



US 20120165110A1

(19) **United States**

(12) **Patent Application Publication**
Cheng

(10) **Pub. No.: US 2012/0165110 A1**

(43) **Pub. Date: Jun. 28, 2012**

(54) **APPARATUS FOR CONNECTING A GOLF CLUB SHAFT TO A GOLF CLUB HEAD AND GOLF CLUBS INCLUDING THE SAME**

Publication Classification

(51) **Int. Cl.**
A63B 53/02 (2006.01)

(52) **U.S. Cl.** **473/305**

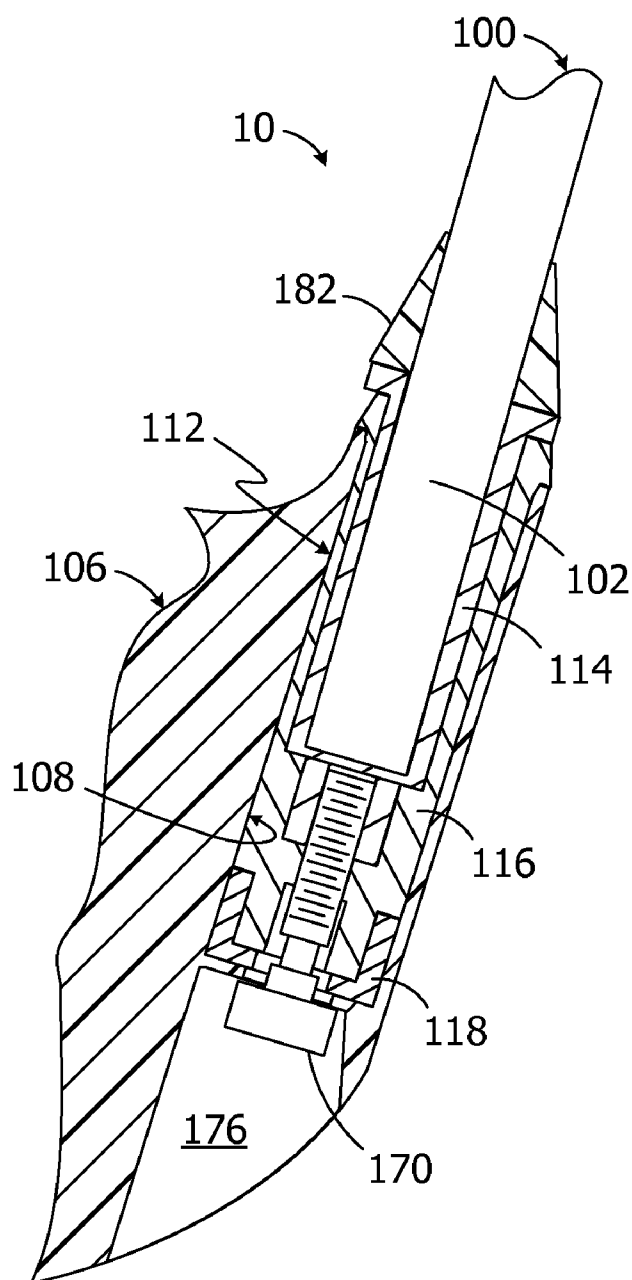
(57) **ABSTRACT**

Apparatus for connecting a golf club shaft to a golf club head, including an adjustment tube, and golf clubs including the same.

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(21) **Appl. No.:** **12/978,381**

(22) **Filed:** **Dec. 23, 2010**



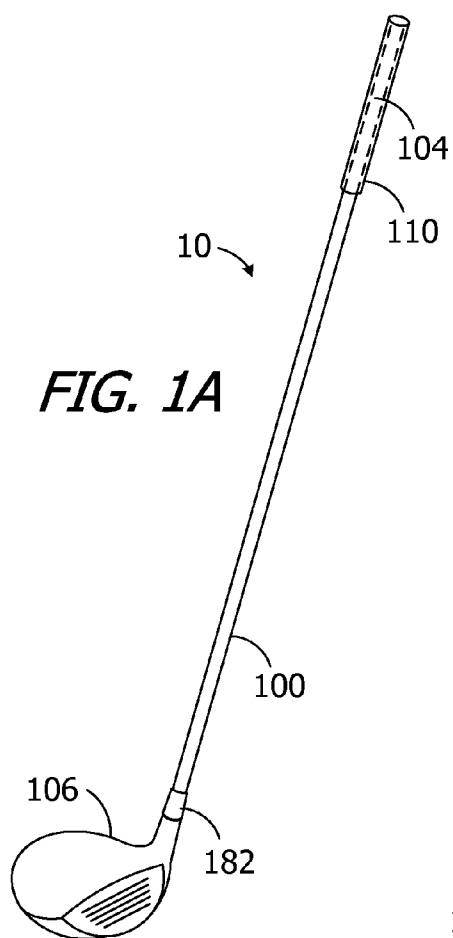
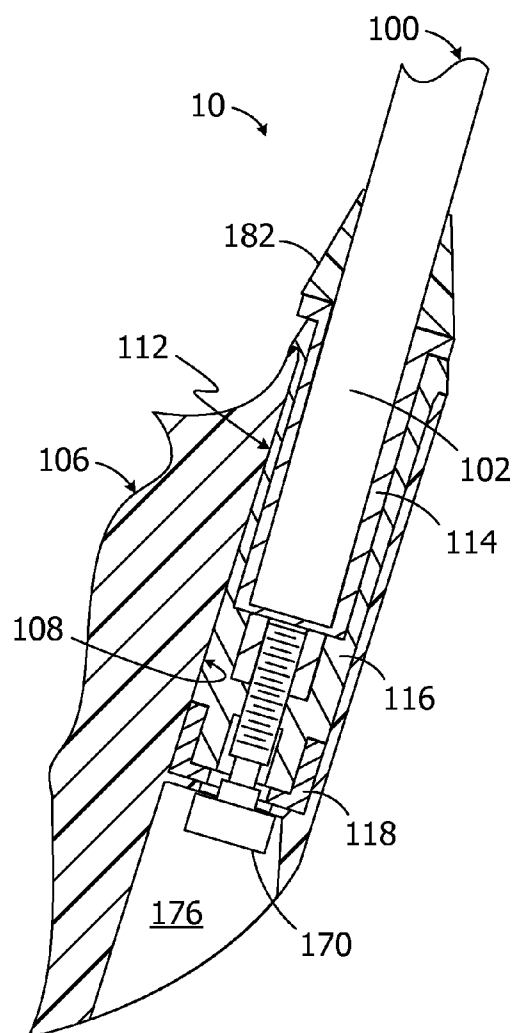


FIG. 1B



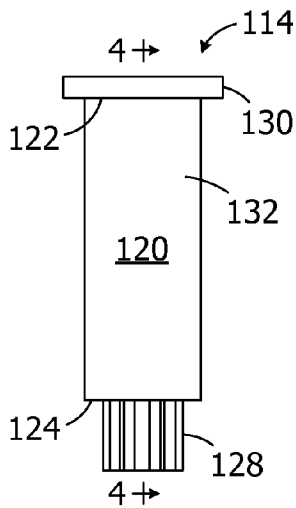


FIG. 2

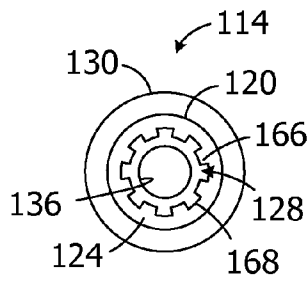


FIG. 3

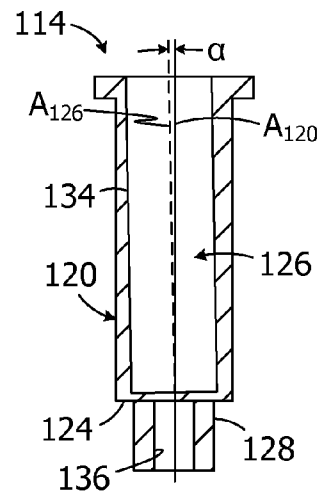


FIG. 4

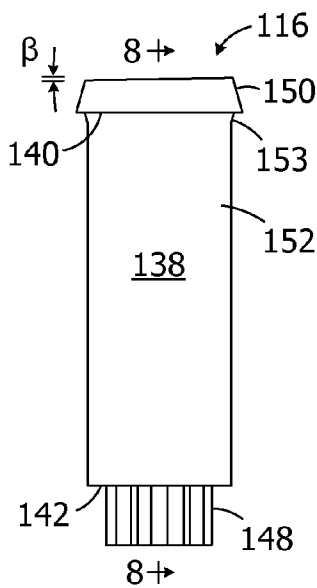


FIG. 5

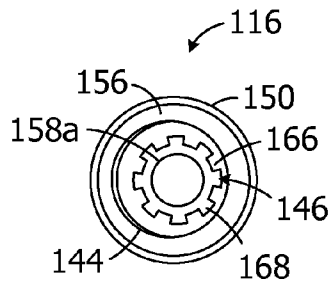


FIG. 6

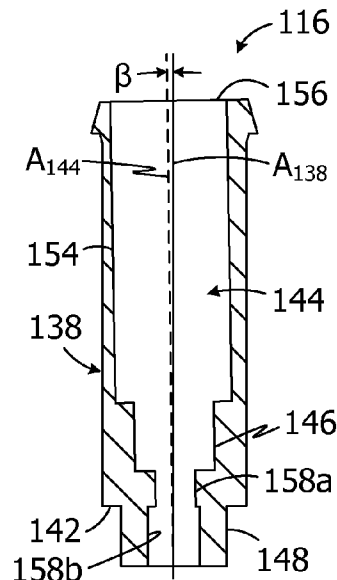


FIG. 8

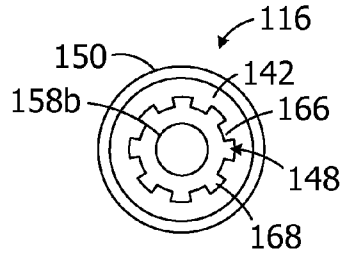


FIG. 7

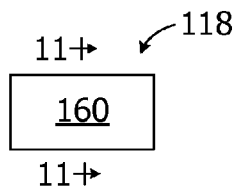


FIG. 9

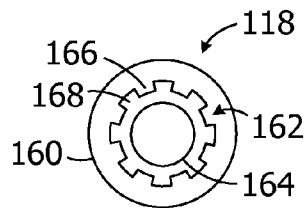


FIG. 10

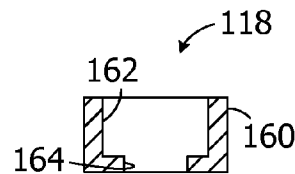
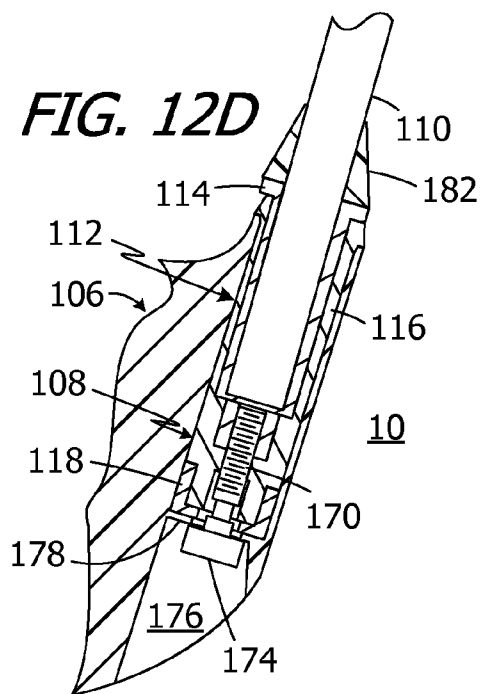


FIG. 11



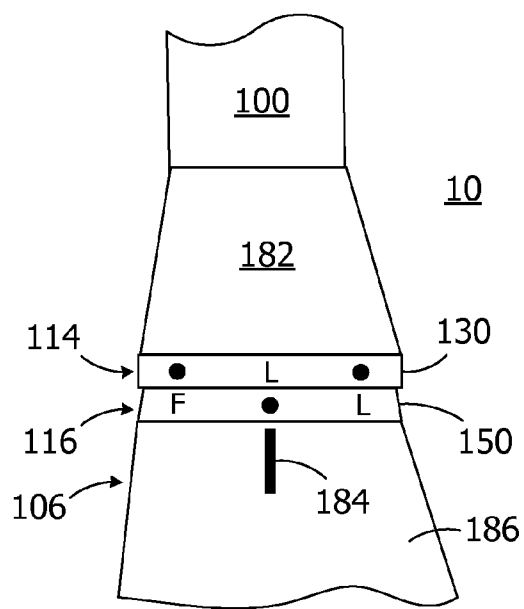


FIG. 13

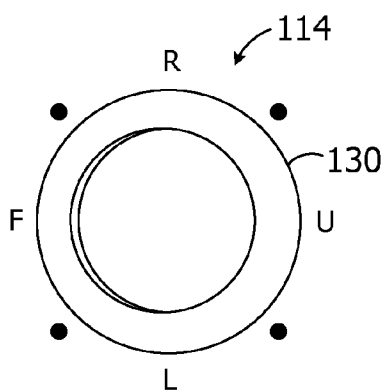


FIG. 14

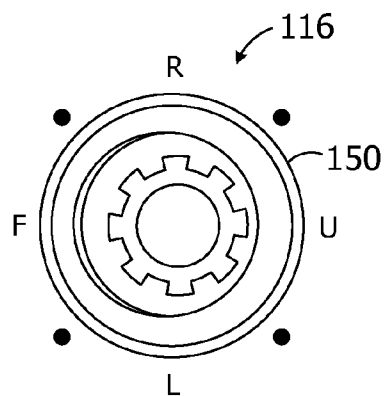
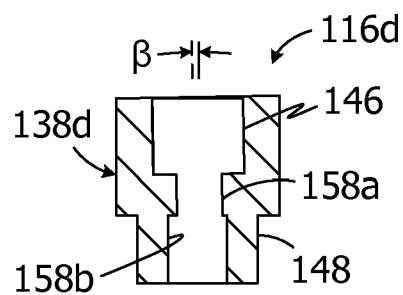
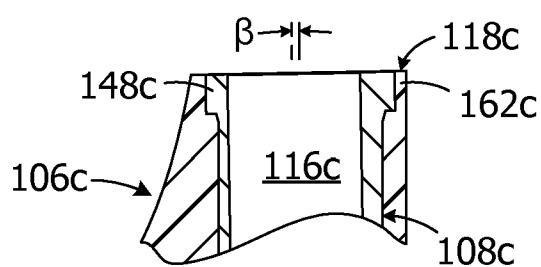
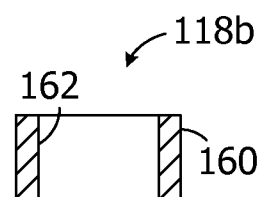
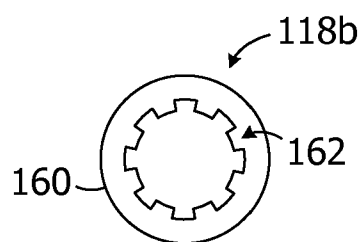
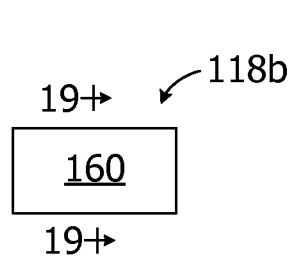
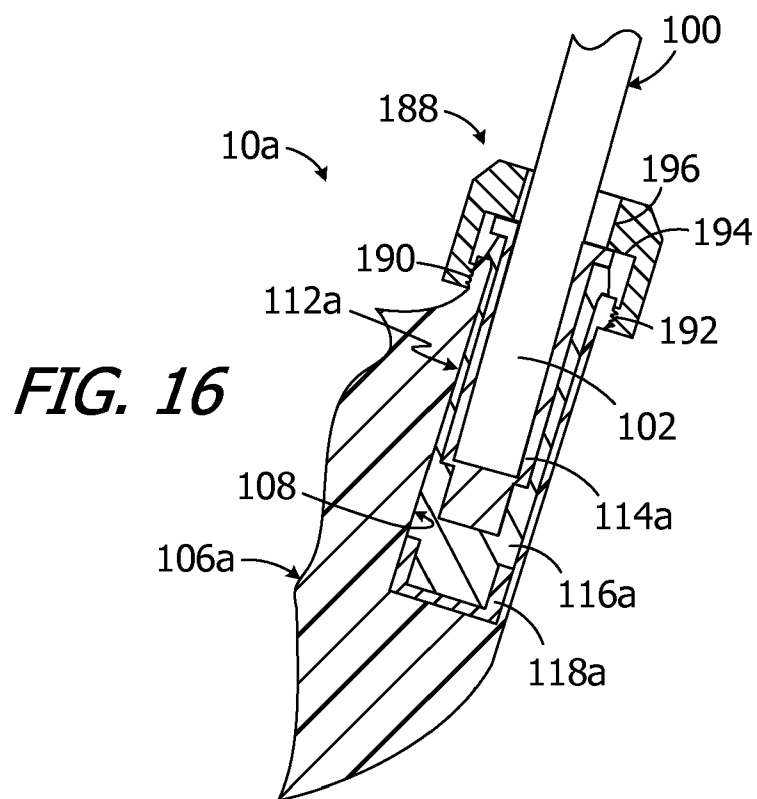


FIG. 15



APPARATUS FOR CONNECTING A GOLF CLUB SHAFT TO A GOLF CLUB HEAD AND GOLF CLUBS INCLUDING THE SAME

BACKGROUND OF THE INVENTIONS

[0001] 1. Field of the Inventions

[0002] The present inventions relate generally to golf clubs.

[0003] 2. Description of the Related Art

[0004] Golfers frequently customize their clubs to better suit their particular swing during the trial and error process commonly referred to as “fitting.” A golfer may try various shafts and club heads, as well as various face, loft and lie angles for each shaft and club head combination, during the fitting process. In order to accommodate such customization, various connector apparatus that releasably and adjustably mount club heads onto shafts have been proposed. The present inventor has determined that such apparatus is susceptible to improvement. For example, the present inventor has determined that conventional connector apparatus can create an unstable connection between the shaft and club head.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Detailed description of embodiments of the inventions will be made with reference to the accompanying drawings.

[0006] FIG. 1A is a side view of a golf club in accordance with one embodiment of a present invention.

[0007] FIG. 1B is a partial section view of the golf club illustrated in FIG. 1A.

[0008] FIG. 2 is a side view of an adapter in accordance with one embodiment of a present invention.

[0009] FIG. 3 is an end view of the adapter illustrated in FIG. 2.

[0010] FIG. 4 is a section view taken along line 4-4 in FIG. 2.

[0011] FIG. 5 is a side view of an angular adjustment tube in accordance with one embodiment of a present invention.

[0012] FIG. 6 is an end view of the angular adjustment tube illustrated in FIG. 5.

[0013] FIG. 7 is another end view of the angular adjustment tube illustrated in FIG. 5.

[0014] FIG. 8 is a section view taken along line 8-8 in FIG. 5.

[0015] FIG. 9 is a side view of a tube lock in accordance with one embodiment of a present invention.

[0016] FIG. 10 is an end view of the tube lock illustrated in FIG. 9.

[0017] FIG. 11 is a section view taken along line 11-11 in FIG. 9.

[0018] FIGS. 12A-12D are section and partial section views showing the assembly of a golf club in accordance with one embodiment of a present invention.

[0019] FIG. 13 is a rear view of a portion of a golf club in accordance with one embodiment of a present invention.

[0020] FIG. 14 is a top view of an adapter in accordance with one embodiment of a present invention showing the locations of various indicia around the perimeter of the adapter.

[0021] FIG. 15 is a top view of an angular adjustment tube in accordance with one embodiment of a present invention showing the locations of various indicia around the perimeter of the angular adjustment tube.

[0022] FIG. 16 is a partial section view of a portion of a golf club in accordance with one embodiment of a present invention.

[0023] FIG. 17 is a side view of a tube lock in accordance with one embodiment of a present invention.

[0024] FIG. 18 is an end view of the tube lock illustrated in FIG. 17.

[0025] FIG. 19 is a section view taken along line 19-19 in FIG. 17.

[0026] FIG. 20 is a section view of a portion of a golf club in accordance with one embodiment of a present invention.

[0027] FIG. 21 is a section view of an angular adjustment tube in accordance with one embodiment of a present invention.

DETAILED DESCRIPTION

[0028] The following is a detailed description of the best presently known modes of carrying out the inventions. This description is not to be taken in a limiting sense, but is made merely for the purpose of illustrating the general principles of the inventions.

[0029] The exemplary golf club **10** illustrated in FIGS. 1A and 1B includes a shaft **100** with a tip portion **102** and grip portion **104**, a club head **106** that has a cylindrical hosel **108** and is adjustably and releasably mounted on the tip portion of the shaft, and a grip **110** carried on the grip portion of the shaft. Although the present inventions are not so limited, the exemplary golf club **10** is a “driver” and the club head **104** is a driver type club head. The present inventions are, however, equally applicable to any and all golf clubs including, but not limited to, all “woods,” “irons,” and “wedges.” The exemplary shaft **102** is a fiber reinforced resin composite shaft. Other suitable shafts include, but are not limited to, metal shafts.

[0030] The club head **106** is adjustably and releasably mounted onto the shaft **100** by way of a mounting apparatus **112** that is capable of positioning the club head at a variety of face angles, loft angles, lie angles and combinations thereof. The exemplary mounting apparatus **112** includes an adapter **114** that is secured to the shaft tip portion **102**, an angular adjustment tube (or “adjustment tube”) **116** and a tube lock **118**. As discussed in greater detail below with reference to FIGS. 2-12D, the adapter **114** may be permanently secured to the shaft **100** and used to bias the shaft at a predetermined loft and/or lie angle, the adjustment tube **116** may be used to fix the rotational orientation of the adapter and to bias the shaft at a loft and/lie angle that is combined with the adapter bias, and the tube lock **118** may be used to fix the rotational orientation of the adjustment tube relative to the club head **106**.

[0031] It should be noted that, as used herein, a first structure is “adjustably” mounted (or secured) to a second structure if the first structure can be mounted in more than one orientation relative to the second structure, and a first structure is “releasably” mounted (or secured) to a second structure if the first structure can be decoupled from the second structure without excessive effort or destruction of either structure or the instrumentality that is securing the structures to one another. By contrast, “permanently” mounted (or secured) structures may not be separated from one another without excessive effort, destruction of either structure and/or destruction of the instrumentality that is securing the two structures to one another. Examples of instrumentalities that

“permanently” secure structures to one another include high strength adhesives, such as epoxy and cyanoacrylate adhesives, and welds.

[0032] Turning first to FIGS. 2-4, the exemplary adapter 114 includes a cylindrical main portion 120 with top and bottom (or “longitudinal”) ends 122 and 124, a cylindrical lumen 126 within the main portion for the shaft 100 (FIGS. 1A and 1B), an adapter rotation restrictor 128 at the main portion bottom end, and a lip 130 at the main portion top end. The main portion 120 has a longitudinal axis A_{120} , an outer surface 132 and an inner surface 134 that defines the cylindrical lumen 126. The cylindrical lumen 126, which has a longitudinal axis A_{126} , is angularly offset (or “biased”) relative to the main portion 120 by an angle α . In other words, longitudinal axis A_{126} is not parallel to longitudinal axis A_{120} . The shaft 100 is carried within the cylindrical lumen 126 when the golf club 10 is in the assembled state and will also be angularly offset from the main portion by angle α . Although not limited to any particular magnitude, angle α may range from about 0.25° to 5° in some implementations, depending on club type, and is 1° in the illustrated implementation. The lip 130 will rest on the adjustment tube lip 150 (discussed below) when the adapter 114 is inserted into the adjustment tube 116 (FIG. 1B). The exemplary adapter rotation restrictor 128 is configured to mate with a rotation restrictor on the adjustment tube 116 in the manner described below.

[0033] The exemplary adapter 114 is also provided with an internal connector 136 (e.g. a threaded lumen) that may be connected to a bolt 170 (or other fastener) in the manner described below with reference to FIGS. 12C and 12D. In other implementations, such as that described below with reference to FIG. 16, the internal connector 136 may be omitted.

[0034] Referring to FIGS. 5-8, the exemplary adjustment tube 116 includes a cylindrical main portion 138 with top and bottom (or “longitudinal”) ends 140 and 142, a cylindrical lumen 144 within the main portion for the adapter 114 (FIGS. 1A and 1B), a first tube rotation restrictor 146 associated with the lumen, a second tube rotation restrictor 148 at the main portion bottom end, and a lip 150 at the main portion top end. The main portion 138 has a longitudinal axis A_{138} , an outer surface 152 with a taper 153, and an inner surface 154 that defines the cylindrical lumen 144. The cylindrical lumen 144 has a longitudinal axis A_{144} and is angularly offset (or “biased”) relative to the main portion 138 by an angle β (as is the first tube rotation restrictor 146). In other words, longitudinal axis A_{144} is not parallel to longitudinal axis A_{138} . Although not limited to any particular magnitude, angle β may range from about 0.25° to 5° in some implementations, depending on club type, and is 1° in the illustrated implementation. The adapter 114 is carried within the cylindrical lumen 144 when the golf club 10 is in the assembled state and will be angularly offset from the adjustment tube main portion 138 by angle β , while the shaft 100 will be angularly offset from the adjustment tube main portion by the combination of angle α and angle β . The exemplary adapter lip 130, which is perpendicular to the adapter cylindrical main portion 120, will rest on the adjustment tube lip 150 when the adapter 114 is inserted into the adjustment tube 116 (FIG. 1B). In order to insure a proper fit, the top surface 156 of the adjustment tube lip 150 slopes at angle β . The first tube rotation restrictor 146 is configured to mate with the adapter rotation restrictor 128, and the second tube rotation restrictor 148 is configured to

mate with a corresponding rotation restrictor 162 on the tube lock 118, in the manner described below.

[0035] The exemplary adjustment tube 116 is also provided with apertures 158a and 158b through which a bolt 170 (or other fastener) may pass in the manner described below with reference to FIGS. 12C and 12D. Giving the range of possible angular orientations of the adjustment tube 116, the diameter of the aperture 158b is larger than the diameter of the associated portion of the bolt 170 (or other fastener) in order to insure sufficient clearance during assembly. The apertures 158a and 158b may also be the same size in some embodiments. In embodiments that do not include such a fastener (e.g., the embodiment illustrated in FIG. 16), the apertures may be omitted.

[0036] Referring to FIGS. 9-11, the exemplary tube lock 118 includes a cylindrical wall 160 and a lock rotation restrictor 162 associated with the wall. The lock rotation restrictor 162 is configured to mate with the second tube rotation restrictor 148 in the manner described below. An aperture 164, through which a bolt 170 (or other fastener) may pass in the manner described below with reference to FIGS. 12C and 12D, may be provided. The diameter of the aperture 164 is larger than the diameter of the associated portion of the bolt 170 (or other fastener) in order to insure sufficient clearance during assembly. In embodiments that do not include such a fastener (e.g., the embodiment illustrated in FIG. 16), the aperture may be omitted.

[0037] The rotation restrictors 128, 146, 148 and 162 fix the rotational orientations of the adapter 114, adjustment tube 116 and lock 118 relative to one another and, as a result, the rotational orientations of angle α and angle β relative to one another and to the golf club head. The golf club head 106 will, therefore, be biased relative to the shaft 100 by the combination of angle α and angle β .

[0038] A wide varied of rotation restrictors may be employed. In the illustrated implementation, the rotation restrictors 128, 146, 148 and 162 are gear-like and include projections 166 and recesses 168. The respective configurations of the projections 166 and recesses 168 are such that the projections of one rotation restrictor (e.g. rotation restrictor 148) fit into recesses of the associated rotation restrictor (e.g. rotation restrictor 162) and vice versa. The number of relative rotational orientations of the adapter 114, adjustment tube 116 and tube lock 118 is dictated by the configurations of the rotation restrictors. In the illustrated implementation, there are eight projections 166 and eight recesses 168 and, accordingly, there are eight relative orientations of the adapter 114 and the adjustment tube 116 as well as eight relative orientations of the adjustment tube 116 and the tube lock 118. Thus, there are sixty-four combinations of the rotational position of angle α and the rotational position of angle β .

[0039] The number of indentations and recesses may be increased or decreased in other implementations and, although the number of possible relative orientations of the adapter 114 and adjustment tube 116 is equal to the number of possible relative orientations of the adjustment tube 116 and tube lock 118, the present inventions are not so limited. It should also be noted that the rotation restrictors are not limited to the illustrated gear-like configuration. By way of example, but not limitation, one or both of the rotation restrictors may be a geometric shape such as a square, triangle, or hexagon.

[0040] The exemplary rotation restrictors also have male/female relationships. To that end, the rotation restrictors 128

and 148 are respectively inserted into the rotation restrictors 146 and 162 when the recesses and protrusions are aligned. This relationship may be reversed in other implementations. It should also be noted that the adjustment tube 116 has two rotation restrictors, one male and one female, although the adjustment tube may be provided with two male rotation restrictors or two female rotation restrictors in other implementations.

[0041] The manner in which the exemplary mounting apparatus 112 may be used to adjustably and releasably mount the club head 106 to the shaft 100 at the desired loft and lie angles is described below with reference to FIGS. 12A-12D.

[0042] Referring first to FIG. 12A, the tube lock 118 is positioned within the club head hosel 108 and permanently secured thereto by, for example, an epoxy adhesive or welding. In other implementations, the tube lock 118 may simply be an integral portion of the club head hosel.

[0043] The adjustment tube 116 is then inserted into the hosel 108. The outer diameter of the cylindrical main portion 138 is essentially identical to the inner diameter of the hosel 108 and, accordingly, there is a tight fit therebetween. It should also be noted that the club head 106 includes a taper 107 that is slightly greater than or equal to the adjustment tube taper 153. The adjustment tube 116 may then be rotated about the longitudinal axis A_{138} of the main portion 138 in order to position the cylindrical lumen 144 (which is biased at angle β) at one of the eight possible orientations, relative to the tube lock 118 and club head 106, where the projections 166 and recesses 168 of the rotation restrictors 148 and 162 are aligned. The adjustment tube 116 is then pushed toward the tube lock 118 until the rotation restrictor 148 is fully seated in the rotation restrictor 162 and the lip 150 abuts the top of the hosel as shown in FIG. 12B. Rotation of the adjustment tube 116 relative to the tube lock 118 is thereby prevented. However, as the assembly is not complete, the adjustment tube 116 may be pulled back, rotated, and pushed back into the tube lock 118 if desired.

[0044] In some instances, a resilient washer (e.g. a rubber washer) or other washer may be positioned at the end of the adjustment tube rotation restrictor 148 and the bottom inner surface of the tube lock 118. The washer prevents the bolt 170 (or other fastener) from easily falling out of the club head when loosened.

[0045] Next, as also shown in FIG. 12B, the adapter 114 is inserted into the adjustment tube 116. The shaft 100 will have been inserted into the adapter lumen 126, and permanently secured thereto with an adhesive or other suitable instrumentality, prior to the adapter 114 being inserted into the adjustment tube 116. The diameter of the adapter outer surface 132 is essentially identical to the diameter of the adjustment tube inner surface 154 and, accordingly, there is a tight fit therebetween. The adapter 114 (and shaft 100) may then be rotated about the longitudinal axis A_{120} of the main portion 120 in order to position the cylindrical lumen 126 (which is biased at angle α) and the shaft 100 at one of the eight possible orientations, relative to the adjustment tube 116, where the projections 166 and recesses 168 of the rotation restrictors 128 and 146 are aligned. The adapter 114 is then pushed toward the adjustment tube 116 until the rotation restrictor 128 is fully seated in the rotation restrictor 146 and the lip 130 abuts the top surface 156 of the adjustment tube lip 150 as shown in FIG. 12C. Rotation of the adapter 114 (and shaft 100) relative to the adjustment tube 116 is thereby prevented. However, as

the assembly is not complete, the adapter 114 may be pulled back, rotated, and pushed back into the adjustment tube 116 if desired.

[0046] The assembly of the mounting apparatus 112 and, therefore, the golf club 10 is completed when the mounting apparatus is releasably anchored or otherwise releasably secured to the club head 106. In the exemplary embodiment illustrated in FIGS. 1-12D, the mounting apparatus 112 is releasably secured to the club head 106 by way of a bolt 170 (FIGS. 12C and 12D), which has a threaded portion 172 and a head 174, and a club head recess 176, which has an end wall 178 and an end wall aperture 180. The bolt head 174 may include an indentation (not shown) for a tool such as a screwdriver, Allen wrench or the like. The diameter of the end wall aperture 180 is smaller than the diameter of the bolt head 174. The bolt 170 is inserted through the end wall aperture 180, tube lock aperture 164 and adjustment tube apertures 158a and 158b, and is secured to the internal connector 136 on the adapter 114 via rotation of the bolt. In some instances, a lock washer may be positioned between the bolt head 174 and the recess end wall 178. Tightening the bolt 170 results in the bolt head 174 abutting the end wall 180, the adapter tube 114 being pulled tightly against the adjustment tube 116, and the adjustment tube being pushed tightly against the tube lock 118 in the manner illustrated in FIG. 12D, thereby completing the assembly of the mounting apparatus 112 and golf club 10. Should subsequent adjustment be desired, the user need only remove the bolt 170 to facilitate disassembly of the mounting apparatus 112.

[0047] In some implementations, a ferrule 182 may be positioned on the shaft 110 and abutting the adapter tube 114 for cosmetic purposes.

[0048] Another aspect of the assembly process is, as alluded to above, obtaining the desired rotational orientations of the adapter 114 and adjustment tube 116 relative to the club head 106. Referring to FIGS. 13-15, the club head 106 may be provided with a marker 184 that serves as a reference point. The marker 184 may be located on the heel 186, as shown, or any other suitable location. The adapter 114 and adjustment tube 116 may be provided with indicia corresponding to the effects of the various orientations of the adapter and adjustment tube (and the angles α and β thereof) relative to the reference point. The adapter 114 and adjustment tube 116 in the illustrated implementation each have eight possible rotational positions relative to the marker 184. The indicia may be provided on the sides of the adapter lip 130 and adjustment tube lip 150, as shown in FIG. 13, or on the top of the lips. The overall configuration of the mounting apparatus 112, the orientation of the tube lock 118, and location of marker 184 are such that the indicia will be aligned with the marker at each rotational position of the adapter 114 and adjustment tube 116.

[0049] The indicia in the illustrated implementation includes letters "L," "R," "U," "F" and dots therebetween. The respective positions of the exemplary indicia on the sides of the adapter lip 130 and adjustment tube lip 150 are shown in FIGS. 14 and 15. For both the adapter 114 and adjustment tube 116, alignment of the L with the marker 184 results in a more leftward shot (i.e. a more closed face and slightly higher loft), alignment of the R with the marker results in a more rightward shot (i.e. a more open face and slightly lower loft), alignment of the U with the marker results in a more upright lie, alignment of the F with the marker results in a more flat lie, and alignment with the dots results in a combination of the

biasing associated with the adjacent letters. For example, aligning the Ls of the adapter **114** and adjustment tube **116** with the marker **184** would maximize the leftward bias without effecting the lie, while the orientations illustrated in FIG. **13** would result in slightly less bias to the left and a small increase in flat bias. It should also be noted that the biasing effect of the mounting apparatus **112** may be eliminated by aligning the L of the adapter **114** with the R adjustment tube **116**.

[0050] Suitable materials for the mounting apparatus **112**, e.g. the adapter **114**, adjustment tube **116** and a tube lock **118**, include but are not limited to 6061-T6 aluminum, 7075-T7 aluminum, titanium, and lightweight alloys of similar strength.

[0051] Although the present inventions have been described in terms of the preferred embodiments above, numerous modifications and/or additions to the above-described preferred embodiments would be readily apparent to one skilled in the art.

[0052] By way of example, but not limitation, the present inventions are not limited to the bolt-based releasable anchoring of the mounting apparatus described above. To that end, the exemplary golf club **10a** illustrated in FIG. **16** is substantially similar to golf club **10** and similar elements are represented by similar reference numerals. Here, however, the mounting apparatus **112a** is releasably secured to the club head **106a** with a removable cap **188**. There are a variety of ways to releasably secure the cap **188** to the club head **106a**. In the illustrated embodiment, threads **190** and **192** are provided on the outer surface of the club head **106a** and the inner surface of the cap **188**. The cap **188** also has an abutment surface **194** that engages the adapter lip **130**. The cap **188** drives the adapter **114a** into the adjustment tube **116a**, and drives the adjustment tube into the tube lock **118a**, as it is screwed onto the club head **106a**. If desired, the adapter **114a**, adjustment tube **116a** and tube lock **118a** may be provided without the internal connector **136** and apertures **158a**, **158b** and **164** (shown in FIG. **12C**), and the club head **106a** may be provided without the club head recess **176** and end wall aperture **180**. The exemplary cap **188** also has an aperture **196** for the shaft **100**. Given the wide variety of possible angular orientations of the shaft **100**, the diameter of the aperture **196** is larger than the diameter of the corresponding portion of the shaft **100**. Also, the cap **188** will typically be positioned on the shaft **100** prior to permanently securing the adapter **114a** to the shaft.

[0053] Turning to FIGS. **17-19**, the exemplary tube lock **118b** is essentially identical to tube lock **118** and similar elements are represented by similar reference numerals. Here, however, the rotation restrictor **162** extends from top to bottom. The tube lock **118b** may be employed in, among others, the exemplary mounting apparatus **112** and **112a**. The tube lock **118b** may also be a separate structure that is attached to the club head (as shown) or an integral portion of the club head hosel.

[0054] In the exemplary embodiments described above, angle α and angle β are both non-zero, i.e. there is some possible biasing associated with both the adapter and the adjustment tube. In other implementations, the angle α may be zero and the angle β may be non-zero, or the angle α may be non-zero and the angle β may be zero.

[0055] It should also be noted that many of the cylindrical surfaces described herein may slightly tapered, i.e. slightly frusto-conical, if necessary or desired. For example, should

the tip portion of the associated golf club shaft be tapered, the adapter lumen **126** (FIG. **4**) may be slightly tapered. The main portion outer surface **132** (FIG. **2**) and adjustment tube inner surface **154** (FIG. **8**) may be slightly tapered. Should the associated golf club hosel be tapered, the adjustment tube outer surface **152** (FIG. **5**) may be slightly tapered.

[0056] The locations of the rotation restrictors may also vary from the illustrated locations. For example, the adapter rotation restrictor **128** (FIG. **4**) may be located on the exterior of the main portion **120** near the lip **130** and the adjustment tube rotation restrictor **146** (FIG. **8**) may be located along the inner surface **154** inward of the lip **150**.

[0057] Turning to FIG. **20**, the tube lock **118c**, with a rotation restrictor **162c**, may be an integral portion of the exemplary club head **106c** and located at the top of the hosel **108c**. The adjustment tube **116c** is provided with a corresponding second tube rotation restrictor **148c** (in place of the rotation restrictor **148** in FIG. **8**) as well as a first tube rotation restrictor **146** in the position illustrated in FIG. **8**.

[0058] Various portions of the exemplary angular adjustment tube **116** (FIGS. **5-8**) may be omitted. As illustrated for example in FIG. **21**, the angular adjustment tube **116d** includes a main portion **138d** that is only long enough to accommodate the first and second rotation restrictors **146** and **148**, and is significantly shorter than the length of the hosel. The first rotation restrictor **146** is biased to angle β as is described above.

[0059] It is intended that the scope of the present inventions extend to all such modifications and/or additions. Moreover, the present inventions include golf clubs having a shaft, a club head, and the apparatus described above and claimed below.

1. An apparatus for use with a golf club shaft adapter having an adapter rotation restrictor and a golf club head with a hosel having a hosel rotation restrictor, the apparatus comprising:

- a main portion defining first and second longitudinal ends and a main portion longitudinal axis;
- a lumen, within the main portion and adapted to receive the golf club shaft adapter, defining an opening associated with the first longitudinal end of the main portion and a lumen longitudinal axis that is not parallel to the main portion longitudinal axis;
- a first main portion rotation restrictor associated with the cylindrical lumen and configured to engage the adapter rotation restrictor; and
- a second main portion rotation restrictor associated with an exterior of the main portion.

2. An apparatus as claimed in claim 1, wherein the main portion has a cylindrical outer surface.

3. An apparatus as claimed in claim 1, wherein the lumen comprises a cylindrical lumen.

4. An apparatus as claimed in claim 1, wherein the lumen longitudinal axis and the main portion longitudinal axis are angularly offset by an angle of about 0.25 degrees to 5 degrees.

- 5. An apparatus as claimed in claim 1, wherein the lumen defines a first longitudinal end associated with the opening and a second longitudinal end; and the first main portion rotation restrictor is associated with the second longitudinal end of the lumen.

6. An apparatus as claimed in claim 5, wherein the second main portion rotation restrictor is associated with the second longitudinal end of the main portion.

7. An apparatus as claimed in claim 1, wherein at least one of the first and second main portion rotation restrictors includes a plurality of projections and a plurality of recesses.

8. An apparatus as claimed in claim 1, wherein one of the first and second main portion rotation restrictors is a male rotation restrictor and the other of the first and second main portion rotation restrictors is a female rotation restrictor.

9. An apparatus as claimed in claim 1, wherein the main portion defines an outer surface and at least part of the outer surface is tapered.

10. An apparatus as claimed in claim 1, further comprising an aperture extending from the second longitudinal end of the main portion to the lumen.

11. An apparatus for use with a golf club shaft and a golf club head with a hosel, the apparatus comprising:

a tube lock including a tube lock rotation restrictor;

an adapter including an adapter main portion defining an adapter main portion longitudinal axis, an adapter lumen configured to receive the golf club shaft and defining an adapter lumen longitudinal axis, and an adapter rotation restrictor; and

an adjustment tube including an adjustment tube main portion defining an adjustment tube main portion longitudinal axis, an adjustment tube lumen configured to receive the adapter and defining an adjustment tube lumen longitudinal axis, a first adjustment tube rotation restrictor configured to engage the adapter rotation restrictor, and a second adjustment tube rotation restrictor configured to engage the tube lock rotation restrictor; wherein the adapter lumen longitudinal axis is not parallel to the adapter main portion longitudinal axis and/or the adjustment tube lumen longitudinal axis is not parallel to the adjustment tube main portion longitudinal axis.

12. An apparatus as claimed in claim 11, wherein the tube lock is configured to be inserted into the hosel and secured thereto.

13. An apparatus as claimed in claim 11, wherein the tube lock rotation restrictor includes a plurality of projections and a plurality of recesses.

14. An apparatus as claimed in claim 11, wherein the adapter main portion has a cylindrical outer surface.

15. An apparatus as claimed in claim 11, wherein the adapter main portion defines first and second longitudinal ends and the adapter rotation restrictor is associated with the second longitudinal end.

16. An apparatus as claimed in claim 15, wherein the adapter main portion includes a connector associated with the second longitudinal end.

17. An apparatus as claimed in claim 11, wherein the adapter lumen longitudinal axis and the adapter main portion longitudinal axis are angularly offset by an angle of about 0.25 degrees to 5 degrees.

18. An apparatus as claimed in claim 11, wherein the adapter rotation restrictor includes a plurality of projections and a plurality of recesses.

19. An apparatus as claimed in claim 11, wherein the adjustment tube main portion has a cylindrical outer surface.

20. An apparatus as claimed in claim 11, wherein the adjustment tube main portion has an outer surface and at least part of the outer surface is tapered.

21. An apparatus as claimed in claim 11, wherein the adjustment tube lumen comprises a cylindrical lumen.

22. An apparatus as claimed in claim 11, wherein the adjustment tube lumen longitudinal axis and the adjustment

tube main portion longitudinal axis are angularly offset by an angle of about 0.25 degrees to 5 degrees.

23. An apparatus as claimed in claim 11, wherein the first and second adjustment tube rotation restrictors are adjacent to one another.

24. An apparatus as claimed in claim 11, wherein the first and second adjustment tube rotation restrictors are associated with opposite longitudinal portions of the adjustment tube main portion.

25. An apparatus as claimed in claim 11, wherein at least one of the first and second adjustment tube rotation restrictors includes a plurality of projections and a plurality of recesses.

26. An apparatus as claimed in claim 11, wherein one of the first and second adjustment tube rotation restrictors is a male rotation restrictor and the other of the first and second adjustment tube rotation restrictors is a female rotation restrictor.

27. An apparatus as claimed in claim 11, further comprising:

an aperture extending from a longitudinal end of the adjustment tube to the adjustment tube lumen.

28. An apparatus as claimed in claim 11, further comprising:

means for releasably securing the adapter and adjustment tube to the golf club head.

29. An apparatus as claimed in claim 11, wherein

the first adjustment tube rotation restrictor and the adapter rotation restrictor are respectively configured such that they can be engaged with one another at a plurality of different rotational orientations; and

the second adjustment tube rotation restrictor and the tube lock rotation restrictor are respectively configured such that they can be engaged with one another at a plurality of different rotational orientations.

30. An apparatus as claimed in claim 11, wherein

the hosel defines a diameter;

the adjustment tube main portion defines an outer diameter, that is substantially equal to the hosel diameter, and an inner diameter; and

the adapter main portion defines an outer diameter that is substantially equal to the inner diameter of the adjustment tube main portion.

31. An apparatus as claimed in claim 11, wherein the adapter lumen longitudinal axis is not parallel to the adapter main portion longitudinal axis and the adjustment tube lumen longitudinal axis is not parallel to the adjustment tube main portion longitudinal axis.

32. An apparatus as claimed in claim 1, wherein the second main portion rotation restrictor is associated with the first longitudinal end of the main portion.

33. An apparatus as claimed in claim 32, wherein the lumen defines a first longitudinal end associated with the opening and a second longitudinal end; and the first main portion rotation restrictor is associated with the second longitudinal end of the lumen.

34. An apparatus as claimed in claim 32, wherein the second main portion rotation restrictor includes a plurality of projections.

35. An apparatus for use with a golf club shaft adapter having an adapter rotation restrictor, the apparatus comprising:

a golf club head including a hosel with a top portion and a hosel rotation restrictor at the top portion of the hosel; and

angular adjustment tube including

a main portion defining first and second longitudinal ends and a main portion longitudinal axis,

a lumen, within the main portion and adapted to receive the golf club shaft adapter, defining an opening associated with the first longitudinal end of the main portion and a lumen longitudinal axis that is not parallel to the main portion longitudinal axis,

a first main portion rotation restrictor associated with the cylindrical lumen and configured to engage the adapter rotation restrictor, and

a second main portion rotation restrictor associated with the exterior of the first longitudinal end of the main portion.

36. An apparatus as claimed in claim **35**, wherein the hosel rotation restrictor is integral with the top portion of the hosel.

37. An apparatus as claimed in claim **35**, wherein the second main portion rotation restrictor includes a plurality of projections.

38. An apparatus as claimed in claim **37**, wherein the hosel rotation restrictor includes a plurality of recesses.

39. An apparatus as claimed in claim **37**, wherein the hosel rotation restrictor includes a plurality of projections that defines a plurality of spaces therebetween.

40. An apparatus as claimed in claim **35**, wherein one of the first and second main portion rotation restrictors is a male rotation restrictor and the other of the first and second main portion rotation restrictors is a female rotation restrictor.

41. An apparatus as claimed in claim **35**, wherein the lumen longitudinal axis and the main portion longitudinal axis are angularly offset by an angle of about 0.25 degrees to 5 degrees.

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