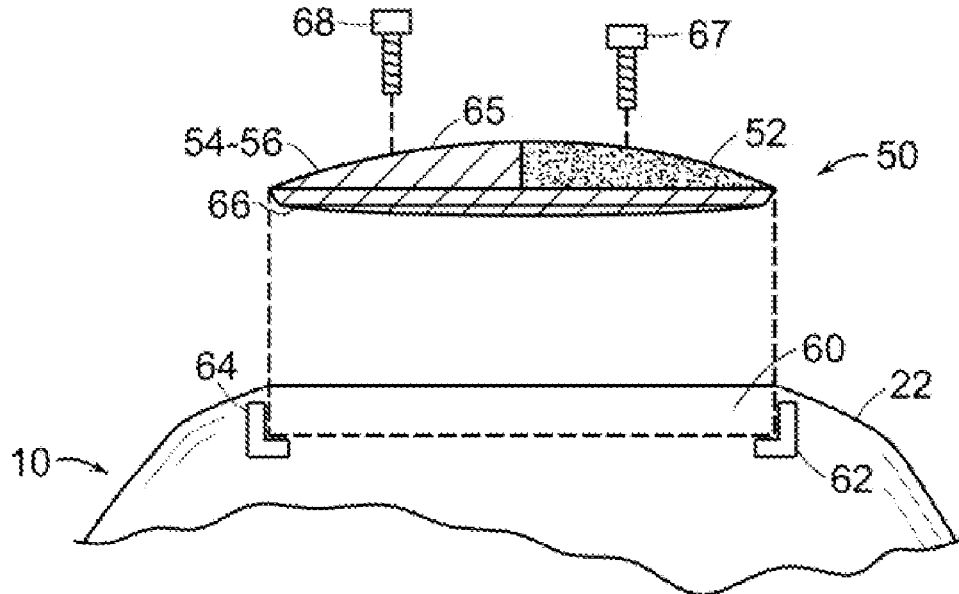




US 20140031141A1

(19) **United States**(12) **Patent Application Publication**
Myrhum(10) **Pub. No.: US 2014/0031141 A1**(43) **Pub. Date: Jan. 30, 2014**(54) **GOLF CLUB HEADS HAVING ADJUSTABLE
WEIGHTED CROWNS AND SOLES TO MOVE
CENTER OF GRAVITY**(52) **U.S. Cl.**
USPC 473/334(76) Inventor: **Mark C. Myrhum**, Del Mar, CA (US)(21) Appl. No.: **13/559,784**(22) Filed: **Jul. 27, 2012****Publication Classification**(51) **Int. Cl.**
A63B 53/06 (2006.01)(57) **ABSTRACT**

The present invention provides golf clubs and golf club heads that can be weight adjusted to move the center of gravity of the clubs and heads. The wood-type clubs have heads with crown and sole plates containing weighted and non-weighted sections. The crown and sole plates can be rotated or removed. In this manner, the weighted sections of the crowns and sole plates can be moved to a particular location, and this adjusts the center of gravity of the club head.



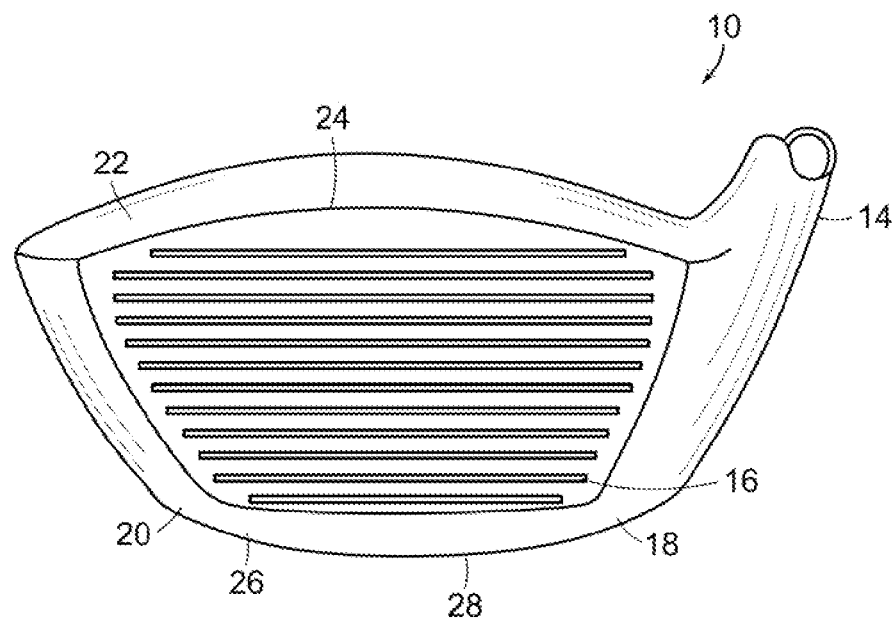


FIG. 1

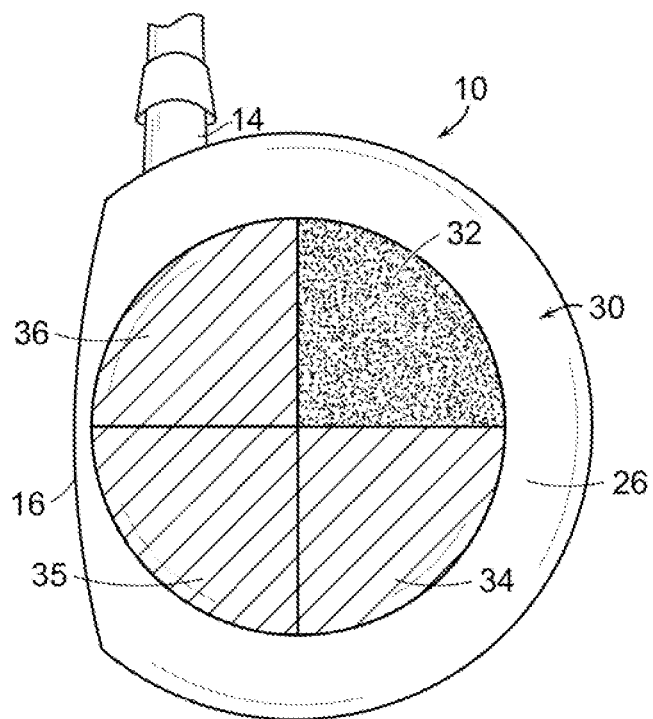


FIG. 2

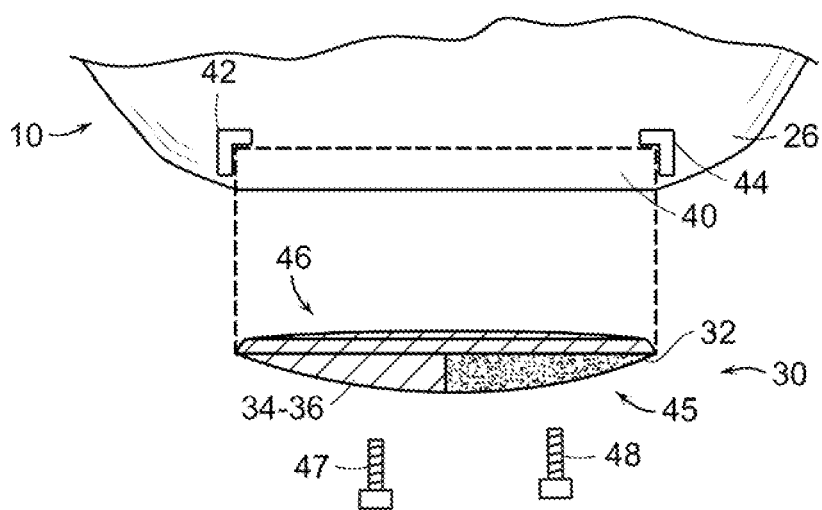


FIG. 3

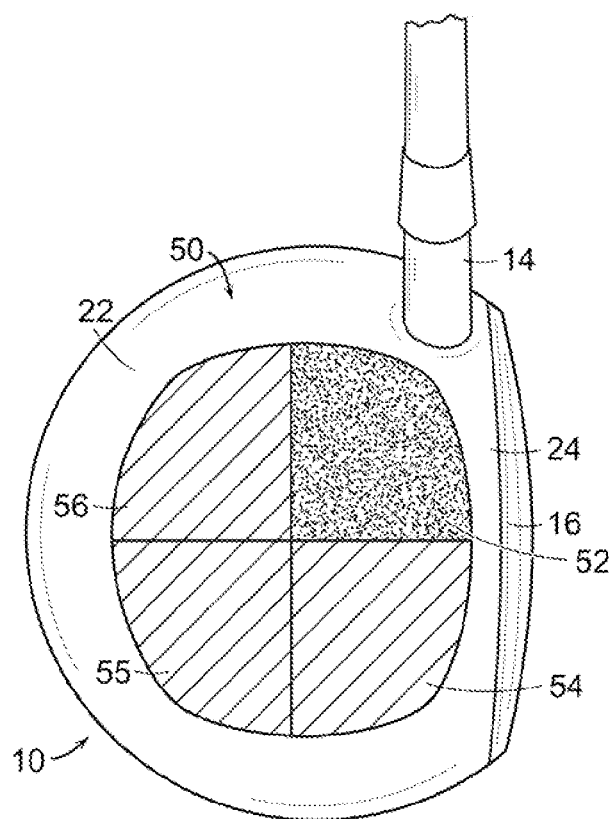


FIG. 4

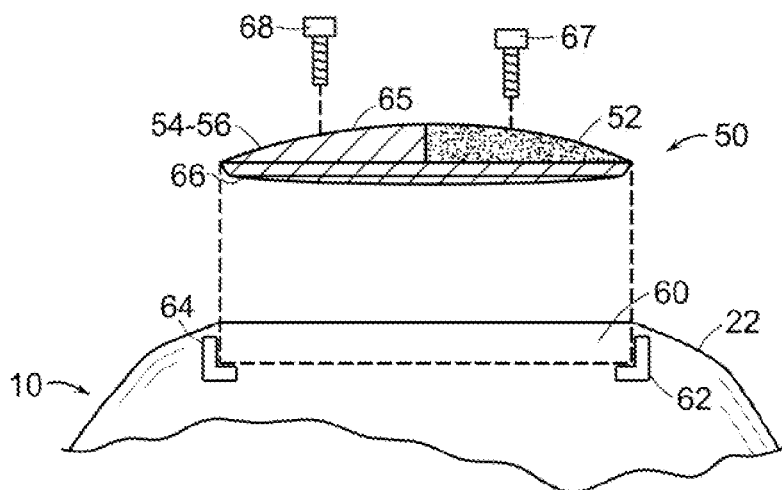


FIG. 5

GOLF CLUB HEADS HAVING ADJUSTABLE WEIGHTED CROWNS AND SOLES TO MOVE CENTER OF GRAVITY

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention generally relates to golf clubs and golf club heads that can be weight adjusted to move the center of gravity of the clubs and heads. More particularly, the invention relates to wood-type clubs having heads with crown and sole plates containing weighted sections. The crown and sole plates can be adjusted to move the center of gravity of the club head to a desired location.

[0003] 2. Brief Review of the Related Art

[0004] Today, professional and amateur golfers commonly use wood-type golf clubs that include, but are not limited to, driver woods, fairway woods, and hybrids. These wood-type are normally not made of natural wood; rather, they are made of metals or composite materials. Still, these clubs are referred to as woods or wood-type clubs. In general, the wood-type clubs have relatively large club heads versus irons and are designed to drive the ball longer distances. In recent years, the golf industry has developed and promoted customizable drivers to help golfers improve the distance, accuracy, and flight trajectory of their shots. In some cases, a golfer's swing motion is analyzed and then he/she is custom-fitted with an appropriate club. In some instances, the settings (for example, lie and loft angles) on the club are not adjustable. Thus, the golfer uses a specific set club based on the results of the club-fitting session. In other instances, the golf club is designed to be adjustable so the user can adjust the settings of the club depending upon changes in the golfer's swing mechanics, the golf course being played and weather, and other factors. However, the Rules of Golf as established by the United States Golf Association (USGA) require that clubs cannot be adjusted during a round. That is, the club settings on the first hole and eighteenth hole must be the same. For example, the Titleist® 910D2 and 910D3 drivers have independent adjustments for the lie and loft angles so that the club can be more precisely fitted for a given golfer and course conditions. This allows the golfer to have better accuracy and control over the ball's flight. These adjustments are made by rotating rings on the hosel of the club.

[0005] In addition, the club manufacturers have looked to adding and selectively distributing the weight around a club's head to adjust the center of gravity of the head. It is known that the center of gravity of a golf club head is an important property of a club. For example, if the center of gravity of the head is positioned away from the ball-striking face and down towards the sole and close to the neutral axis, the club head will tend to place less back-spin on the ball. This generally will help make the ball travel a greater flight distance.

[0006] Many club heads contain integral weights that are pre-built into the head structure; thus, weights cannot be added or subtracted. With such clubs, the golfer cannot adjust the weighting to match his or her swing and playing performance. On the other hand, there are some club heads containing screw-in weights that allow a golfer to change the head's weight distribution as desired. With these heads, the golfer can change the weight distribution and center of gravity of the head to meet his or her playing needs. However, it can be time-consuming and difficult to change multiple weight inserts in the head. Often, special tools are required to install and remove the weight inserts. In still other instances, high

density weight members have been attached to the sole, crown, skirt, or other parts of the club head to obtain the desired distribution of weight. These weight members can be attached by adhesives or screw-fasteners. But, clubs having these weight pieces can be awkward to use because the weight pieces may become dislodged when the club head makes impact with the ball.

[0007] As discussed above, there are different conventional ways for positioning weights around a golf club's head and adjusting the weights as desired. Although some of these weight adjustment and redistribution systems have been somewhat successful, there is a need for an improved system. The improved weight adjustment system and any related club components should be generally easy to manufacture, have low material costs, and provide the finished club with optimum playing performance properties. Moreover, it is important that the weight adjustment system be relatively simple for the golfer to use. The present invention provides such golf clubs and golf club heads having such adjustable weight systems having these benefits and as well as other advantageous characteristics and features.

SUMMARY OF THE INVENTION

[0008] The present invention relates to golf clubs and golf club heads that can be weight-adjusted to move the center of gravity of the clubs and heads. In one embodiment, the wood-type golf club head includes a body having a heel end, a toe end, and a front ball-striking surface; a crown extending between the heel and toe ends and from a top edge of the front ball-striking surface, the crown having a front portion and a rear portion; and a sole extending between the heel and toe ends and from a bottom edge of the front ball-striking surface, the sole having a sole aperture therein; and a sole plate positioned within the sole aperture so that the body defines an interior cavity.

[0009] The sole plate has at least two sections of differing weight and is rotatably attached to the sole so the sole plate can rotate from a first position to a second position. In this manner, the center of gravity of the club is changed. For example, the weighted section(s) of the sole plate may comprise a first metal material is selected from the group consisting of copper, tungsten, steel, magnesium tin, silver, gold, and platinum; while the crown plate may comprise a second metal material selected from the group consisting of titanium and aluminum alloys. The golf club head also may contain a crown plate having at least two sections of differing weight that is rotatably attached to the sole so the sole plate can rotate from a first position to a second position. The weighted and non-weighted sections of the crown plate also may be made of the above-described metal materials. The first position of the sole plate/crown plate provides the club with a first center of gravity and the second position provides the club with a second center of gravity, whereby the first and second centers of gravity are different.

[0010] In another embodiment, a first sole plate is positioned within the sole aperture and this plate is removably attached so it can be removed and a second sole plate attached in place thereof. The first and second sole plates are of differing weight, whereby the first sole plate provides the club with a first center of gravity and the second sole plate provides the club with a second center of gravity, the first and second centers of gravity being different.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The novel features that are characteristic of the present invention are set forth in the appended claims. However, the preferred embodiments of the invention, together with further objects and attendant advantages, are best understood by reference to the following detailed description in connection with the accompanying drawings in which:

[0012] FIG. 1 is a front elevation view of a golf club head that may be made in accordance with the present invention;

[0013] FIG. 2 is a bottom view of a golf club head that may be made in accordance with the present invention;

[0014] FIG. 3 is an exploded view of the golf club head in FIG. 2 showing the sole plate being inserted into the sole aperture of the sole of the head;

[0015] FIG. 4 is a top view of a golf club head that may be made in accordance with the present invention; and

[0016] FIG. 5 is an exploded view of the golf club head in FIG. 4 showing the crown plate being inserted into the crown aperture of the crown of the head.

DETAILED DESCRIPTION OF THE INVENTION

[0017] The present invention relates generally to golf club heads having a weight adjustable system. The wood-type clubs have heads with crown and sole plates containing weighted sections. The crown and sole plates can be adjusted to move the center of gravity of the club head to a desired location.

[0018] Referring to FIG. 1, a golf club head (10) of this invention is generally shown. The head includes a generally hollow body (12) with a hosel (14) adapted for fitting a golf club shaft (not shown). The head (10) may be formed from any suitable metal such as, for example stainless steel, aluminum, or titanium alloys. The head (10) includes a forward-facing wall (16) for striking a golf ball. Further, the body (12) has a heel end-portion (18) located near the hosel (14) and an opposite toe end-portion (20). The head (10) further includes a crown (22) extending between the heel and toe-end portions (18, 20) and from a top edge (24) of the front ball striking surface (16). The crown (22) extends between the heel end (18) and the toe end (20) and from the top edge (24) of the front wall (16) along the top surface of the head (10). The sole (26) extends between the heel end (18) and the toe end (20) and from a bottom edge (28) of the front wall (16) along the bottom surface of the head (10). In one version, the club head (10) is constructed such that the hosel (14), front wall (16), crown (22), and sole (26) may be integrally formed. Alternatively, the various components used to form the club head (10) may be separately molded, cast, forged or otherwise manufactured and then assembled.

[0019] The front wall (16) may have any suitable loft angle for a wood-type club such as, for example, between 6 and 30 degrees, or between 10 and 25 degrees, or between 12 and 22 degrees. The hosel (14) may be offset so that the lie angle of a golf club incorporating the head (10) may vary, typically from about 50 to about 70 degrees.

[0020] As shown in FIG. 2, a sole plate (30) may be attached to the sole (26) of the golf club. The sole plate (30) includes weighted section(s) (32) and non-weighted section (s) (34), (35), (36) that may be rotated to move the center of gravity of the club to a desired location as described in further detail below. The sole plate (30) has removable and rotatable features so the selective weighting and balancing of the club head (10) can be carried out.

[0021] Referring to FIG. 3, the sole plate (30) is shown to be a removable and rotatable dome-shaped structure which fits snugly within a sole aperture (40) located in the sole (26) of the club head (10). It should be understood that this dome-shaped structure is for illustration purposes only, and the sole plate (30) may have any suitable structure such as, for example, a square, trapezoidal, or triangular-shape. Also, as shown in FIG. 3, the weighted section (32) constitutes about 25% of the total volume of the sole plate, and the non-weighted sections (34, 35, and 36) constitute about 75% of the volume of the sole plate. It should be understood, however, that this particular weight distribution is exemplary only and is not meant to be restrictive. For example, the weighted section (s) (32) may constitute about 30%, 50%, 70%, 75%, or 90% or any other suitable volume amount of the sole plate (30).

[0022] In FIG. 3, the sole plate (30) is guided into place within the sole aperture (40) by small abutments or ledges (42, 44) located in the aperture. The sole plate (30) fits snugly under these ledges (42, 44) so that there is a tight fit within the sole (26) of the club head (10). When the sole plate (30) is secured within the sole aperture (40) of the club head (10), the sole plate (30) is flush and level with the bottom surface of the head. The sole plate includes an exterior surface (45) and an interior surface (46).

[0023] The sole plate (30) is secured to the club head (10) by a suitable fastening means such as, for example, screws, clips, rivets, or adhesives, provided that, the fastening means securely locks the sole plate (30) in place and is capable of being easily removed. The golfer also must be able to remove the sole plate without causing damage to the golf club head. In FIG. 3, the sole plate (30) is shown being firmly secured in the sole aperture (40) by a plurality of screws (47, 48). Preferably, the sole plate is held in place by multiple screws, for example, 2, 4, 8, or 12 screws. To rotate the sole plate, the golfer may loosen the screws, lift the sole plate out of the sole aperture, rotate the sole plate to the desired new position, and then tighten the screws to lock the sole plate in place. This weight rotating mechanism is easy to use and allows the golfer to selectively redistribute the weight in the sole plate. The sole plate may be rotated in angular increments in a clockwise or counter-clockwise direction.

[0024] As shown in FIG. 4, a crown plate (50) also may be attached to the crown (22) of the club head (10). In one embodiment, only a sole plate (as described above) is attached to the club head (10). In another embodiment, only a crown plate (50) is attached to the club head (10). In yet another version, both a sole plate (30) and crown plate (50) are attached to the club head (10). The crown plate (50) also includes weighted section (s) (52) and non-weighted section (s) (54, 55, 56) and has removable and rotatable features as described in further detail below. In this manner, the golfer can carry out selective weighting and balancing of the club head using the crown plate (50) as opposed to the sole plate (30). In other instances, both the crown plate (50) and sole plate (30) can be rotated to provide the desired weight redistribution.

[0025] Referring to FIG. 5, the crown plate (50) is shown to be a removable and rotatable dome-shaped structure which fits snugly within a crown aperture (60) located within the crown (22) of the club head (10). It should be understood that this dome-shaped structure is for illustration purposes only, and the crown plate (50) may have any suitable structure such as, for example, a square, trapezoidal, or triangular-shape.

Also, as shown in FIG. 5, the weighted section (52) constitutes about 25% of the total volume of the crown plate, and the non-weighted sections (54, 55, and 56) constitute about 75% of the volume of the crown plate. It should be understood, however, that this particular weight distribution is exemplary only and is not meant to be restrictive. For example, the weighted section (s) (52) may constitute about 30%, 50%, 70%, 75%, or 90% or any other suitable volume amount of the crown plate (50).

[0026] As shown in FIG. 5, the crown plate (50) is guided into place within the aperture (60) by small abutments or ledges (62, 64) that provide a means for supporting the plate (50). The crown plate (50) fits on these ledges (62, 64) to provide a tight fit. When the crown plate (50) is secured within the crown aperture (60) of the club head (10), the crown plate (50) is flush and level with the top surface of the head. The crown plate (50) includes an exterior surface (65) and an interior surface (66).

[0027] The crown plate (50) is secured to the club head (10) by a suitable fastening means such as, for example, screws, clips, rivets, or adhesives, provided that, the fastening means securely locks the crown plate (50) in place and is capable of being easily removed. The golfer also must be able to remove the crown plate (50) without causing damage to the club head (10). In FIG. 5, the crown plate (50) is shown being firmly secured in the sole aperture (60) by a plurality of screws (67, 68). Preferably, the crown plate (50) is held in place by multiple screws, for example, 2, 4, 8, or 12 screws. To rotate the crown plate, the golfer may loosen the screws, lift the crown plate out of the aperture, rotate the crown plate to the desired new position, and then tighten the screws to lock the crown plate in place. This weight rotating mechanism is easy to use and allows the golfer to selectively redistribute the weight in the crown plate. The crown plate may be rotated in angular increments in a clockwise or counter-clockwise direction.

[0028] The sole plate (30) and crown plate (50) contain weighted and non-weighted sections as shown in FIGS. 2-5. By the term, "weighted sections" and "non-weighted sections", it is meant sections or regions of the sole plate and crown plate having different weights. Particularly, a weighted section has a relatively greater weight than a non-weighted section. Preferably, the weighted section has a weight of at least 10% greater than a non-weighted section. More particularly, the weighted section may have a weight of at least 10%, 20%, 30%, 40% or 50% greater than the non-weighted section. For example, in one embodiment, a weighted section can weigh 5 grams, while a non-weighted section can weigh 3 grams. The weight of the weighted and non-weighted sections can vary by any suitable amount, for example, by 5, 7, 10, 12, 15, 18, 20 or 25 grams.

[0029] The weighted section of the sole plate/crown plate can be made from a suitable heavy weight material such as, for example, a metal selected from the group consisting of copper, tungsten, steel, magnesium, tin, silver, gold and platinum alloys. The non-weighted section can be made from a suitable light weight material such as, for example, a metal selected from the group consisting of titanium and aluminum alloys. In another version, the weighted section is made of a metal composite material, and the non-weighted section is made of a non-metal composite material. For example, a metal composite material, wherein at least one component is a metal, may be used. The other component may be a metal or non-metal compound such as a ceramic or organic material.

For example, boron carbide particles may be dispersed in an aluminum matrix or reinforcing carbon fibers interposed in an aluminum matrix may be used. For the non-weighted sections, a non-metal composite material such as an epoxy composition that is reinforced with carbon fiber or a nylon material that is reinforced with aramid (e.g., Kevlar® fiber) may be used. Other polymeric materials such as polyurethanes, polyureas, ethylene-based acid copolymer ionomer resins, polyolefins, polyesters, polyethers, fluoropolymers, and rubber also may be used.

[0030] The golf club head (10), when designed as a driver, preferably has a volume from 200 cubic centimeters to 600 cubic centimeters, more preferably from 300 cubic centimeters to 500 cubic centimeters, and most preferably from 420 cubic centimeters to 470 cubic centimeters, with a most preferred volume of 460 cubic centimeters. The volume of the golf club head (10) will also vary between fairway woods (preferably ranging from 3-woods to thirteen woods) with smaller volumes than drivers. The golf club head (10), when designed as a driver, preferably has a mass of no more than 215 grams, and more preferably a mass of 180 to 215 grams. More particularly, the mass of the club head can be about 199 to about 201 grams in some instances. When the golf club head (10) is designed as a fairway wood, the head preferably has a mass of 200 to 250 grams and more preferably from 209 grams to 223 grams. Finally, for hybrid golf clubs, the club head (10) preferably has a mass of 210 to 260 grams and more preferably from 223 to 252 grams.

[0031] As discussed above, the center of gravity of the club can be adjusted by rotating the sole plate (30) or crown plate (50) so that the weighted section(s) is in the desired location. For example, if the weighted section is rotated so that the center of gravity of the head (10) is positioned away from the ball-striking face (16) and down towards the sole (26) and near the neutral axis, the club head will tend to place less back-spin on the ball. This will help make the ball potentially travel a greater flight distance.

[0032] In another embodiment, the sole plate (30) and/or crown plate (50) are removed from the club head and a second sole plate (30) and/or crown plate (50) having a different weight is inserted in place thereof. For example, in one embodiment, a sole plate having a weight of 30 grams can be removed from the club head and a sole plate having a weight of 60 grams can be inserted in place thereof. In another embodiment, a crown plate having a weight of 20 grams can be removed from the club head and a crown plate having a weight of 40 grams can be inserted in place thereof. By selectively removing and replacing sole and crown plates having different weights, the center of gravity of the club head can be adjusted.

[0033] It is understood that the golf clubs and golf club heads described and illustrated herein represent only some embodiments of the invention. It is appreciated by those skilled in the art that various changes and additions can be made to these products without departing from the spirit and scope of this invention. It is intended that all such embodiments be covered by the appended claims.

We claim:

1. A wood-type golf club head, comprising:
 - a body having a heel end, a toe end, and a front ball-striking surface;
 - a crown extending between the heel and toe ends and from a top edge of the front ball-striking surface, the crown having a front portion and a rear portion;

a sole extending between the heel and toe ends and from a bottom edge of the front ball-striking surface, the sole having a sole aperture therein; and

a sole plate positioned within the sole aperture so that the body defines an interior cavity, the sole plate having at least two sections of differing weight and being rotatably attached to the sole so the sole plate can rotate from a first position to a second position, the first position providing the club with a first center of gravity and the second position providing the club with a second center of gravity whereby the first and second centers of gravity are different.

2. The wood-type golf club head of claim 1, wherein the crown includes a crown aperture and a crown plate is positioned within the crown aperture the crown plate having at least two sections of differing weight and being rotatably attached to the crown so the crown plate can rotate from a first position to a second position, the first position providing the club with a first center of gravity and the second position providing the club with a second center of gravity, whereby the first and second centers of gravity are different.

3. The wood-type golf club head of claim 1, wherein the sole plate is rotatably attached to the sole by at least one fastening means.

4. The wood-type golf club head of claim 3, wherein the fastening means is multiple screws.

5. The wood-type golf club head of claim 1, wherein the sole plate is rotatably attached to the sole so the sole plate can be rotated in a clockwise or counter-clockwise direction

6. The wood-type golf club head of claim 5, wherein the sole plate is rotatably attached to the sole so the sole plate is rotated in angular increments in a clockwise or counter-clockwise direction.

7. The wood-type golf club head of claim 1, wherein the sole plate has a weighted section made of a first metal material and a non-weighted section made of a second metal material, the first and second metal materials being of differing weight.

8. The wood-type golf club head of claim 7, wherein the first metal material is selected from the group consisting of copper, tungsten, steel, magnesium tin, silver, gold, and platinum alloys.

9. The wood-type golf club head of claim 7, wherein the second metal material is selected from the group consisting of titanium and aluminum alloys.

10. The wood-type golf club head of claim 1, wherein the sole plate has a weighted section made of a metal composite material and a non-weighted section made of a non-metal composite material, the first and second composite materials being of differing weight.

11. The wood-type golf club head of claim 1, wherein the composite material is carbon fiber embedded in a polymer matrix.

12. The wood-type golf club head of claim 1, wherein the sole plate has weighted and non-weighted sections, the weighted section having a weight which is at least 10% greater than the non-weighted section.

13. The wood-type golf club head of claim 1, wherein the sole plate has weighted and non-weighted sections, the weighted section comprising at least 25% of the total volume of the sole plate.

14. The wood-type golf club head of claim 1, wherein the sole plate has weighted and non-weighted sections, the weighted section comprising about 50% of the total volume of the sole plate.

15. The wood-type golf club head of claim 1, wherein the crown plate has a weighted section made of a first metal material and a non-weighted section made of a second metal material, the first and second metal materials being of differing weight.

16. The wood-type golf club head of claim 15, wherein the first metal material is selected from the group consisting of copper, tungsten, steel, magnesium tin, silver, gold, and platinum alloys.

17. The wood-type golf club head of claim 15, wherein the second metal material is selected from the group consisting of titanium and aluminum alloys.

18. The wood-type golf club head of claim 1, wherein the crown plate has weighted and non-weighted sections, the weighted section having a weight which is at least 10% greater than the non-weighted section.

19. The wood-type golf club head of claim 1, wherein the crown plate has weighted and non-weighted sections, the weighted section comprising at least 25% of the total volume of the sole plate.

20. A wood-type golf club head, comprising:

a body having a heel end, a toe end, and a front ball-striking surface;

a crown extending between the heel and toe ends and from a top edge of the front ball-striking surface, the crown having a front portion and a rear portion;

a sole extending between the heel and toe ends and from a bottom edge of the front ball-striking surface, the sole having a sole aperture therein; and

a first sole plate positioned within the sole aperture so that the body defines an interior cavity, the first sole plate being removably attached to the sole so the first sole plate can be removed and a second sole plate attached in place thereof, the first and second sole plates being of differing weight, the first sole plate providing the club with a first center of gravity and the second sole plate providing the club with a second center of gravity, the first and second centers of gravity being different.

21. The wood-type golf club head of claim 20, wherein the crown includes a crown aperture and a first crown plate is positioned within the crown aperture, the first crown plate being removably attached to the crown so the first crown plate can be removed and a second crown plate attached in place thereof, the first and second crown plates being of differing weight, the first crown plate providing the club with a first center of gravity and the second crown plate providing the club with a second center of gravity, the first and second centers of gravity being different.

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