WEIGHT-ADJUSTABLE GOLF CLUB HEAD PROVIDED WITH REAR LIGHTWEIGHT COVERING

Inventors: Cheng-Jin Chen, Taichung County (TW); Chiu-Hong Tsai, Taoyuan County (TW)

Correspondence Address:
BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747

Assignee: Fu Sheng Industrial Co., Ltd.

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ABSTRACT

A weight-adjustable golf club head includes a rear lightweight covering and a golf club head body combined therewith. The rear lightweight covering has a rear crown portion and a rear wall portion extended therefrom. The golf club head body is combined with the rear lightweight covering which is designed to have a striking face, a front crown portion and a sole portion. The rear lightweight covering is made from a low specific gravity metal, and is designed to have a thickness less than 0.6 mm. The rear lightweight covering has an inner surface formed with a plurality of reinforcing ribs.
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BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a weight-adjustable golf club head provided with a rear lightweight covering. Particularly, the present invention relates to the rear lightweight covering of the golf club head made from a low specific gravity metal. More particularly, the present invention also relates to the rear lightweight covering of the golf club head having an inner surface formed with reinforcing ribs.

[0003] 2. Description of the Related Art

[0004] A conventional golf club head, as described in U.S. Pat. No. 6,783,465, entitled “GOLF CLUB HEAD,” includes a golf club head body and a striking plate. The golf club head body has a front portion, a crown portion and a sole portion. Furthermore, the golf club head body includes a heel side portion and a toe side portion opposite thereto. The striking plate is connected with the front portion of the golf club head body. To enhance elastic deformability, a series of recessed grooves are provided on the crown portion of the golf club head. In this case, each of the recessed grooves extends along a club-head-width direction from the heel side portion and the toe side portion of the crown portion; namely, each of the recessed grooves is arranged to extend along the direction substantially parallel to a horizontal reference line of the striking plate. Such a structure of the recessed groove can enhance the deformability of the golf club head body while impacting a golf ball.

[0005] In addition to this, a series of protruded ribs are provided on the sole portion of the golf club head body so as to reinforce structural strength. However, there would be further advantageous that the protruded ribs can lower a center of gravity of the golf club head body for enhancing stability in striking the golf ball. Accordingly, the hitting characteristics of such a structure of the golf club head are enhanced.

[0006] In general, such an arrangement of the golf club head body has several drawbacks. For example, the crown portion of the golf club head body has a total thickness greater than a depth of the recessed groove provided thereon. Although these recessed grooves can be successful in enhancing elastic deformability of the crown portion of the golf club head body, a number of design limitations exist for lowering the center of gravity of the golf club head body due to difficulties in manufacture. A design-limiting problem due to a depth of the recessed groove is an increase of the thickness of the crown portion. However, it would be disadvantageous to provide a thinner thickness of the crown portion and to lower the center of gravity of the golf club head body.

[0007] Another problem with providing the recessed groove is the difficulty in increasing the strength of the crown portion. During use of the golf club head body in impacting the golf ball, the crown portion is susceptible to distortion or crack due to an ultimately thin thickness of the crown portion existing right in the recessed groove. By way of example, there is a need to provide means for reinforcing the thin-thickness portion of the crown portion if the thickness is less than 0.6 mm. Hence, there is a need for improving the crown portion of the golf club head body.

[0008] Another problem with the direction of extending the recessed groove across the golf club head width is susceptible to weakening the entire structure of the golf club head body. Furthermore, another problem occurring during impacting the golf ball is a loss of the adequately elastic deformability of the crown portion due to the stress transmitting in a front-to-rear direction of the golf club head.

[0009] As is described in greater detail below, the present invention intends to provide a weight-adjustable golf club head provided with a rear lightweight covering which is made from a low specific gravity metal so as to reduce weight of a crown portion and a rear portion of the golf club head. The rear lightweight covering has a rear crown portion and a rear wall portion to combine with a golf club head body which has a striking plate and a sole portion. The rear lightweight covering reduces the entire weight and simplifies the entire structure of the golf club head in such a way as to mitigate and overcome the above problem.

SUMMARY OF THE INVENTION

[0010] The primary objective of this invention is to provide a weight-adjustable golf club head provided with a rear lightweight covering which has a relatively thin thickness and is made from a low specific gravity metal. The rear lightweight covering has an extension to form a rear wall portion. Accordingly, the rear lightweight covering can lower the center of gravity and reduce the weight of the golf club head.

[0011] The secondary objective of this invention is to provide a weight-adjustable golf club head provided with the rear lightweight covering. The rear lightweight covering is integrally formed with a rear crown portion and a rear side wall portion, and is combined with a golf club head body which is designed to integrally form with a striking face and a sole portion. Accordingly, the rear lightweight covering can simplify the entire structure of the golf club head.

[0012] Another objective of this invention is to provide a weight-adjustable golf club head provided with the rear lightweight covering. The rear lightweight covering has an inner surface formed with reinforcing ribs. Accordingly, the rear lightweight covering can lower the center of gravity and enhance the strength of the golf club head.

[0013] Another objective of this invention is to provide a weight-adjustable golf club head provided with the rear lightweight covering which has an inner surface formed with reinforcing ribs which extend along a front-to-rear direction of the golf club head. Accordingly, the rear lightweight covering with such reinforcing ribs can enhance elastic deformability of the golf club head in impacting a golf ball.

[0014] The weight-adjustable golf club head in accordance with an aspect of the present invention includes a rear lightweight covering and a golf club head body combined therewith. The rear lightweight covering has a rear crown portion and a rear wall portion extended therefrom. The golf club head body is combined with the rear lightweight covering which is designed to have a striking face, a front crown portion and a sole portion. The rear lightweight covering is made from a low specific gravity metal, and is designed to have a thickness less than 0.6 mm. The rear lightweight covering has an inner surface formed with a plurality of reinforcing ribs.

[0015] In a separate aspect of the present invention, the reinforcing ribs extend along a front-to-rear direction of the golf club head.
In a further separate aspect of the present invention, the reinforcing rib adjacent to a center portion of the rear crown portion of the rear lightweight covering has a greater length.

In a yet further separate aspect of the present invention, the reinforcing ribs are formed on an outer surface of the rear lightweight covering.

Further scope of the applicability of the present invention will become apparent from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, since various will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limiting of the present invention, and wherein:

FIG. 1 is an exploded perspective view illustrating a weight-adjustable golf club head having a rear sectional lightweight covering in accordance with a preferred embodiment of the present invention;

FIG. 2 is a top elevational view illustrating the weight-adjustable golf club head combined with the rear sectional lightweight covering in accordance with the preferred embodiment of the present invention; and

FIG. 3 is a cross-sectional view, taken along line 3-3 in FIG. 2, illustrating the weight-adjustable golf club head combined with the rear sectional lightweight covering in accordance with the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring initially to FIGS. 1 through 3, views of a weight-adjustable golf club head in accordance with the preferred embodiment of the present invention are illustrated. Preferably, the golf club head utilized in practicing the preferred embodiment of the present invention can be selected from several types. By way of example, the golf club head utilized in practicing this illustrated embodiment of the present invention is selected from a driver or a wood-type club head.

With reference to FIG. 1, the weight-adjustable golf club head in accordance with the preferred embodiment of the present invention includes a rear lightweight covering designated numeral 1 and a golf club head body designated numeral 2. The rear lightweight covering 1 is designed to connect with a rear portion of the golf club head body 2 so as to constitute the golf club head. Preferably, the rear lightweight covering 1 is made from a relatively low specific gravity metal selected from the group consisting of titanium alloy, Fe-Mn-Al alloy, aluminum alloy and magnesium alloy etc. The rear lightweight covering 1 is designed to have a relatively thin thickness, preferably less than 0.6 mm, so as to reduce the total weight of the golf club head and to minimize the dimensions thereof.

Referring now to FIGS. 1 through 3, the golf club head body 2 is made from a relatively high specific gravity metal selected from the group consisting of carbon steel, low-carbon steel, maraging steel, cast iron, nickel-based alloy and structural alloy etc. In this manner, the weight of the golf club head body 2 may be several times higher than that of the rear lightweight covering 1. In this present invention, the ratio may be specifically grown due to the fact that the rear lightweight covering 1 has a relatively thin thickness, preferably less than 0.6 mm. When the rear lightweight covering 1 and the golf club head body 2 are combined, the golf club head body 2 can specifically lower the center of gravity of the golf club head.

Constructions of the rear lightweight covering 1 shall be described in detail with reference to FIGS. 1 through 3. Preferably, the rear lightweight covering 1 is integrally formed with a rear crown portion 11, a rear wall portion 12 and a plurality of reinforcing ribs 13. The rear crown portion 11 has a crown-connecting periphery (unlabeled) while the rear wall portion 13 has a wall-connecting periphery (unlabeled). The rear crown portion 11 extends downwardly from the rear crown portion 11. To combine the rear lightweight covering 1 with the golf club head body 2, the crown-connecting periphery is integrally formed from the wall-connecting periphery so as to form a first connecting periphery. The crown-connecting periphery has a crown-assembling edge 111 located at a front upper portion of the rear crown portion 11. Correspondingly, the wall-connecting periphery has wall-assembling edges 121 located at upright portions of the rear wall portion 12, and a bottom-assembling edge 122 located at a lower portion of the rear wall portion 12. To reinforce the structure of the rear lightweight covering 1, the reinforcing ribs 13 are provided and protruded on an inner surface thereof, and extended in a front-to-rear direction of the golf club head. In a preferred embodiment, the reinforcing ribs 13 are integrally formed on the inner surface of the rear lightweight covering 1 by means of a stamping operation. Preferably, the reinforcing ribs 13 are parallel each other. In an alternative embodiment, the reinforcing ribs 13 are formed by means of an etching process. Accordingly, it would be advantageous that the rear lightweight covering 1 is not susceptible to distortion or crack during impacting a golf ball.

Preferably, the reinforcing rib 13 adjacent to a center portion of the rear crown portion 11 of the rear lightweight covering 1 has a greater length with respect to the front-to-rear direction. Conversely, the reinforcing rib 13 arranged beyond the center portion of the rear crown portion 11 of the rear lightweight covering 1 has a shorter length. The number of the reinforcing ribs 13 provided in practicing the present invention may not affect the elastic deformability of the rear lightweight covering 1.

In an alternative, the reinforcing ribs 13 are provided on an outer surface of the rear crown portion 11 of the rear lightweight covering 1 without departing from the present invention.

Constructions of the golf club head body 2 shall be described in detail with also reference to FIGS. 1 through 3. Preferably, the golf club head body 2 is integrally formed with a striking face 21, a front crown portion 22 and a sole portion 23. In this preferred embodiment, the striking face 21 is integrally connected between the front crown portion 22 and the sole portion 23. By way of example, in an alternative embodiment, the striking face 21 is separately fabricated and then combined with the golf club head body 2. The front crown portion 22 has a crown-connecting periphery (unlabeled) while the sole portion 23 has a sole-
connecting periphery (unlabeled). Preferably, the crown-connecting periphery is integrally formed from the sole-connecting periphery so as to form a second connecting periphery. The second connecting periphery of the golf club head body 1 mechanically connects with the first connecting periphery of the rear lightweight covering 1 when assembled. The crown-connecting periphery has a crown-assembling edge 221 located at a rear upper portion of the front crown portion 22, and further extends downwardly to form wall-assembling edges 222. Correspondingly, the sole-connecting periphery has a sole-assembling edge 231 located at a rear portion of the sole portion 23. The golf club head body 2 further includes a hose 124 arranged at a neck portion adjacent the heel so as to receive a club shaft (not shown).

[0030] It is apparent from FIG. 1 that the rear lightweight covering 1 occupies a specific volume of the golf club head. Yet further, the rear lightweight covering 1 varies in shape and thickness in adjusting the center of gravity of the golf club head according to the design need. The rear lightweight covering 1, however, shares a lower amount of weight to lower the center of gravity of the golf club head. The golf club head body 2 also varies in weight in adjusting the center of gravity of the golf club head according to the design need. It is also apparent from FIG. 1 that the golf club head body 2 varies in volume or weight but it shares a higher amount of weight of the golf club head.

[0031] Referring again to FIGS. 2 and 3, in assembling operation, the first connecting periphery of the rear lightweight covering 1 is aligned with the second connecting periphery of the golf club head body 2. In this circumstance, the crown-assembling edge 111 of the rear lightweight covering 1 is engaged with the crown-assembling edge 221 of the golf club head body 2; the wall-assembling edges 121 of the rear lightweight covering 1 are engaged with the wall-assembling edges 222 of the golf club head body 2; and the bottom-assembling edge 122 is engaged with the sole-assembling edge 231 of the golf club head body 2. Once assembled, the rear lightweight covering 1 can be securely mounted on the golf club head body 2 to form the weight-adjustable golf club head. The connecting operation in practicing the present invention may be performed by means of welding, braze welding, adhesive or screw-connection. It would be advantage that the stress impacted on the striking face 21 cannot damage the rear lightweight covering 1 due to the fact that such an arrangement separates the entire structure of the rear lightweight covering 1 from the striking face 21 of the golf club head body 2.

[0032] Referring again to FIGS. 1 through 3, the rear lightweight covering 1 is designed to have a thickness less than 0.6 mm except the reinforcing ribs 13 so that it performs a high degree of elastic deformability in impacting the golf ball. Additionally, since the rear lightweight covering 1 is made from a relatively low specific gravity metal, the center of gravity of the golf club head is shifted and adjusted in manufacture. It would be advantage that the strength of the rear lightweight covering 1 is increased due to that the reinforcing ribs 13 of the rear lightweight covering 1 extend along the front-to-rear direction of the golf club head in which the stress impacted on the striking face 21 of the golf club head body 2 is transmitted. More importantly, the reinforcing ribs 13 are successful in reinforcing the thin thickness of the rear lightweight covering 1 even though the thickness of the rear lightweight covering 1 is less than 0.6 mm.

[0033] It will be apparent from the aforementioned discussions that although it would be advantageous to design the golf club head body by providing the recessed grooves on the crown portion and to provide the sole portion, disclosed in U.S. Pat. No. 6,783,465, thereby lowering the center of gravity, the recessed grooves cannot effectively lower the center of gravity and provide adequate elastic deformability in the crown portion. Referring back to FIG. 1, the rear lightweight covering 1 of the present invention can provide a high degree of elastic deformability in the crown portion of the golf club head body 2. Furthermore, a set of the reinforcing ribs 13 extended in the front-to-rear direction can reinforce the thin thickness of the rear lightweight covering 1 in striking the golf ball.

[0034] Although the invention has been described in detail with reference to its presently preferred embodiment, it will be understood by one of ordinary skill in the art that various modifications can be made without departing from the spirit and the scope of the invention, as set forth in the appended claims.

What is claimed is:

1. A weight-adjustable golf club head, comprising:
   a golf club head body;
   a rear lightweight covering having a rear crown portion and a rear wall portion to combine with the golf club head body, the rear lightweight covering having a thickness less than 0.6 mm; and
   a plurality of reinforcing ribs formed on an inner surface of the rear lightweight covering, the reinforcing ribs extending along a front-to-rear direction of the golf club head body;
   wherein the reinforcing ribs reinforce the rear lightweight covering which provides a high degree of elastic deformability in impacting a golf ball.

2. The weight-adjustable golf club head as defined in claim 1, wherein the rear lightweight covering is selected from one of a titanium-alloy covering, a Fe-Mn-Al alloy covering, an aluminum alloy covering and a manganese alloy covering.

3. The weight-adjustable golf club head as defined in claim 1, wherein the rear lightweight covering is integrally formed with the rear crown portion and the rear wall portion.

4. The weight-adjustable golf club head as defined in claim 1, wherein the golf club head body is integrally formed with a striking face, a front crown portion and a sole portion.

5. The weight-adjustable golf club head as defined in claim 1, wherein the reinforcing ribs are formed on an inner surface of the rear crown portion of the rear lightweight covering.

6. The weight-adjustable golf club head as defined in claim 5, wherein the reinforcing ribs are parallel each other while extending along the front-to-rear direction of the golf club head body.

7. The weight-adjustable golf club head as defined in claim 1, wherein the rear lightweight covering has a first connecting periphery while the golf club head body has a second connecting periphery.

8. The weight-adjustable golf club head as defined in claim 7, wherein the first connecting periphery has a crown-connecting periphery and a wall-connecting periphery while
the second connecting periphery has a crown-connecting periphery and a sole-connecting periphery.

9. The weight-adjustable golf club head as defined in claim 8, wherein the crown-connecting periphery of the first connecting periphery has a crown-assembling edge to connect with that of the second connecting periphery.

10. The weight-adjustable golf club head as defined in claim 8, wherein the wall-connecting periphery of the first connecting periphery has wall-assembling edges to connect with those of the second connecting periphery.

11. The weight-adjustable golf club head as defined in claim 8, wherein the wall-connecting periphery of the first connecting periphery has a bottom-assembling edge to connect with a sole-assembling edge of the second connecting periphery.

12. The weight-adjustable golf club head as defined in claim 1, wherein the rear lightweight covering has a specific gravity lower than that of the golf club head body.

13. The weight-adjustable golf club head as defined in claim 1, wherein the reinforcing rib adjacent to a center portion of the rear crown portion of the rear lightweight covering has a greater length.