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# A GOLF CLUB HEAD

The present invention generally relates to golf clubs and more particularly, to golf drivers.

Since the heads of the golf drivers are typically made of wood, there are often referred to as wood drivers or simply as woods.

As can be seen in Figure 8, the head (A') of a prior art wood driver is formed from an appropriately-shaped piece of solid wood (2'). The wood head (A') has a front face (1') to strike a golf ball and a rear side (3') behind the front face. A metal sole plate (4') is typically secured within a cut-out in the sole side of the wood head. The wood head is also provided with a plastics plate on the front face and a metal block on the rear side. Although wood drivers are used by practically all golfers, they suffer from one very significant disadvantage. In the wood drivers it can be seen that the centre of gravity (G') of the club head lies at a point closer to the rear side and far above the sole side of the wood head. In consequence, the sweet spot (P') of the club head, which is a point on the front face at which an extension from the centre of gravity (G') intersects with the tangent line (T) of the front face at a right angle is positioned high up the centre of the front face as shown in Figure 8. Ideally, to get a longer hitting distance and directional stability of a ball, the ball must be hit at the sweet spot of the club head. In actual play, however, most average golf players tend to hit the ball at the centre of the front face of the club head. Therefore, when they hit the ball with the wood driver, they hit the ball at a location displaced from the sweet spot of the club head. This results in inaccurate ball control

and a shorter hitting distance than had been expected. Of course, in wood drivers, attempts have been made to move the centre of gravity of the club head from the location of Figure 8 to a position closer to the front face and to the sole side of the head by placing a weight in the head. This enables the sweet spot of the club head to coincide with the centre of the front face as shown in Figure 9. However, in wood drivers, since each wood head is formed from a different piece of solid wood of different properties and is separately shaped, such a desired position of the centre of gravity must be determined one by one by separately calculating both the proper quantity of the weight and the proper position of the head to which such weight is to be arranged for each wood driver. Therefore, in the conventional wood drivers, a very complicated process is required to provide a large number of wood drivers whose centres of gravity are all located in such a desired position as that shown in Figure 9.

Accordingly, an object of the present invention is to provide an improved golf driver whose centre of gravity is positioned at the lower and frontal part of the club head in which the sweet spot of the club head is coincident with the centre of the front face thereof. In the present invention, this object is achieved by arranging a particularly designed weighting structure on the inner wall of the club head.

According to our invention in a golf club head comprising a hollow metal body, and a metal sole plate, the body includes a front wall providing a generally flat impact face of the club head, a top wall defining a generally round upper side of the club head, a rear wall defining a back of the club head, the lower edges of the front and rear walls defining the edge of an opening in

the body through which the body opens downwardly, and a hosel extending integrally from the top wall, the thickness of substantially the lower half of the front wall increasing towards the said edge of the opening, and the sole plate is attached in the said opening in close conformity with the configuration of the opening and is provided in its inner side with a raised portion extending longitudinally adjacent to the lower end of the front wall to form a heel-side weighting block on the heel side of the club head and a further toe-side weighting block on the toe-side of the club head, the toe-side weighting block being heavier than the heel-side weighting block.

This enables a large number of practically-identical club heads to be easily produced. In order to accomplish this, a golf club head may be formed by casting stainless steel in the shape of hollow substantially complete golf club head. In the preferred embodiment, both the body, and the sole plate may be formed as metal castings. Once the dies, from which the body or the sole plate is cast, are completed they can be used repeatedly to produce a large number of practically-identical casts, thereby providing identically-shaped bodies and sole plates, respectively. After casting, the sole plate may be welded in the opening to the sole side of the body to form an integral complete club head.

One embodiment of our invention and a conventional golf club head are illustrated in the accompanying drawings in which:-

Figure 1 is a front elevation showing the club head body of a golf driver according to the present invention;

Figure 2 is a bottom view of the club head body of Figure 1;

Figure 3 is a section on the line 2-2 of Figure 2;

Figure 4 is a section on the line 3-3 of Figure 2;

Figure 5 is a top plan view showing the sole plate;

Figure 6 is a section on the line 6-6 of Figure 5;

Figure 7 is a section on the line 7-7 of Figure 5;

Figure 8 is a section of the club head of a conventional wood golf driver; and

Figure 9 is a section of the club head of a golf driver of the present invention.

A preferred embodiment of the invention is illustrated in Figures 1 to 7, and 9 of the drawings. Unlike some prior golf drivers, the club head according to the invention is made primarily of metal. A metal head body (A) which is a main part of the club head is shown in Figure 1. A metal sole plate (B), which in practice is an integral part of the club head, is shown in Figure 5 separated from the main head body (A). The head body (A) is hollow and is constituted by a front wall providing a generally flat impact face of the club head, a top wall defining a generally round upper side of the club head, a rear wall defining a back of the club head, a bottom wall providing the edge of a cut-out or an opening through which the hollow head body (A) opens downwards and a hosel extending integrally from the top wall.

As shown in Figures 1 to 3, the hollow head body (A) has a toe (1), a heel (2), a front face (3) to hit a golf ball, a rear side (4) behind said front face (3), a top portion (5), and a sole or bottom side (6) providing the edge (7) of an opening or a cut-out (8) through which the hollow head body (A) opens downwards. The opening or the cut-out (8) in the sole side (6) of the hollow head body (A) is adapted to receive the sole plate (B) therein. The head body (A) further includes a hollow hosel (9) which extends therefrom. As will be appreciated, the hosel (9) is adapted to receive the shaft of the golf driver.

The head body (A), shown in Figure 1 and the related figures, is an all metal hollow body formed by casting an appropriate metal, e.g. stainless steel, into a desired hollow cup-shape. The sole plate (B), shown in Figure 5 and the related figures, is also formed from cast metal, e.g. stainless steel, and is shaped to mate with the opening or the cut-out (8) in the sole side (6) of the head body (A). The sole plate (B) is welded in the opening or the cut-out (8) to the sole side (6) of the head body (A) to form the complete club head as shown in Figure 9.

Detailed explanation will now be made regarding the particularly designed weighting structure which is arranged on the inner wall of the hollow club head in order to displace the centre of gravity of the club head from a location (G') in Figure 8 to such desired position (G) as shown in Figure 9, which lies at a point much closer to the front face (3) and the sole side (6) of the club head, thereby to align the sweet spot (P) with the centre of the front face (3). Referring to Figures 3 and 4, there is shown the first weighting portion integrally formed on the front face of the head

body (A). The weighting portion of the head body (A) is formed by thickened portion (10) extending from the toe (1) along the lower portion of the inner wall of the front face (3) toward the heel (2). At the heel (2), the end of the thickened portion (10) is positioned under the lower extension of the hosel (9), which is located inside of the hollow interior (11) of the head body (A). The thickened portion (10) protrudes inwardly from the inner wall of the front face (3) into the hollow interior (11) of the head body (A) in a slanting direction and the thickness is gradually increased towards its bottom side as shown in Figure 3. The internal side of the slanted thickened portion (10) lies between the outer surface of the front face (3) and the plane passing along the axis or extension from the hosel (9). The angle constituted by the internal side of the thickened portion (10) and by the sole plate (B) is not more than 90°. Preferably, the thickened portion (10) is formed on at least the lower half of the front face (3).

In Figure 5, there is disclosed the second weighting portion, also integrally formed on the inner side of the sole plate (B). The second weighting portion of the sole plate (B) is formed by a raised portion or rib (12) extending longitudinally thereon near the front side of the sole plate (B). The second weighting or raised portion (12) is constituted by a weighting block (13) formed on the heel side and a further weighting block (14) formed on the toe side of the club head. The toe-side weighting block (14) is thicker than the heel-side weighting block (13) to give it more weight.

Figure 9 shows the positional relationship between the first and second weighting portions, i.e. between the thickened portion (10) of the head body (A) and the

raised portion (12) of the sole plate (B) when the sole plate (B) is joined to the head body (A). As shown, the raised portion (12) of the sole plate (B) is arranged side-by-side with the thickened portion (10) of the head body (A) and extends longitudinally in a direction adjacent to the lower end of the internal side of the thickened portion (10) in alignment with the axis or the extension from the hosel (9). Preferably, the thickened portion (10) and the raised portion (12) are formed by casting the same stainless steel. By forming the weighting portions (10, 13 and 14) on the internal wall of the club head in such a particularly designed arrangement as described above, the centre of gravity of the club head can be positioned at the lower and frontal location (G) thereof where the sweet spot (P) coincides with the centre of the front face (3) as shown in Figure 9.

Referring again to Figure 4, the hollow head body (A) is further integrally formed with three spaced-apart rib-like members (15) at the upper half of the inner wall of the front face (3) to increase the resistance of the front face (3) to deformation as a result of its impact with the golf ball. The members (15) extend vertically and upwardly from the top of the thickened portion (10) to the lower surface of the top portion (5) of the head body (A).

Further, to facilitate the alignment of the sole plate (B) in the opening or the cut-out (8) of the sole side (6) of the head body (A), when combining the sole plate (B) and the head body (A) together, the sole plate (B) has three lip portions (16, 17 and 18) two of which (16, 17) are placed on the edge portion (7) of the sole side (6) of the head body (A) and the remaining one (18) fits into a complementary notch (19) formed on the edge portion (7) as shown in Figures 3 and 5.

The hollow head body (A) and the sole plate (B) are permanently secured to one another to form the integral hollow club head and can be filled with a foamed plastics material to reduce unaccustomed and objectionable sounds, due to the hollowness of the metal driver head as shown in Figure 9. For this purpose, a through-hole (20) is formed on the heel-side weighting block (13) of the raised portion (12) on the sole plate (B) at the centre thereof adjacent to the toe-side weighting block (14) as shown in Figure 5 through which a charge of the foamed plastics material is introduced into the hollow interior (11) of the hollow club head. In this case, it is preferable to use foamed plastics material of the kind provided with a low specific gravity so as not to cause substantial displacement of the centre of gravity (G) of the club head which is shown in Figure 9. Further, to adjust the overall weight of the club head to the player's requirements, lead powder can be mixed with the foamed plastics material, or a suitable weighting member can be inserted into a blind-hole in the expanded foam plastics in the club head (A) by way of the through-hole (20). In this embodiment, a self-tapping screw (21) is used as such a weighting member. The self-tapping screw (21) is also adapted to close the through-hole (20).

As described above the weight of the club head is concentrated in the face and sole sides thereof as a result of the particularly designed weighting structure formed on the inner wall of the front face (3) of the head body (A) and of the sole plate (B). By such weight distribution, the centre of gravity of the club head is positioned at a location (G) much closer to the front face and to the sole side thereof where the sweet spot (P) can coincide with the centre of the front face of the club head as shown in Figure 9. Additionally, in

accordance with the present invention, since the club head is formed from two parts of cast metal, a large number of practically-identical club heads can be easily produced at low cost.

CLAIMS

1. A golf club head comprising a hollow metal body, and a metal sole plate, in which the body includes a front wall providing a generally flat impact face of the club head, a top wall defining a generally round upper side of the club head, a rear wall defining a back of the club head, the lower edges of the front and rear walls defining the edge of an opening in the body through which the body opens downwardly, and a hosel extending integrally from the top wall, the thickness of substantially the lower half of the front wall increasing towards the said edge of the opening, and the sole plate is attached in the said opening in close conformity with the configuration of the opening and is provided in its inner side with a raised portion extending longitudinally adjacent to the lower end of the front wall to form a heel-side weighting block on the heel side of the club head and a further toe-side weighting block on the toe-side of the club head, the toe-side weighting block being heavier than the heel-side weighting block.

2. A golf club head according to claim 1, wherein the hollow body and the sole plate are formed from cast metal.

3. A golf club head according to claim 1 or claim 2, wherein the hollow body and the sole plate are both formed from stainless steel.

4. A golf club head according to any preceding claim, wherein an angle constituted by the internal side of the said lower half of the front wall of the hollow body and by the sole plate is not greater than 90°.

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5. A golf club head according to any preceding claim, wherein the metal body head is filled with a foamed plastics material.

6. A golf club head according to claim 5, wherein the raised portion of the sole plate is formed with a through-hole through which a charge of foamed plastics material is introduced into the interior of the hollow metal body.

7. A golf club head according to claim 6, wherein the through-hole is formed in the heel-side weighting block adjacent to the toe-side weighting block.

8. A golf clug head according to any preceding claim, wherein the metal body is further formed integrally on its inner side at the upper half of the front wall with spaced-apart ribs, and the said upper half of said front wall extends vertically and upwardly from the top of the said lower half of the front wall up to the lower surface of the top wall.

9. A golf club head according to claim 8, wherein the internal side of the lower half of the front wall lies between the outer surface of the front wall and an extension from the hosel, and the raised portion on the sole plate is positioned in alignment with the extension from the hosel.

10. A golf club head according to any preceding claim, wherein the hosel has a lower part extending into the hollow interior of said body and wherein the heel end of the lower half of the front wall lies under the lower part of the hosel.

11. A golf club head according to any of claims 5 to 10, wherein a self-tapping screw is inserted in the expanded foamed plastics material within the metal body through the through-hole.

12. A golf club head according to any of claims 5 to 11, wherein lead powder is mixed with the foamed plastics material.

13. A golf club head substantially as described herein with reference to and as illustrated in Figures 1 to 7, and Figure 9 of the accompanying drawings.

14. A golf club comprising a head as claimed in claim 13, in combination with a shaft carrying said head.

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