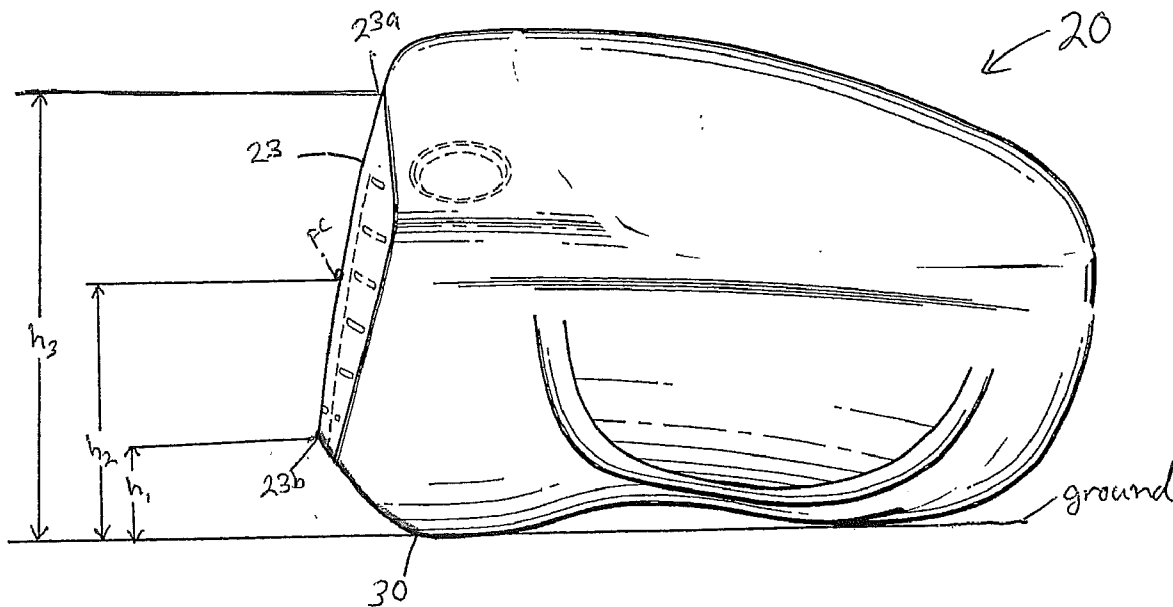
(52) **U.S. Cl.** ..... **473/328; 473/349; 473/345**

(57) **ABSTRACT**

Correspondence Address:  
**CALLAWAY GOLF COMPANY**  
**2180 RUTHERFORD ROAD**  
**CARLSBAD, CA 92008-7328 (US)**

A driver type golf club head (20) preferably having a body (21) defined by a crown (22), a face (23) and a sole (24). The face (23) has an elevated height,  $h_1$ , as measured from a lower edge (23b) of the face (23) to the ground. The height,  $h_1$ , is preferably at least 0.3 inch from the ground.

(73) Assignee: **CALLAWAY GOLF COMPANY, CARLSBAD, CA (US)**



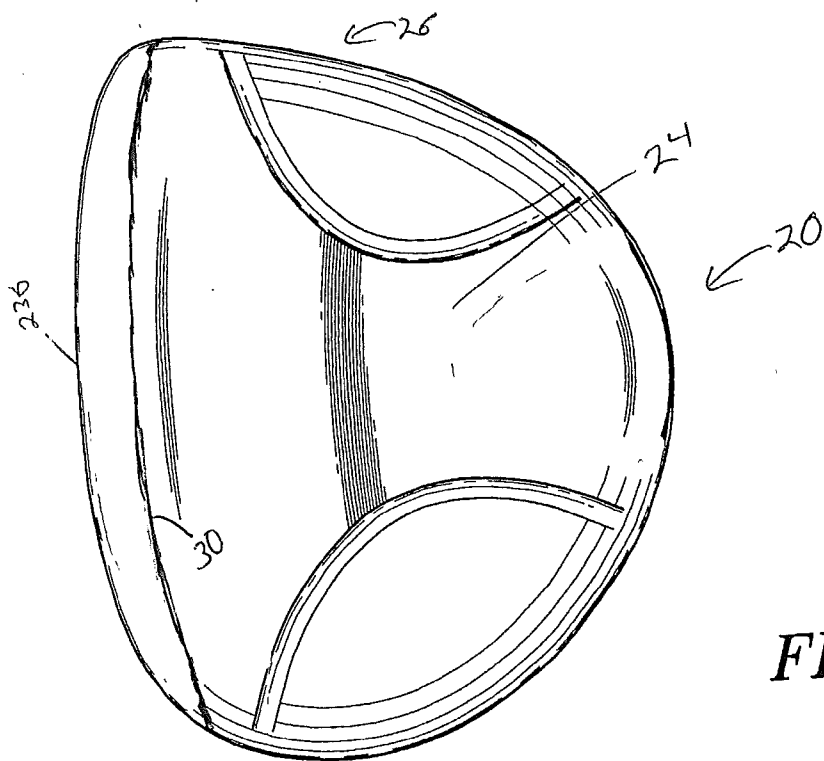


FIG. 1

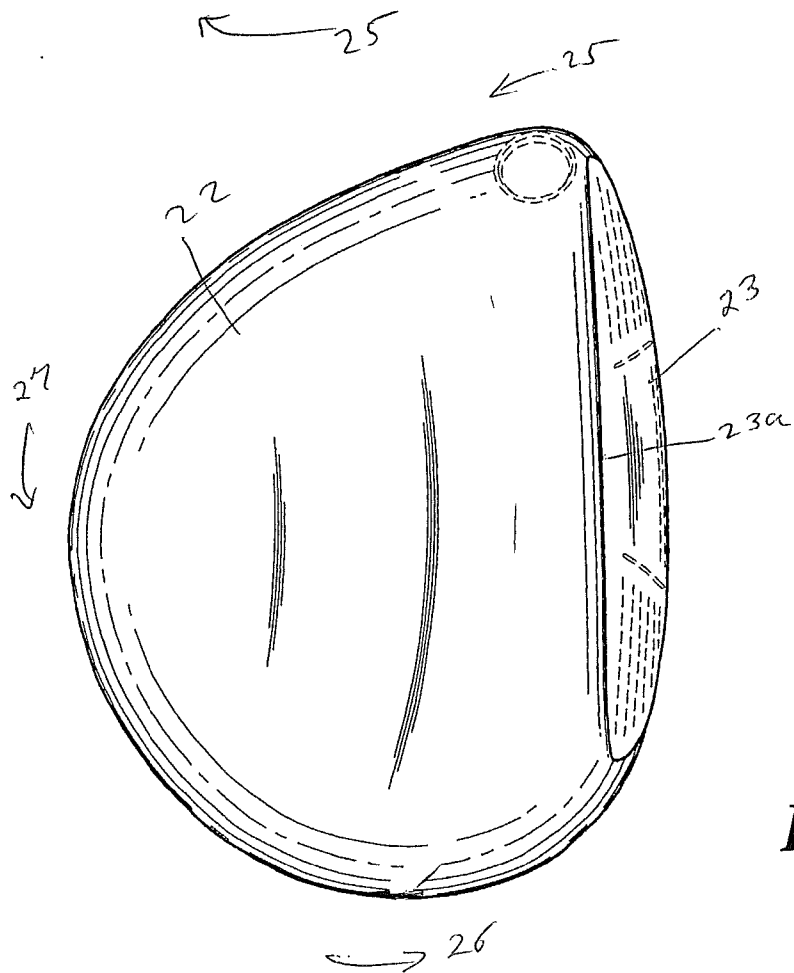


FIG. 2

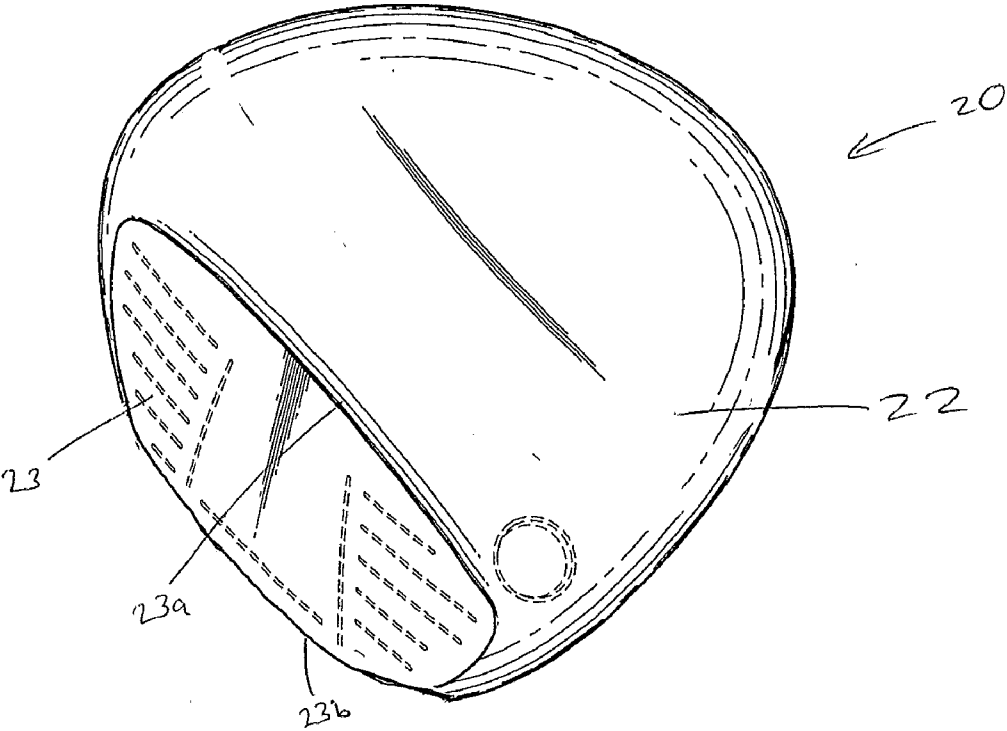


FIG. 3

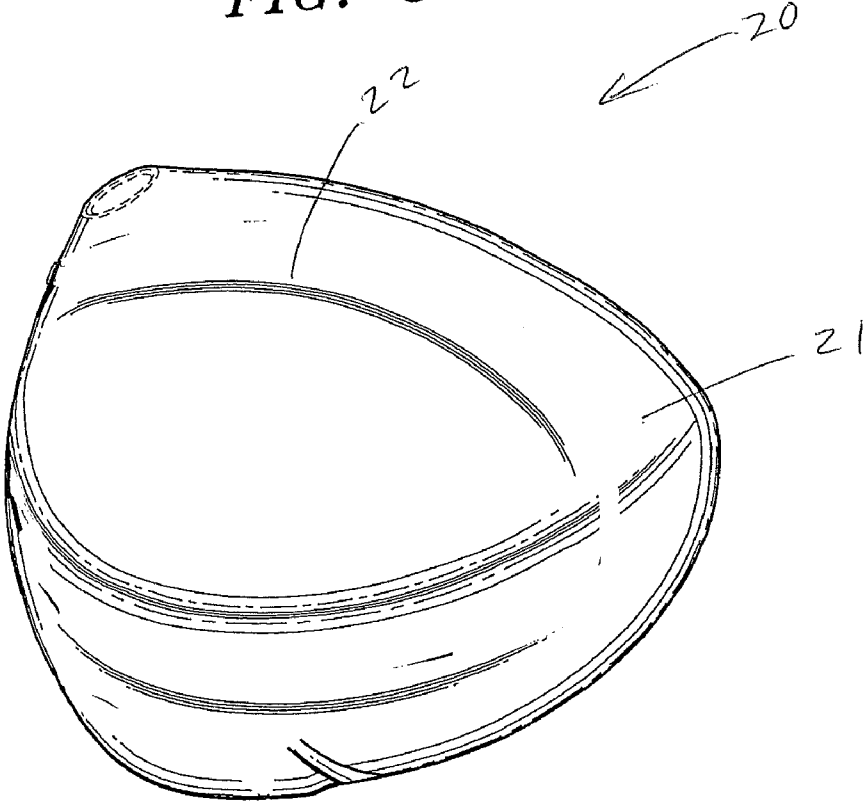


FIG. 4

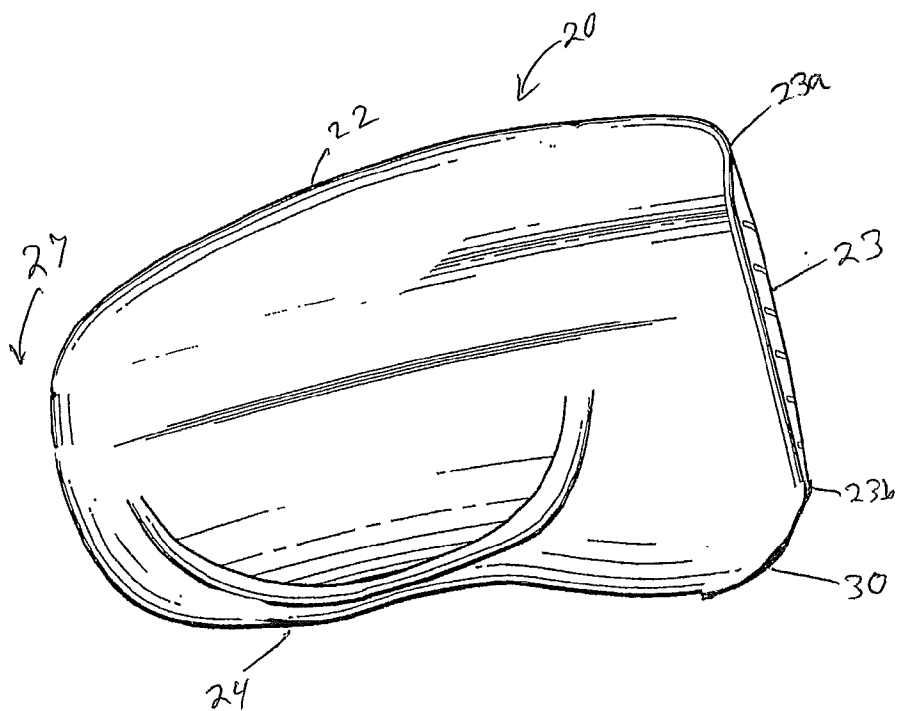


FIG. 5

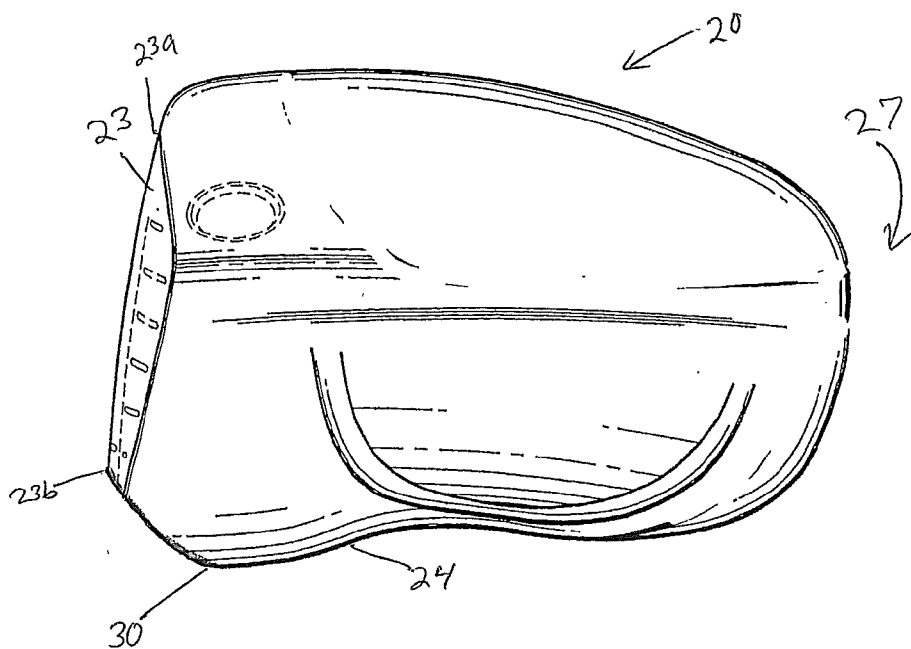


FIG. 6

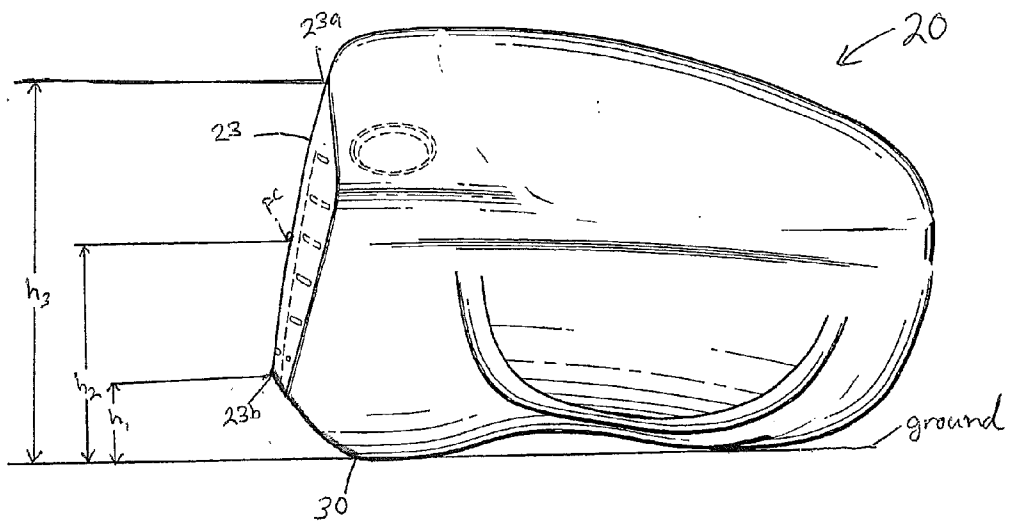


FIG. 6A

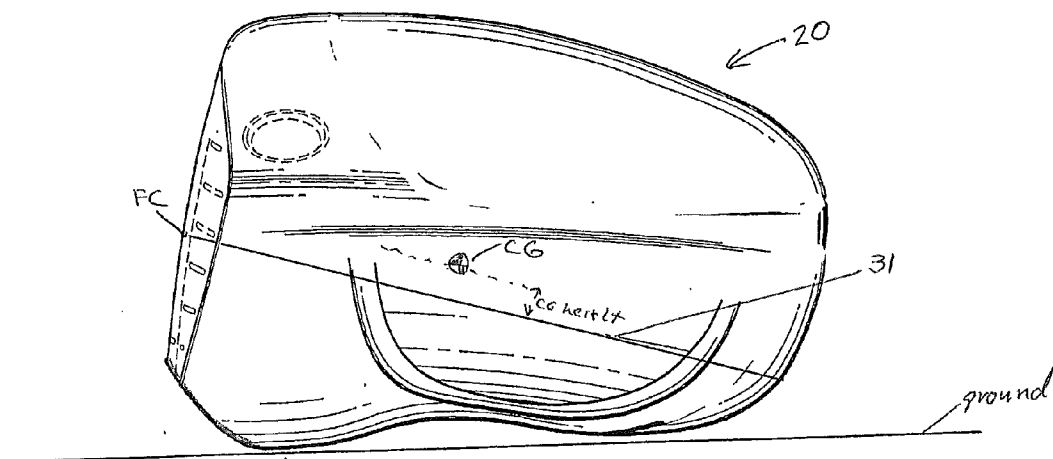


FIG. 6B

**GOLF CLUB HEAD WITH ELEVATED FACE**

CROSS REFERENCES TO RELATED APPLICATIONS

[0001] Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable

BACKGROUND OF THE INVENTION

[0003] 1. Field of the Invention

[0004] The present invention relates to a golf club head. More specifically, the present invention relates to a golf club head having an elevated face.

[0005] 2. Description of the Related Art

[0006] Existing driver heads are generally designed such that when the club is soled on the ground, the bottom of the striking face is near the ground. As a result, there are limits to how low the cg of the head can be placed relative to the striking face. As driver sizes increase towards USGA limit dimensions (5"x5"x2.8"), especially in depth, these shapes have a common deficiency in that the cg tends to be high, relative to the face center normal. As a result these drivers, many of which have a depth approaching 5", appreciatively have large Izz and Iyy moment of inertia values, but also center of gravity, ("CG") positions that are deep and high, which is unfavorable. The high CG position results in shots that have excess backspin which causes a less preferable ball flight and reduced distance.

BRIEF SUMMARY OF THE INVENTION

[0007] The current invention allows for the forgiveness advantages typical of a large, deep driver, while having the added advantages of reduced backspin and improved trajectory and distance. It is hypothesized that the distribution of ball strikes on the face will migrate to follow the center of the face. This is in part due to visual perception that the preferred hit location is at the center of the face. Thus, as the face and center are raised further off the ground, so too will the hit distribution.

[0008] The current invention is a driver type golf club head comprising a crown, a sole, a front wall having a perimeter, and a face. There is a heel wall extending 4.0 inches to 5.0 inches rearward from the perimeter of the front wall. Additionally, there is a rear wall substantially perpendicular to the heel wall, and a toe wall substantially perpendicular to the rear wall, the toe wall extending from 4.0 inches to 5.0 inches from a rear edge of the toe wall.

[0009] The face has a first height, h1, measured from the ground to the bottom of the face, a second height, h2, measured from the ground to the center of the face and a third height, h3, measured from the ground to the top of the face, when a golf club is at address.

[0010] The first height, h1 is at least 0.3 inch above the ground when the golf club head is at address. The golf club head has a volume ranging from 400 cubic centimeters to 470 cubic centimeters, a moment of inertia, Izz, about the center of gravity of the golf club head greater than 5000 grams-centimeters squared, and a moment of inertia, Iyy, above the center of gravity of the club head greater than 3500 grams-centimeters squared.

[0011] The ratio of h2/h3 is at least, if not greater than, 0.57 and the height of the center of gravity is at least, if not greater than, 0.060 inch relative to the face center normal. The measurement of h1 is preferably more than 0.3 inch when a golf club is at address at a lie angle of sixty degrees and a face angle of zero degree.

[0012] One aspect of the present invention is a driver type golf club head. The golf club head includes a body with an elevated face. The body has a crown portion, a front wall having a perimeter and a sole portion. The body also has a heel wall, a toe wall and a rear wall. The heel wall extends 4.0 inches to 5.0 inches rearward from the perimeter of the front wall and the rear wall is substantially perpendicular to the heel wall. The toe wall is substantially perpendicular to the rear wall, and the toe wall extends from 4.0 inches to 5.0 inches from the rear edge of the toe wall. The face on the front wall has a first height, h1, measured from the ground to the bottom of the face, a second height, h2, measured from the ground to the center of the face and a third height, h3, measured from the ground to the top of the face. When then the golf club head is at address with a lie angle of 60 degrees and a face angle 0 degrees, h1 is at least 0.3 inch above the ground. Preferably, the ratio of h2/h3 is at least, if not greater than, 0.57. The height of the center of gravity is at least, if not greater than, 0.060 inch relative to the face center normal. The golf club head has a volume ranging from 400 cubic centimeters to 470 cubic centimeters, a moment of inertia, Izz, about the center of gravity of the golf club head greater than 5000 grams-centimeters squared, and a moment of inertia, Iyy, above the center of gravity of the club head greater than 3500 grams-centimeters square.

[0013] A second aspect of the present invention is a golf club head. The golf club head has a body having a face wall, a crown wall, a sole wall, a heel wall, a rear wall, and a toe wall. The face wall has an approximately rectangular shape and the face wall has a variable thickness. The golf club head has a volume ranging from 400 cubic centimeters to 470 cubic centimeters, a moment of inertia about the Izz axis through the center of gravity of the golf club head which is greater than 5000 grams-centimeters squared, and a moment of inertia, Iyy, above the center of gravity of the club head greater than 3500 grams-centimeters squared. The face wall has a first height, h1, measured from the ground to the bottom of the face, a second height, h2, measured from the ground to the center of the face and a third height, h3, measured from the ground to the top of the face, when then the golf club head is at address. When the golf club is at address at a lie angle of preferably sixty degrees and a face angle of zero degree, h1 is at least 0.3 inch above the ground. The height of the center of gravity is at least, if not greater than, 0.060 inch relative to the face center normal. The ratio of h2/h3 is at least, if not greater than, 0.57.

[0014] Another aspect of the present invention is a golf club head. The golf club head has a face component composed of a metal material. The face component has a striking plate portion and a return portion. Coupled to the return portion of the face component is a substantially square aft-body. The length of the face component coupled to the aft-body ranges from 4 inches to 5 inches. The striking plate portion has a first height, h1, measured from the ground to the bottom of the face, a second height, h2, measured from the ground to the center of the face and a third height, h3, measured from the ground to the top of the face, when a golf club is at address. When the golf club is at address at a lie angle of sixty degrees

and a face angle of zero degree, h1 is at least 0.3 inch above the ground. The ratio of h2/h3 is at least, if not greater than, 0.57. The golf club head has a volume ranging from 400 cubic centimeters to 470 cubic centimeters, a moment of inertia, Izz, about the center of gravity of the golf club head greater than 5000 grams-centimeters squared, a moment of inertia, Iyy, above the center of gravity of the golf club head greater than 3500 grams-centimeters squared. The height of the center of gravity is at least, if not greater than, 0.060 inch relative to the face center normal.

[0015] Having briefly described the present invention, the above and further objects, features and advantages thereof will be recognized by those skilled in the pertinent art from the following detailed description of the invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

- [0016] FIG. 1 is a bottom plan view of a golf club head.
- [0017] FIG. 2 is a top plan view of a golf club head.
- [0018] FIG. 3 is a top perspective view of a golf club head.
- [0019] FIG. 4 is a top perspective view of a golf club head.
- [0020] FIG. 5 is a toe side view of a golf club head.
- [0021] FIG. 6 is a heel side view of a golf club head.
- [0022] FIG. 6A is a heel side view of a golf club head.
- [0023] FIG. 6B is a heel side view of a golf club head.

DETAILED DESCRIPTION OF THE INVENTION

[0024] As shown in FIGS. 1-6, a golf club of the present invention is generally designated 20. The golf club head 20 preferably includes a body 21 defined by a crown 22, a face 23, a sole 24, a heel end 25, a toe end 26 and an aft end 27. A leading edge 30 of the sole 24 is the forwardmost lowest point of the sole 24 at address. A lowest edge 23b of the face 23 is adjacent to a forwardmost edge of the sole 24.

[0025] As shown in FIG. 6A, the face 23 has a first height, h1, measured from the ground to a lowest edge 23b of the face 23 when a golf club utilizing the golf club head 20 is at address. The face 23 also preferably has a second height, h2, measured from the ground to a face center "FC" of the face 23 when then the golf club head is at address. The face 23 also has a third height, h3, measured from the ground to an upper edge 23a of the face 23, when then the golf club head is at address.

[0026] The first height, h1 is preferably at least 0.3 inch above the ground when a golf club utilizing the golf club head 20 is at address, and more preferably 0.31 inch to 0.50 inch above the ground when a golf club utilizing the golf club head 20 is at address.

[0027] In a preferred embodiment, the golf club head 20 has a volume ranging from 400 cubic centimeters to 470 cubic centimeters, a moment of inertia, Izz, about the center of gravity of the golf club head greater than 5000 grams-centimeters squared, and a moment of inertia, Iyy, above the center of gravity of the club head greater than 3500 grams-centimeters squared.

[0028] Additionally in a preferred embodiment, the ratio of h2/h3 is at least, if not greater than, 0.57. As shown in FIG. 6B, the height of a center of gravity of the golf club head 20, "CG", is at least, if not greater than 0.060 inch relative to a face center normal line 31. Also in the preferred embodiment, the measurement of h1 is preferably more than 0.3 inch when

the golf club head is addressed at a lie angle of sixty degrees and the face angle is zero degree.

[0029] The golf club head 20 is preferably composed of a single piece of metal, and is preferably composed of a cast metal material. More preferably, the cast metal material is a stainless steel material or a titanium material such as pure titanium and titanium alloys such as 6-4 titanium alloy, SP-700 titanium alloy (available from Nippon Steel of Tokyo, Japan), DAT 55G titanium alloy available from Diado Steel of Tokyo, Japan, Ti 10-2-3 Beta-C titanium alloy available from RTI International Metals of Ohio, and the like. Alternatively, the golf club head 20 is manufactured through forging, welding, forming, machining, powdered metal forming, metal-injection-molding, electrochemical milling, and the like.

[0030] The face 23 preferably has variable thickness. Various variable face thickness patterns are disclosed in U.S. Pat. No. 6,471,603, for a Contoured Golf Club Face, U.S. Pat. No. 6,368,234 for a Golf Club Striking Plate Having Elliptical Regions Of Thickness, and U.S. Pat. No. 6,398,666 for a Golf Club Striking Plate With Variable Thickness, which are all owned by Callaway Golf Company and which pertinent parts are hereby incorporated by reference.

[0031] The golf club head 20 preferably has a high coefficient of restitution thereby enabling for greater distance of a golf ball hit with the golf club head. The coefficient of restitution (also referred to herein as "COR") is determined by the following equation:

$$e = \frac{v_2 - v_1}{U_1 - U_2}$$

[0032] wherein U<sub>1</sub> is the club head velocity prior to impact; U<sub>2</sub> is the golf ball velocity prior to impact which is zero; v<sub>1</sub> is the club head velocity just after separation of the golf ball from the face of the club head; v<sub>2</sub> is the golf ball velocity just after separation of the golf ball from the face of the club head; and e is the coefficient of restitution between the golf ball and the club face.

[0033] The values of e are limited between zero and 1.0 for systems with no energy addition. The coefficient of restitution, e, for a material such as a soft clay or putty would be near zero, while for a perfectly elastic material, where no energy is lost as a result of deformation, the value of e would be 1.0. The golf club head 20 preferably has a coefficient of restitution ranging from 0.81 to 0.94, as measured under conventional test conditions.

[0034] The mass of the golf club head 20 preferably ranges from 165 grams to 250 grams, more preferably ranges from 175 grams to 230 grams, and most preferably from 190 grams to 205 grams.

[0035] The center of gravity and the moment of inertia of the golf club head 20 is preferably measured using a test frame (X<sup>T</sup>, Y<sup>T</sup>, Z<sup>T</sup>), and then transformed to a head frame (X<sup>H</sup>, Y<sup>H</sup>, Z<sup>H</sup>). The center of gravity of a golf club head may be obtained using a center of gravity table having two weight scales thereon, as disclosed in U.S. Pat. No. 6,607,452, entitled High Moment Of Inertia Composite Golf Club, and hereby incorporated by reference in its entirety.

[0036] In general, the moment of inertia, Izz, about the Z axis for the golf club head 20 preferably ranges from 2800 g-cm<sup>2</sup> to 5000 g-cm<sup>2</sup>, preferably from 3000 g-cm<sup>2</sup> to 4500 g-cm<sup>2</sup>, and most preferably from 3750 g-cm<sup>2</sup> to 4250 g-cm<sup>2</sup>. The moment of inertia, Iyy, about the Y axis for the golf club

head 20 preferably ranges from 1500 g-cm<sup>2</sup> to 4000 g-cm<sup>2</sup>, preferably from 2000 g-cm<sup>2</sup> to 3500 g-cm<sup>2</sup>, and most preferably from 2400 g-cm<sup>2</sup> to 2900 g-cm<sup>2</sup>. The moment of inertia, Ixx, about the X axis for the golf club head 20 preferably ranges from 1500 g-cm<sup>2</sup> to 4000 g-cm<sup>2</sup>, preferably from 2000 g-cm<sup>2</sup> to 3500 g-cm<sup>2</sup>, and most preferably from 2500 g-cm<sup>2</sup> to 3000 g-cm<sup>2</sup>.

[0037] In general, the golf club head 20 preferably has products of inertia such as disclosed in U.S. Pat. No. 6,425, 832, and is hereby incorporated by reference in its entirety. Preferably, each of the products of inertia, Ixy, Ixz and Iyz, of the golf club head 20 has an absolute value less than 100 grams-centimeter squared. Alternatively, the golf club head 20 has at least one or two products of inertia, Ixy, Ixz and Iyz, with an absolute value less than 100 grams-centimeter squared.

[0038] A width of the golf club head 20 preferably ranges from 4.0 inches to 5.5 inches, and most preferably from 4.75 inches to 5.0 inches. The height of the golf club head preferably ranges from 2.0 inches to 3.0 inches, and most preferably ranges from 2.40 inches to 2.65 inches. The length of the golf club head preferably ranges from 3.5 inches to 5.5 inches, and most preferably from 4.0 inches to 5.0 inches.

[0039] From the foregoing it is believed that those skilled in the pertinent art will recognize the meritorious advancement of this invention and will readily understand that while the present invention has been described in association with a preferred embodiment thereof, and other embodiments illustrated in the accompanying drawings, numerous changes, modifications and substitutions of equivalents may be made therein without departing from the spirit and scope of this invention which is intended to be unlimited by the foregoing except as may appear in the following appended claims. Therefore, the embodiments of the invention in which an exclusive property or privilege is claimed are defined in the following appended claims.

We claim as our invention:

1. A driver type golf club head comprising: a body having a crown, a sole, and a face; wherein the face has a first height, h1, measured from the ground to a lower edge of the face, a second height, h2, measured from the ground to a center of the face, and a third height, h3, measured from the ground to an upper edge of the face; and wherein h1 is at least 0.3 inch above the ground when at address.
2. The driver type golf club head in claim 1 wherein a volume of the body ranges from 400 cc to 470 cc.
3. The driver type golf club head in claim 1 wherein the golf club head has a moment of inertia, Izz, about a center of gravity of the golf club head greater than 5000 grams-centimeters squared and a moment of inertia, Iyy, above the center of gravity greater than 3500 grams-centimeters squared.
4. The driver type golf club head in claim 1 wherein a height of a center of gravity of the golf club head is at least 0.060 inch relative to a face center normal line.
5. The driver type golf club head in claim 1 wherein a ratio of h2 divided by h3 is at least 0.57.

6. The driver type golf club head in claim 1 wherein a length from the lower edge of the face to an aft end of the golf club head ranges from 4 inches to 5 inches.

7. The driver type golf club head in claim 1 wherein address for a golf club utilizing the golf club head is at a lie angle of sixty degrees and a face angle of zero degree.

8. A driver type golf club head comprising: a crown, a sole and a face having an upper edge and a lower edge;

a length from the lower edge of the face to an aft end of the golf club head ranges from 4 inches to 5 inches

wherein the face at address has a first height, h1, measured from the ground to the bottom of the face, a second height, h2, measured from the ground to the center of the face and a third height, h3, measured from the ground to the top of the face;

wherein h1 is at least 0.3 inch above the ground at address; and

wherein the golf club head has a volume ranging from 400 cubic centimeters to 470 cubic centimeters, a moment of inertia, Izz, about a center of gravity of the golf club head greater than 5000 grams-centimeters squared, and a moment of inertia, Iyy, above the center of gravity of the club head greater than 3500 grams-centimeters squared.

9. The driver type golf club head in claim 8 wherein the ratio of h2/h3 is at least 0.57.

10. The driver type golf club head in claim 8 wherein a height of the center of gravity of the golf club head is at least 0.060 inch relative to a face center normal line.

11. The driver type golf club head in claim 8 wherein address for a golf club utilizing the golf club head is at a lie angle of sixty degrees and a face angle of zero degree.

12. A golf club head comprising: a body having a face, a crown and a sole, the body composed of a titanium alloy material;

wherein the golf club head has a volume ranging from 400 cubic centimeters to 470 cubic centimeters;

wherein the face, at address, has a first height, h1, measured from the ground to a lower edge of the face, a second height, h2, measured from the ground to the center of the face and a third height, h3, measured from the ground to an upper edge of the face;

wherein h1 is at least 0.3 inch above the ground; and

wherein the golf club head has a moment of inertia about the Izz axis through a center of gravity of the golf club head which is greater than 5000 grams-centimeters squared, and a moment of inertia about the Ixx axis through the center of gravity of the golf club head which is greater than 3500 grams-centimeters squared.

13. The driver type golf club head in claim 12 wherein a ratio of h2/h3 is at least 0.57.

14. The driver type golf club head in claim 12 wherein a height of a center of gravity of the golf club head is at least 0.060 inch relative to a face center normal line.

15. The driver type golf club head in claim 12 wherein address for a golf club utilizing the golf club head is at a lie angle of sixty degrees and a face angle of zero degree.

\* \* \* \* \*