QUICK DISCONNECT SYSTEM FOR COUPLING A GOLF CLUB HEAD WITH A GOLF CLUB SHAFT

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ABSTRACT

A hosel fitting for connecting a shaft to one of a plurality of club heads comprises a first portion of a tubular structure configured to be affixed to the end of the shaft and a second portion of the tubular structure configured to be received by a bore in a club head. The second portion of the tubular portion can be configured to extend down into the bore. The hosel fitting can also comprise a fastener receiving portion for receiving a fastener configured to affix the hosel fitting to any one of the plurality of club heads.
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RELATED APPLICATIONS INFORMATION


BACKGROUND

[0002] 1. Field

[0003] This invention relates to wood golf clubs and, more particularly, to such wood golf clubs wherein the vertical center of gravity of the wood club head is selectable.

[0004] 2. Background

[0005] The golf clubs that are used to hit the golf ball the greatest distances are the “woods”. The woods originally were made of natural wood but today are made of metals or composite materials. However, they continue to be termed “wood golf clubs” or “woods”, and that terminology is used herein.

[0006] The wood golf clubs have wood club heads with relatively large mass, and loft angles of the faces relative to the soles selected to achieve a long flight distance of the struck golf ball. A golf player typically carries up to five woods, which are distinct from each other in that the loft angle varies from about 7 to about 11 degrees for a driver wood golf club, and about 12 degrees and higher for other wood golf clubs. Of the golf clubs termed “woods”, the drivers, with relatively low loft angles, are designed to hit the golf ball the greatest distances. The golfer selects the required wood golf club from this group of wood golf clubs. A wood golf club, and normally a driver, is used for most long shots from the tee, and may be used on intermediate shots on some longer holes.

[0007] As the game of golf has been studied analytically, it has become clear that the design of the wood golf club plays a part in the ability of the player to hit long, accurately directed shots. For example, the shapes of the wood club heads have been optimized. Large-sized wood club heads have been introduced. Wood club heads have been designed to allow the player to add weight to the wood club head.

[0008] While these approaches yield benefits, the present inventors have observed that most players still cannot obtain wood golf clubs that are optimal for the individual. Players vary according to weight, height, strength, skill and other factors. Wood golf clubs may be purchased with varying shaft lengths, but the wood club heads themselves do not change, except as to the loft angle of the face and the ability to add weight to the wood club head in some designs. These approaches do not provide the required flexibility in selecting the wood club heads that are best suited to the individual player.

[0009] There is a need for an improved approach to the design of wood club heads, which allows the player to obtain wood golf clubs that are optimized for the individual. The present invention fulfills this need, and further provides related advantages.

SUMMARY

[0010] A hosel fitting for connecting a shaft to one of a plurality of club heads comprises a first portion of a tubular structure configured to be affixed to the end of the shaft and a second portion of the tubular structure configured to be received by a bore in a club head. The second portion of the tubular portion can be configured to extend down into the bore. The hosel fitting can also comprise a fastener receiving portion for receiving a fastener configured to affix the hosel fitting to any one of the plurality of club heads.

[0011] In one aspect, the bore, hosel fitting, and shaft are always substantially in line. In other words, the purpose of the hosel fitting is not to realign the angle of the shaft the club head, i.e., it is not intended to adjust the lie angle. Rather, the hosel fitting is meant to allow anyone of a plurality of shafts to be interfaced with a club head, so that different shaft configurations can be tested without changing any other parameters.

[0012] Other features and advantages of the present invention will be apparent from the following more detailed description of the preferred embodiment, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention. The scope of the invention is not, however, limited to this preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a perspective view of a wood golf club according to the invention;

[0014] FIGS. 2-4 are sectional views taken on line 2-2 of FIG. 1, illustrating a preferred technique for adjusting the center of gravity of the wood club head;

[0015] FIGS. 5-7 are side sectional views, like those of FIGS. 2-4, and taken on line 2-2 of FIG. 1, illustrating a second technique for adjusting the center of gravity of the wood club head;

[0016] FIG. 8 is an enlarged, partially exploded, sectional view of the wood club head, taken on line 8-8 of FIG. 1; and

[0017] FIG. 9 is a block diagram of a method of providing a wood golf club for a player.

DETAILED DESCRIPTION

[0018] FIG. 1 depicts a wood golf club 20. The wood golf club 20 is sometimes termed a “wood” club or a “wood”. The wood golf club 20 includes a wood club head 22 and a generally cylindrical wood club shaft 24 affixed to the wood club head 22. The wood club shaft 24 may be of any operable material of construction, such as metal (e.g., titanium, aluminum), composite (e.g., graphite/epoxy), or even natural wood; produced by any operable method; of any operable diameter; of any operable length; and of any operable physical properties (e.g., elastic modulus, strength). One of the features of the present invention, as will be discussed subsequently in relation to FIG. 8, is that the wood club shaft 24 is readily interchangeable.

[0019] FIG. 2 is a sectional view through the wood club head 22. In the preferred form, the basic structure of the wood club head 22 preferably includes two pieces, a one-piece wood head body 26 and a one-piece wood head face
plate 28 affixed to the wood head body 26 by a weldment 30, by an adhesive, or by other means for affixing. The wood head body 26 may be described in terms of two regions pertinent to the present discussion, a generally planar sole 32 that rests upon the ground 34, and a crown 36 that is visible to the eye of the player when the player holds the wood golf club 20 and looks downwardly toward the wood club head 22. The wood head body 26 is preferably hollow, and the crown 36 is convexly (outwardly) curved relative to the interior of the wood head body 26. The crown 36 is the convexly, outwardly curved portion of the wood head body 26 that is uppermost in FIG. 2. The sole 32 is the lowermost portion of the wood head body 26 in FIG. 2, which is flat over most of its area and slightly upwardly curved toward the left hand side of FIG. 2 (remote from the wood head face plate 28). The sole 32 meets and is contiguous with the crown 36 on the left hand side of FIG. 2.

[0020] The wood head body 26 may be made of any operable material, but is preferably made of a metal alloy such as a titanium alloy. The wood head body 26 may be made by any operable manufacturing process, but is preferably made by a casting technique such as lost wax casting or die casting. It may also be forged or machined. The wood head face plate 28 is made separately from the wood head body 26. The wood head face plate 28 is preferably also a metal alloy such as a titanium alloy, but a different alloy composition than used in the wood head body 26. The wood head face plate 28 is preferably forged. After the wood head body 26 and the wood head face plate 28 are fabricated separately, they are joined by fitting the wood head face plate 28 into a recess formed on the wood head body 26 and then welded, adhesively bonded, or otherwise attached in place by the weldment 30 that extends around the periphery of the wood head face plate 28.

[0021] The inventors have determined that an important performance characteristic of the wood golf club 20 is a vertical location of a center of gravity 38 of the wood head body 26. The “vertical location” is a distance Dc0 from an external surface 40 of the sole 32 toward the crown 36 measured along a line 42 perpendicular to the planar portion of the sole 32.

[0022] FIGS. 2-4 illustrate three wood club heads 22 for a set of wood golf clubs 20. These three wood club heads 22 of FIGS. 2-4 have substantially the same external shapes and volumes. The three wood club heads 22 also have substantially the same total weights. The shapes, volumes, and weights of the three wood club heads 22 in this set of wood golf clubs 20 are substantially the same in order to allow optimization of the selection of the vertical location of the center of gravity 38, without simultaneously varying other parameters such as shape, loft angle, and total weight of the wood club head 22.

[0023] The vertical locating of the center of gravity 38 of the three wood club heads 22, while maintaining the limitation of substantially constant external shape, volume, and total weight, may be accomplished by any operable approach. FIGS. 2-4 illustrate a preferred approach, changing the thicknesses of the sole 32 and the crown 36 to redistribute weight and move the center of gravity 38 vertically. The thickness changes and the movement of the center of gravity 38 are quite small and may be difficult to discern in precisely scaled drawings, so in FIGS. 2-4 the thickness variations and the vertical displacement of the center of gravity 38 are exaggerated. In the wood club head 22 of FIG. 2, a thickness t of the sole 32 is relatively large, and a thickness t of the crown 36 is relatively small, so that the weight of the sole is relatively large and the weight of the crown is relatively small. Consequently, the center of gravity 38 is relatively low (i.e., near to the sole 32). (The exact locations where the thickness of the sole and the thickness of the crown are measured is not critical, as long as they are generally in the centers of the respective regions and are consistently positioned from wood club head to wood club head within a set.) The weight of a region such as the crown or the sole generally correlates with its thickness within this set of club heads, so that the thicker the region, the greater its weight. In the wood club head 22 of FIG. 3, the thickness t of the sole 32 is smaller than that of the wood club head 22 of FIG. 2, and the thickness t of the crown 36 is greater than that of the wood club head 22 of FIG. 2. The result is that the center of gravity 38 of the wood club head 22 of FIG. 3 is higher (i.e., further from the sole 32) than the center of gravity 38 of the wood club head 22 of FIG. 2. In the wood club head 22 of FIG. 4, the thickness t of the sole 32 is smaller than that of the wood club head 22 of FIG. 3, and the thickness t of the crown 36 is greater than that of the wood club head 22 of FIG. 3. The result is that the center of gravity 38 of the wood club head 22 of FIG. 4 is higher (i.e., further from the sole 32) than the center of gravity 38 of the wood club head 22 of FIG. 3. The wood club head 22 of FIG. 2 is termed the “L” (low) center of gravity variation, the wood club head 22 of FIG. 3 is termed the “M” (medium) center of gravity variation, and the wood club head 22 of FIG. 4 is termed the “H” (high) center of gravity variation. More variations in the vertical location of the center of gravity 38 may be provided than the three illustrated, but initial testing indicates that three variations are sufficient for most applications. The changes in thickness of the sole 32 and of the crown 36 in each case are selected so that the total weight of the wood club head 22 remains the same. The changes in thickness are accommodated by varying the position of an inner wall 44 of the wood club head 22, so that the shape of an outer wall 46 remains unchanged.

[0024] The wood head bodies 22 of FIGS. 2-4 are preferably manufactured by a lost wax casting approach. This technique is known generally for the manufacture of hollow golf club head bodies of other designs, see for example U.S. Pat. No. 5,429,365. Generally, there is an outer casting shell that defines the position, shape, and size of the outer wall 46, and a casting core that defines the position, shape, and size of the inner wall 44. In the present case, the outer casting shell used for the three wood club heads 22 of FIGS. 2-4 is the same, so that the wood head bodies 22 have the same external shape, loft angle, and volume, about 335 cubic centimeters in the preferred approach. The casting cores used to cast the three wood head bodies 26 have a constant volume, so that the total amount of metal (and hence the weight) in each of the wood head bodies 26 is a constant amount, preferably in the range of from about 195 to about 205 grams in the preferred approach wherein the wood head bodies 26 are cast from the titanium alloy titanium-6 weight percent aluminum-4 weight percent vanadium. The casting cores are differently positioned, so as to define the thicknesses of the sole 32 and the crown 36 in the manner discussed previously to produce the three different types of wood club heads 22 of FIGS. 2-4.
[0025] Once the outer casting shell and the casting core are positioned, molten metal is poured into the space between and cooled to solidify and to form each of the wood head bodies 22. Any operable castable material may be used, but a titanium alloy such as titanium-6 weight percent aluminum-4 weight percent vanadium is preferred. After the cast metal has solidified, the outer casting shell and the casting core are removed, leaving the final hollow cast wood club head 22 having a cast microstructure. In alternative fabrication techniques, such as a forged or a machined microstructure, the final wood club head 22 has a corresponding microstructure such as a forged or a machined microstructure, respectively.

[0026] Other operable techniques for changing the vertical location of the center of gravity 38 may be used, and FIGS. 5-7 illustrate one such alternative approach. The pertinent parts of the prior discussion of the embodiments of FIGS. 2-4 are incorporated here. In the embodiment of FIGS. 5-7, a sole fitting 48 is formed in the sole 32, and a crown fitting 50 is formed in the crown 36. These fittings 48 and 50 are externally accessible. A corresponding sole weight insert 52 and a crown weight insert 54 are inserted into the respective sole fitting 48 and crown fitting 50. In a preferred version of this embodiment, the fittings 48 and 50 are female-threaded fittings, and the weight inserts 52 and 54 are matching male-threaded weights. The weight inserts 52 and 54 may be readily installed, removed, and moved in various combinations. The total weight of the sole weight insert 52 and the crown weight insert 54 is maintained constant, so that the total weight of the wood club heads 22 of FIGS. 5-7 remains constant.

[0027] The approach of FIGS. 2-4 has the advantage that the weight change is distributed broadly over the sole and the crown. The approach of FIGS. 5-7 has the advantage that the weight inserts 52 and 54 may be readily changed. The approach of FIGS. 5-7 has the additional advantage that the total of the weight inserts 52 and 54 may be readily changed, if desired.

[0028] The wood club heads of FIGS. 2-4 and 5-7 are illustrated as being conventional in configuration, except for the ability to change the vertical location of the center of gravity. Other modifications that have been found or may be found useful in wood club heads, such as changes in external shape or total weight, or material of construction, may be utilized in conjunction with the present approach.

[0029] The approaches of FIGS. 2-4 and FIGS. 5-7 are used to change the vertical location of the center of gravity 38. Another factor that significantly influences the performance of the wood golf club 20 is the nature of the wood club shaft 24. FIG. 8 illustrates an embodiment of the present approach that allows various types of wood club shafts 24 to be used with the variations of FIGS. 2-4 and FIGS. 5-7. The preferred wood club head 22 of the present approach has no integral hosel, which is a tubular portion that extends upwardly from the crown 36 of the conventional wood club head. The wood club shaft of the conventional wood club is inserted into the hosel and affixed to the hosel with an adhesive such as an epoxy.

[0030] In the present approach as seen in FIG. 8, the wood club head 22 has no hosel, but instead has a bore 60 fabricated into the wood head body 26. The bore 60 has a base 62 that defines the bottom of the bore 60. An aperture 64 extends through the base 62. The bore 60 is sized to receive a hosel fitting 66 affixed to an end 68 of the wood club shaft 24. (The hosel fitting 66 is not integral with the wood club head 22.) The bore 60 is oriented in the wood club head 22 so that the wood club shaft 24 has the proper orientation to the wood club head 22 and to the wood head face plate 28. A fastener, preferably a male-threaded fastener 70 such as the illustrated bolt, extends through the aperture 64 of the base 62 to engage the female-threaded hosel fitting 66, and thence the wood club shaft 24, to the respective wood club head 22, when the hosel fitting 66 is inserted into the bore 60. The sole 32 is locally recessed at recess 72 so that the head of the fastener 70 does not strike the ground 34 when the wood golf club 20 is swung. With this approach, the wood club shaft 24 may be readily changed so that different shafts may be tested and possibly used with the various wood club heads 22. Shafts of different lengths, diameters, materials of constructions, elastic properties, and other characteristics may thence be utilized.

[0031] An important application of the present approach is to maximize the performance of the golf player for the wood golf clubs, by providing the optimal wood golf club equipment for the individual player. FIG. 9 illustrates this approach. A wood golf club of a test configuration is provided, numeral 80. The performance of the wood golf club test configuration when used by the particular player is analyzed, numeral 82. The steps 80, 82 are repeated, numeral 84, for a new test configuration, and may be repeated as many times as necessary to determine the optimum performance of the player as a function of the several variables that may be evaluated. Variables that may be included in the evaluation include the wood club head 22 and particularly the vertical location of the center of gravity of the wood club head, as discussed above, the type of drive club shaft 24 that is installed to the wood club head 22, and the type of golf ball being hit. This procedure would be used for a first set of wood golf clubs with a constant selected loft angle, and then may be used for additional sets of wood golf clubs with a different (but constant within any one set) loft angle. The present procedure is expected to yield the best benefits for the wood golf clubs with the lowest loft angles, termed the “drivers”, but it may be used as well for other wood golf clubs.

[0032] The following performance tables for golfers A, B, and C, employees of the assignee, were developed by the procedure of FIG. 9 during the initial testing of the present approach. Each entry in the tables represents the average of multiple hits of a single commercial brand of golf ball. Performance was evaluated using a standard Launch Monitor device for analyzing golf ball movement. In each case, the golfer used three wood golf clubs 20. The wood club head 22 in each case was a 335 cubic centimeter, 200 gram, 7.5 degree loft angle club. The variation between the wood golf clubs was (L), medium (M), or high (H) vertical position of the center of gravity 38. The following table gives the approximate thicknesses, measured in inches, of the sole 32 and the crown 36 at the same respective point on each wood club head, and the resulting vertical position of the center of gravity in millimeters.
In the following performance tables, the table entries are, from left to right, the wood club head identification (L, M, or H), the initial launch speed (\(V_0\)) of the ball in miles per hour, the spin rate (SR) of the ball in revolutions per minute, the launch angle (LA) of the ball in degrees, the carry distance (CD) on the fly of the golf ball in yards, and the total distance (TD) of the golf ball on the fly and rolling, in yards.

<table>
<thead>
<tr>
<th>Golfer A</th>
<th>Club Ident</th>
<th>(V_0)</th>
<th>SR</th>
<th>LA</th>
<th>CD</th>
<th>TD</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>160.5</td>
<td>2066</td>
<td>8.6</td>
<td>228.7</td>
<td>255.4</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>160.3</td>
<td>2163</td>
<td>9.4</td>
<td>237.9</td>
<td>268.2</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>161.2</td>
<td>2436</td>
<td>9.7</td>
<td>239.0</td>
<td>271.9</td>
<td></td>
</tr>
</tbody>
</table>

What is claimed is:

1. A hosel fitting for connecting a shaft to one of a plurality of club heads comprising:
   - a first portion of a tubular structure configured to be affixed to the end of the shaft;
   - a second portion of the tubular structure configured to be received by a bore in a club head, the second portion of the tubular portion extending downwardly into the bore;
   - a fastener receiving portion for receiving a fastener configured to affix the hosel fitting to any one of the plurality of club heads; and
   wherein the bore, hosel fitting, and shaft are always substantially in line.

2. The hosel fitting of claim 1, wherein the fastener receiving portion comprises a female-threaded fastener receiver configured to receive a male-threaded fastener.

3. The hosel fitting of claim 2, wherein the male-threaded fastener comprises a bolt.

4. The hosel fitting of claim 1, wherein the fastener receiving portion comprises a male-threaded fastener receiver configured to receive a female-threaded fastener.

5. The hosel fitting of claim 1, wherein the second portion of the tubular structure is configured to extend downwardly into the bore until it contacts a base of the bore.

6. A golf club assembly, comprising:
   - a fastener;
   - a club head comprising a bore;
   - a shaft; and
a hosel fitting for connecting the shaft to the club head, the hosel fitting having:

a first portion of a tubular structure configured to be affixed to the end of the shaft;

a second portion of the tubular structure configured to be received by the bore in the club head, the second portion of the tubular portion extending downwardly into the bore;

a fastener receiving portion for receiving the fastener, the fastener configured to affix the hosel fitting the club head, wherein the bore, hosel fitting, and shaft are always substantially in line.

7. The golf club assembly of claim 6, wherein the fastener receiving portion comprises a female-threaded fastener receiver, and wherein the fastener is a male-threaded fastener.

8. The golf club assembly of claim 7, wherein the male-threaded fastener comprises a bolt.

9. The golf club assembly of claim 6, wherein the fastener receiving portion comprises a male-threaded fastener receiver, and wherein the fastener comprises a female-threaded fastener.

10. The golf club assembly of claim 6, wherein the bore comprises a base, and wherein the second portion of the tubular structure is configured to extend downwardly into the bore until it contacts the base of the bore.

11. The golf club assembly of claim 10, wherein the bore further comprises an aperture in the base, wherein the fastener is configured to extend through the aperture to mate with the fastener receiving portion.

12. The golf club assembly of claim 6, wherein the bore is configured to orient the shaft properly when the shaft is connected to the club head using the hosel fitting.

13. The golf club assembly of claim 6, wherein the fastener is configured to allow the club head to be exchange with a different club head.

14. The golf club assembly of claim 13, wherein the different club head comprises a different center of gravity relative to the first club head.

15. The golf club assembly, wherein the fastener allows the shaft to be exchange with a different shaft.

16. The golf club assembly of claim 6, wherein the club head comprises a recess substantially below the bore, the recess configured so that the fastener will not strike the ground when the golf club assembly is swung.

17. The golf club assembly of claim 6, wherein the golf club head is a wood type golf club head.

18. The golf club assembly of claim 6, wherein the golf club head is an iron type golf club head.

19. The golf club assembly of claim 6, wherein the golf club head is a hybrid type golf club head.

20. A system for fitting a golfer for a golf club, comprising:

at least one club head comprising a bore;

a fastener; and

at least one shaft assembly comprising a shaft and a hosel fitting, the hosel fitting comprising:

a first portion of a tubular structure configured to be affixed to the end of the shaft;

a second portion of the tubular structure configured to be received by the bore in the club head, the second portion of the tubular portion extending downwardly into the bore;

a fastener receiving portion for receiving the fastener, the fastener configured to affix the hosel fitting club head, wherein the bore, hosel fitting, and shaft are always substantially in line.

21. The system of claim 20, wherein the fastener receiving portion comprises a female-threaded fastener receiver, and wherein the fastener is a male-threaded fastener.

22. The system of claim 21, wherein the male-threaded fastener comprises a bolt.

23. The system of claim 20, wherein the fastener receiving portion comprises a male-threaded fastener receiver, and wherein the fastener comprises a female-threaded fastener.

24. The system of claim 20, wherein the bore comprises a base, and wherein the second portion of the tubular structure is configured to extend downwardly into the bore until it contacts the base of the bore.

25. The system of claim 24, wherein the bore further comprises an aperture in the base, wherein the fastener is configured to extend through the aperture to mate with the fastener receiving portion.

26. The system of claim 20, wherein the bore is configured to orient the shaft properly when the shaft assembly is connected to the club head.

27. The system of claim 20, further comprising a plurality of club heads, each of the plurality of club heads comprising a bore.

28. The system of claim 27, wherein the fastener is configured to allow the club head to be exchange with a different one of the plurality of club heads.

29. The system of claim 28, wherein the different club head comprises a different center of gravity relative to the first club head.

30. The system of claim 20, further comprising a plurality of shaft assemblies.

31. The system of claim 30, wherein the fastener allows the shaft assembly to be exchange with a different one of the plurality of shaft assemblies.

32. The system of claim 20, wherein the club head comprises a recess substantially below the bore, the recess configured so that the fastener will not strike the ground when the shaft assembly is connected with the club head.

33. The system of claim 20, wherein the club head is a wood type golf club head.

34. The system of claim 20, wherein the golf club head is an iron type golf club head.

35. The system of claim 20, wherein the golf club head is a hybrid type golf club head.

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