ABSTRACT
A golf-club head has a first half of shaped crown integrally including skirt and a hosel connection having a hosel attachment opening. A second half is a bottom plate having an integral striking face with built-in angle of loft so that the two halves are welded together providing solder leakage concentrating on the lower part of the head. A hosel is welded to the crown at the hosel connection.
FIG. 2
INTEGRAL SOLE FACE CLUB HEAD

FIELD OF THE INVENTION

[0001] This invention relates to a method of manufacturing sports equipment, specifically a golf club made of two head halves and a hosel.

DISCUSSION OF RELATED ART

[0002] The traditional forged component structure of a golf-club head has four pieces, a crown, a hosel, a faceplate, and a sole in clockwise direction of FIG. 5. The crown of the traditional four-piece golf club is welded to the sole at its upwardly extending skirt so that leakage of solder wire is about 8-10 g, which concentrates on the upper part of the head, raising the head's center of gravity. This makes the total solder welding weight of about 22 g which can affect the golf club head weight distribution and center of gravity or CG in short. Therefore, loss of precision and other center of weight problems have long been unsolved in four-piece type of golf-club head. Since the weight distribution of a club head is generally uniform, in order to correct the center of gravity one must add inserts commonly made of heavier material to the sole and skirt of the head.

[0003] Traditionally, the sole and skirt are integrally formed from one sheet of metal as seen in FIG. 5 although it is preferred to have a thicker sole than the skirt. Unfortunately, the traditional method makes this difficult because the sole and skirt are formed from a uniform thickness planar metal sheet. Additionally, the welding junction of the four pieces that defines the hosel connection requires excessive solder accumulation causing a variety of weight distribution and tolerance problems.

[0004] Further, there are issues with regard to welding the sole, crown and face to one another (each other). Each positioning of the pieces in production cannot guarantee the same profile of the resulting face angle, i.e. the angle of loft for every product.

SUMMARY OF THE INVENTION

[0005] The club head of this invention has the faceplate with sole made in a single piece like the crown with the integral skirt. The club head also includes a stretched hosel connection. A workpiece pattern is prepared and a mold draws the faceplate and sole, which is erected from the faceplate along a transverse line at a built-in angle of loft. Thus, the faceplate is formed from a flat sheet of metal into a face-sole unit. Similarly, another mold draws the crown of the golf-club head to integrally include a skirt and stretched hosel connection. Thus, the crown is formed from a second flat sheet of metal into a crown-skirt unit. In certain crown shapes, the male mold member may have to be made collapsible.

[0006] Optionally, the hosel may be integral to the faceplate formed of a single piece of metal and welded to the crown at the hosel connection when the club parts are welded along an interface formed between the face-sole unit and crown-sole unit. Also, the hosel and face of the face-sole unit can be made of two separate pieces of metal and joined together. The hosel and face can be joined together before or after the welding of other parts.

[0007] The hosel connection has a hosel attachment opening receiving a standard cylindrical hosel with precise tolerance. The crown-skirt unit is then welded to the face-sole unit along a seam line and to the hosel in order to form the golf-club head. In traditional structures, the sole is integrated with skirt and is then welded with the crown, striking face and hosel. The striking face commonly has grooves, which indicate the sweet spot.

[0008] Welding the crown-skirt unit to the face-sole unit advantageously lowers the center of gravity of the head compared to the traditional component welded structure. In the present invention, the welding position is lowered to the lower side of the head and the bottom at the face-sole unit with an in-leakage of solder of about 3 g, which concentrates on the lower part of the head. Thus, a portion of weight is shifted from the upper part of the head, where the crown and the skirt would otherwise have been welded, to the lower part of the head. In comparison, conventional golf club head includes three components of a crown, a sole with a skirt, a faceplate welded via the respective seam lines. The club head also has a hosel, which protrudes into the cavity of the club head through an opening defined by converging edges of the three components and welded thereto.

[0009] According to the present invention, the junction between the faceplate and the sole is completely spared any welding seam that may cause the unevenness of the sole bottom and the irregular loft angle plaque associated with conventional golf club heads. Overall, the net effect is to guarantee the production of club head with same external shape or the angle of loft that was difficult to achieve in the past because the separate face had to be positioned and welded to the sole as well as the crown. It means the head’s center of gravity CG can be lowered by about 1-1.5 mm or more compared to that of a head made in a traditional fashion. A 1 mm CG shift should substantially affect the sweet spot. In addition, the integral structure of the face-sole unit ensures the durable junction of the face and sole with eliminated possibility of cracking even after repeated high impacts during the life of the club head.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is an exploded perspective view of the club head according to the present invention depicting the steps to make the same.

[0011] FIG. 2 is a perspective view of the club head according to the present invention.

[0012] FIG. 3 is a side sectional view of the club head of FIG. 1.

[0013] FIG. 4 is a side sectional view of the prior art club head.

[0014] FIG. 5 is an exploded view of the prior art club head.

[0015] FIG. 6 is a perspective view of the prior art club head of FIG. 5.

[0016] FIG. 7 is an exploded view of the club head according to the present invention.

[0017] FIG. 8 is a perspective view similar to FIG. 2 for comparison with the prior art club head.

[0018] FIG. 9 is a perspective view of the crown according to the present invention.

[0019] FIG. 10 is a perspective view of the prior art crown.
OBJECTS OF THE INVENTION

[0020] 1. Relocating welding seams to the bottom, and avoiding skirt to crown welding as well as face to sole welding. Lowering the sweet spot by 1-1.5 mm.

[0021] 2. Guaranteeing the club head production with same external shape or the angle of loft.

[0022] 3. Increasing strength at the junction of the face and sole with eliminated possibility of cracking even after repeated high impacts.

[0023] 4. Making a design where welding solders does not change the center of gravity as much. Save 8 grams of welding weight and have only about 14 grams of welding concentrated in the lower sole plate.

[0024] 5. Using the welding solder weight savings to lower the center of gravity by having a thicker sole plate.

[0025] 6. Creating a better hosel connection by having a one-piece stretch formed hosel connection to allow tighter tolerance.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0026] A mold may use a wide variety of metal forming methods such as forging, casting, stamping, rolling, or super plastic deformation to make the parts to the golf-club head. One method in current use is discussed in Song, U.S. patent Ser. No. 10/672,463, which is incorporated herein by reference. Here a wide variety of means for forming parts can be used. Although a variety of means for forming parts can be used, it is preferred to make the face-sole unit from super plastic deformation technique. The super plastic deformation technique is not required for any part of the invention. Also, titanium is not required, but preferred as the best mode.

[0027] Referring to FIGS. 1 and 2, the key to the club head 100 of this invention is the faceplate 120a with sole 120b offered in single piece like the crown 110a with skirt 110b. The club head 100 also includes a stretched hosel connection. A workpiece pattern 105 is prepared and a mold draws the faceplate 120a and sole 120b erected from the faceplate 120a along a transverse line 116 at a predetermined angle, which defines the angle of loft for the subsequent club head 100 in FIG. 2. Therefore, the faceplate 120a is formed from a flat sheet of metal into a face-sole unit 120. Similarly, another mold draws the crown 110a of the golf-club head to integrally include a skirt 110b and stretched hosel connection 117. Thus, the crown 110a is formed from a flat sheet of metal into a crown-skirt unit 110. In certain crown shapes, the male mold member may have to be made collapsible. According to the prior art it is well known how to make a male mold member collapsible for removal from the workpiece.

[0028] As can be seen in the prior art clubs, the hosel 140 may be integral to the faceplate 120a formed of a single piece of metal and welded to the crown at the hosel connection when the club parts are welded along an interface formed between the face-sole unit and crown-skirt unit. The present invention does not require a hosel 140 and face 120a to be made of one piece of metal and thus integrally formed. The hosel 140 and face 120a of the face-sole unit 120 can be made of two separate pieces of metal and joined together. The hosel 140 and face 120a can be joined together before or after the welding of other parts.

[0029] The hosel connection has a hosel attachment opening 115 receiving a standard cylindrical hosel 140 with precise tolerance. The crown-skirt unit 110 is then welded to the face-sole unit 120 along a seam line 112 and to the hosel 140 in order to form the golf-club head 100. In traditional structures, the sole (bottom) is integrated with skirt and is then welded with the crown, striking face and hosel. The striking face 120a commonly has grooves not shown, which indicate the sweet spot.

[0030] FIG. 3 shows a sectional view of the club head 100 that has been sawn in half after assembly. The wider outside portion of the hosel 140 matches the circumference of the shaft not shown, and the narrower inside portion 142 of the hosel 140 fits inside the crown-skirt unit 110. The hosel 140 is connected to the crown-skirt unit 110 at the hosel connection opening 115. A weld 112 attaches the face-soul unit 120. On the right side is depicted the other half of the club such that the two halves of the striking faces are facing each other.

[0031] Welding the crown-skirt unit 110 to the face-sole unit 120 should lower the center of gravity of the head compared to the traditional component welded structure. In the present invention, the welding position 112 is lowered to the lower side of the head and the bottom at the face-sole unit 120 with an in-leakage of solder of about 3 g, which concentrates on the lower part of the head. Thus, a portion of weight is shifted from the upper part of the head, where the crown and the skirt would otherwise have been welded as seen in FIG. 4, to the lower part of the head as seen in FIG. 3. FIG. 4 shows conventional golf club head 200 having three components of a crown 210, a sole 220 with a skirt, a face plate 230 welded via seam lines 212a, 212b and 212c. The club head 200 also has a hosel 240, which protrudes into the cavity of the club head through an opening defined by converging edges of the three components and welded thereto.

[0032] In contrast, it is clear from FIG. 3 that the junction between the faceplate 120a and the sole 120b is completely spared any welding seam that may cause the unevenness of the sole bottom and the irregular loft angle plaque associated with conventional golf club heads.

[0033] Overall, the net effect is to guaranty the production of club head with same external shape or the angle of loft which was difficult to achieve in the past because the separate face had to be positioned and welded to the sole as well as the crown. It means the head’s center of gravity CG can be lowered by about 1-1.5 mm or more compared to that of a head made in a traditional fashion. A 1 mm CG shift should substantially affect the sweet spot.

[0034] In addition, the integral structure of the face-sole unit 120 ensures the durable junction of the face and sole with eliminated possibility of cracking even after repeated high impacts during the life of the club head.

[0035] FIG. 5 shows an exploded view of the prior art. The crown 210, the striking face 230, the sole 220, and the hosel 240 are connected to each other manually and welded along their interfaces forming a hollow golf club. As seen in FIG.
the placement of the various elements requires manual skill. FIG. 6 shows welding of the assembled prior art club shown in FIG. 5. The hosel 240 is welded at hosel welding 218, which is built up and manually configured. To make such club requires three seam lines 212a, 212b and 212c.

FIG. 7 shows the exploded view of the present invention. The hosel 140 rests in a pre-configured position in the crown-skirt unit 110. The face-soul unit 120 is connected. The sole welding to the crown skirt 110 is toward the bottom of the club, lowering the center of gravity after welding as opposed to raising center of gravity common in the prior art.

FIG. 8 shows the assembled present invention having a micro weld 118 between the hosel 140 that is a much smaller weld required. With a smaller weld the tolerance is tighter and the center of gravity change is smaller. Between the face-soul unit 120 and crown-skirt unit 110 the single seam line 112 is present.

When the crown 110a and skirt 110b are integrally formed, the crown-skirt unit 110 is locally stretched to form a hosel connection opening 115 and throat portion 117, which together constitute an integral seat (arch) 920 shown in FIG. 9.

The hosel 140 is commonly cylindrical having a pair of terminating ends. A first end inserts into the crown 110a on the club head and a second end attaches to the shaft not shown. The hosel 140 is placed in the hosel receiving opening 115. The hosel member portion 142 fitting into the crown 110a is of smaller cross-section than the portion of the hosel member 140 that does not fit into the inside of the crown 110a. The hosel 140 is then welded to the hosel (connection) area around the opening 115. After the connection welding, the shapes of throat part or hosel attachment area 117 on all heads are standardized having much smaller variances than before. The hosel rests on the hosel connection opening 115 so that a welder can more easily position the hosel.

The top portion of the hosel is larger than the hosel opening 115 on the crown 110a. The top portion of the hosel allows the hosel to rest in the opening without having to position the hosel (moving) into or out of the opening. The bottom cylindrical portion of the hosel designed to connect to the crown is sized to fit into the circular opening. The bottom cylindrical portion does not need to be snugly fitted, and can have some slack. The hosel attachment area 920 can be formed as a round protrusion drawn from and protruding from the top of the crown. The round protrusion 920 would then have a terminating circumference. The hosel attachment area should have a terminating circumference matching the circumference of an annular protrusion defined by the diametric transition between the top and inserted portions of the hosel 140. During assembly, the top portion of the hosel matches with the circumference of the hosel attachment area so that after welding and surface finish, the weld between the hosel attachment area and hosel is a smooth transition and not noticeable. The top portion of the hosel forms the outside circumference of the hosel.

FIG. 10 shows the crown of the prior art having no enclosed opening to secure the hosel 240 prior to and during welding. The crown 110 of the prior art has an open connection 940 that does not provide tight tolerance.

The thickness of the sole 120b can be greater than that of the skirt plate thickness. The side and bottom parts of a traditional four piece head are of basically uniform thickness with a welding weight of around 22 g. But as the welding weight of the present invention is about 8-10 g lighter than usual, the thickness of the sole can be increased for greater moment of inertia and change in center of gravity.

By utilizing different thickness of metal for the face-soul unit 120 shifting the designed center of gravity or change of moment of inertia is possible according to the present invention.

Additionally, using titanium for the head with the method of super plastic deformation (SPD) or severe plastic deformation forming the faceplate 120a may have more varieties of thickness to change the weight distribution of the club head, so as to lower the center of gravity of the club.

The SPD formation allows the face-soul unit 120 to have its middle portion 121 thicker than the rest though other variations in thickness along the entire wall of the face-soul unit 120 can be realized. The adjustment of sectional thickness and structure of the striking face enhances the bouncing rate and the striking distance of the club. The crown-skirt unit 110 and the face-soul unit 120 of the present invention may be welded by SPD formation.

After welding, the club head is surface finished and then can be attached to a shaft to form the golf club. The surface finish can be prepared so that the entire connection appears as a single continuous shaft protruding from the crown.

CALL OUT LIST OF ELEMENTS

100 Golf-Club Head
105 Workpiece
110 Crown-Skirt Unit
110a Crown
110b Skirt
112 Seam Line
115 Hosel Attachment Opening
117 Hosel Connection with Arch
118 Micro Weld
120 Face-Sole Unit
120a Faceplate
120b Sole
121 Thicker Face Portion
140 Hosel
142 Hosel Member Portion Fitting Into Club
200 Prior Art Club Head
210 Crown
212a, 212b, 212c Seam Lines
218 Hosel Welding
220 Sole
230 Face Plate
A golf-club head comprising:

a. a crown integrally including skirt and a hosel connection having a hosel attachment opening;

b. a bottom sole having an integral striking face extending from said bottom sole, said bottom sole and striking face being welded to said crown and skirt along a closed loop of seam line, wherein solder leakage concentrates on the lower part of said head; and

c. a hosel having a lower section for inserting into said hosel attachment opening and an enlarged section with an annular transition, which is formed between said lower section and seated on said hosel connection for welding attachment thereto.

2. The golf-club head of claim 1 wherein said hosel attachment opening is round and receives a standard cylindrical hosel.

3. The golf-club head of claim 1 wherein said crown and skirt are integrally formed to include an arch at said hosel connection.

4. The golf-club head of claim 1 wherein the thickness of said bottom sole is greater than the skirt plate thickness.

5. The golf-club head of claim 1 wherein said crown and skirt are integrally formed to include an arch at said hosel connection, which terminates in a circumference matching the outside circumference of said annular transition of said hosel.

6. A golf-club head comprising:

a. a crown formed from a single sheet of metal so that it integrally includes a skirt and a stretched hosel connection having a hosel attachment area (opening);

b. a bottom sole having an integral striking face extending from said bottom sole, wherein solder leakage concentrates on the lower part of said head; and

c. a hosel formed integral to said striking face and sole unit for receiving a shaft, said hosel having a lower section and an enlarged section with an annular transition, which is formed between said lower section and seated on said hosel connection for welding attachment thereto, whereby said crown and skirt unit is welded to said bottom sole and striking face unit along an interface formed therebetween.

7. The golf-club head of claim 6 wherein said hosel attachment opening is round and receives a standard cylindrical hosel.

8. The golf-club head of claim 6 wherein said crown and skirt unit is integrally formed to include an arch at said hosel connection.

9. The golf-club head of claim 6 wherein the thickness of said bottom sole is greater than said skirt plate thickness.

10. The golf-club head of claim 6 wherein said crown and skirt unit includes an arch at said hosel connection, which terminates in a circumference matching the outside circumference of said annular transition of said hosel.

11. A golf-club head comprising:

a. a crown formed from a flat sheet of metal so that it integrally includes a skirt and a hosel connection;

b. a bottom sole having an integral striking face extending from said bottom sole and being welded to said crown, wherein solder leakage concentrates on the lower part of the head; and

c. a hosel welded to said crown at said hosel connection.

12. The golf-club head of claim 11 wherein the hosel attachment opening is round and receives a standard cylindrical hosel.

13. The golf-club head of claim 11 wherein the crown and skirt are integrally formed to include an arch at the hosel connection.

14. The golf-club head of claim 11 wherein the thickness of the bottom sole is greater than the skirt plate thickness.

15. The golf-club head of claim 11 wherein said crown and skirt are integrally formed to include an arch at said hosel connection, which terminates in a circumference matching the outside circumference of said annular transition of said hosel.

* * * * *