(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 July 2014 (31.07.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/116539 A1

(51) International Patent Classification:
A63B 53/14 (2006.01)

(21) International Application Number:
PCT/US2014/012199

(22) International Filing Date:
20 January 2014 (20.01.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/755,200 22 January 2013 (22.01.2013) US

(71) Applicant: **KARSTEN MANUFACTURING CORPORATION** [US/US]; 2201 W. Desert Cove, Phoenix, Arizona 85029 (US).

(72) Inventors: **JERTSON, Martin**; 2201 W. Desert Cove, Phoenix, Arizona 85029 (US). **STOKKE, Ryan**; 2201 W. Desert Cove, Phoenix, Arizona 85029 (US). **NICOLETTE, Michael**; 2201 W. Desert Cove, Phoenix, Arizona 85029 (US).

(74) Agents: **JENNY, Paul** et al.; MICHAEL BEST & FRIEDRICH LLP, 180 N. Stetson Avenue, Suite 2000, Chicago, Illinois 60601 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

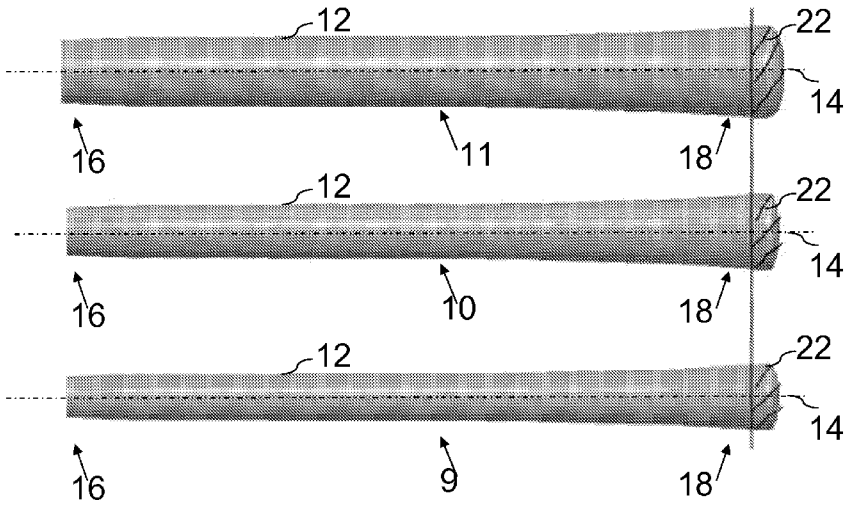
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: VARIABLE DENSITY GOLF CLUB GRIPS

FIG. 2



(57) **Abstract**: Embodiments of golf club grips and methods to manufacture such golf club grips are generally described herein. In some embodiments, the golf club grip may include a hollow grip body associated with a longitudinal axis and a density that smoothly varies along the longitudinal axis to achieve a predetermined swing weight when a golf club shaft is received within the hollow grip body. In other embodiments, golf club grips comprise a hollow grip body including no more than two sections along the longitudinal axis. A first section is associated with a first density, a second section is associated with a second density, and the first density is less than the second density to achieve a predetermined swing weight when the golf club shaft is received within the hollow grip body.

WO 2014/116539 A1

VARIABLE DENSITY GOLF CLUB GRIPS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This claims priority to U.S. Patent Application No. 61/755,200, filed on January 22, 2013, the contents of which are fully incorporated herein by reference.

FIELD

[0002] The present disclosure relates to grips, and in particular grips for sport equipment.

BACKGROUND

[0003] In several types of sports, such as golf, hockey, baseball, softball, tee ball, and cricket, an individual may use a club with a striking face to strike an object such as a ball. For each sport, a variety of clubs may be used. In particular, golf clubs may include a driver-type golf club, a fairway wood-type golf club, a hybrid-type golf club, an iron-type golf club, a wedge-type golf club, and a putter-type golf club. For such golf clubs, grips made of a molded rubber material or synthetic polymeric materials may be used. The grips may be available in various sizes, which may affect the weight of the grips, which, in turn, may affect the swing weight and/or center of gravity of the golf club.

[0004] In some golf clubs, an end cap may be placed in an abutting relationship with a butt end of a grip. Compared to the grip, the end cap may be made of a firmer and/or harder material to give more strength and prevent the shaft from poking through the end of the grip. The end cap may be pre-formed and then coupled to or assembled with the grip. For manufacturing of the grip, particularly for a large volume or batch of grips, repeatedly forming the end cap separately from or before forming the grip and assembling them together can be time-consuming, cumbersome, and cost-prohibitive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] **FIG. 1** is a perspective view of a golf club grip according to one embodiment of the apparatus, methods, and articles of manufacture described herein;

[0006] **FIG. 2** is an enlarged partial side view of a family of golf club grips in various sizes;

[0007] **FIG. 3** is a graph plotting a center of gravity of the golf club grips of **FIG. 2** for a respective grip weight;

[0008] **FIG. 4** is an enlarged partial cross sectional view one of the golf club grips of **FIG. 2**;

[0009] **FIG. 5** is an enlarged partial side view of a family of golf club grips according to other embodiments; and

[0010] **FIG. 6** is an enlarged partial cross sectional view of one of the golf club grips of **FIG. 5**.

[0011] Corresponding reference characters indicate corresponding elements among the various views of the drawings. The headings used in the figures should not be interpreted to limit the scope of the claims.

DESCRIPTION

[0012] As described herein, golf club grips in some embodiments comprise a hollow grip body associated with a longitudinal axis and a density that smoothly (e.g., linearly) varies along the longitudinal axis to achieve a predetermined swing weight when a golf club shaft is received within the hollow grip body. In other embodiments, golf club grips comprise a hollow grip body including no more than two sections along the longitudinal axis. A first section is associated with a first density, a second section is associated with a second density, and the first density is less than the second density to achieve a predetermined swing weight when the golf club shaft is received within the hollow grip body. The predetermined swing weight may assist in enhancing the performance of the golf club. For example, a center of gravity may be advantageously positioned at a desired location of the golf club to potentially improve the balance, stability, and performance. The disclosed golf club grips can make the manufacturing thereof less cumbersome and more efficient.

[0013] Referring to **FIG. 1**, for example, a golf club grip **10** comprises a hollow grip body **12** for receiving a golf club shaft **13**. The hollow grip body **12** is associated with a longitudinal axis **14**. The hollow grip body **12** defines a first end, shaft-receiving end, or open tip end **16** and a second end or butt end **18** positioned distal to the shaft-receiving end **16**. The golf club grip **10** may be coupled to a putter-type golf club (e.g., mallet-type putter, blade-type putter, or any other types of putters), or any other types of golf clubs. For example, in some embodiments, the golf club grip **10** may be coupled to a driver-type golf club, a fairway wood-type golf club, an iron-type golf club, a hybrid-type golf club, or a wedge-type golf club. The apparatus, methods, and articles of manufacture described herein are not limited in this regard. In some embodiments, the hollow grip body **12** may be dimensioned to fittingly receive a corresponding golf club shaft. In other embodiments, the hollow grip body **12** may be dimensioned to fittingly receive, for example, a hockey stick, baseball bat, lacrosse stick or other clubs.

[0014] Referring also **FIG. 2**, for example, a manufacturer may stock a family, group, or set of interchangeable golf club grips **9**, **10**, **11** to choose from or customize based on various sizes. For example, the golf club grip **9** may be associated with an outer diameter from approximately 1.7 cm to approximately 2.7 cm, the golf club grip **10** may be associated with an outer diameter from approximately 1.8 cm to approximately 2.8 cm, and the golf club grip **11** may be

associated with an outer diameter from approximately 2.0 cm to approximately 3.0 cm. In some embodiments, the golf club grips **9**, **10**, **11** may be associated with an outer diameter of at least 1.6 cm, at least 1.7 cm, at least 1.8 cm, or at least 1.9 cm. In further embodiments, the golf club grips **9**, **10**, **11** may be associated with an outer diameter of no more than 3.1 cm, no more than 3.0 cm, no more than 2.9 cm, or no more than 2.8 cm. In some embodiments, the outer diameter may be measured with the golf club grips **9**, **10**, **11** mounted on the respective golf club shaft **13**. A wrap of tape (not shown) may be applied before mounting the golf club grips **9**, **10**, **11** on the respective golf club shaft. The wrap of tape may measure approximately 0.02 cm in thickness. In other embodiments, the outer diameter may be measured with the golf club grips **9**, **10**, **11** in a relaxed state, and not including a wrap of tape.

[0015] It should be noted that some embodiments disclosed herein may conform to rules and/or standards of golf defined by various golf standard organizations, governing bodies, and/or rule establishing entities such as the United States Golf Associations (USGA) and the Royal and Ancient Golf Club of St. Andrews (R&A), but the apparatus, methods, and articles of manufacture described herein are not limited in this regard.

[0016] For some golf club grips, the mass or swing weight may change by up to 6 points depending on the dimensions, shapes, and volumes of the golf club grips. For instance, a family of grip sizes can have a mass that varies by approximately 26 grams from the smallest size to the largest size. A large golf club grip, for example, may weigh more than a smaller golf club grip, thereby slanting the center of gravity or balance point for the golf club from the golf club head toward the butt end. On the other hand, a small golf club grip, for example, may weigh less than a larger golf club grip, thereby slanting the center of gravity or balance point for the golf club from the butt end toward the golf club head. Accordingly, for some golf club grips, the center of gravity or balance point may not be stable when the dimension, shape, and volume changes.

[0017] One benefit of the disclosed golf clubs and manufacturing method thereof is that the disclosed golf clubs are capable of achieving or maintaining substantially the same mass, swing weight, and/or center of gravity regardless of the dimension, shape, and volume of the golf club grips **9**, **10**, **11**. Accordingly, the performance of the club may potentially be maximized. In some embodiments, the mass of all golf club grips **10** is within 5 grams (including all values to within 1 gram

or within the known tolerance/error of the particular weight value). That is, the dimension or volume of the golf club grips **9**, **10**, **11** may be increased without significantly increasing the mass or swing weight. Accordingly, the golf club grips **9**, **10**, **11** may be associated with the same mass, which may be predetermined depending on the use requirements or preferences for the particular golf club grips **9**, **10**, **11**. To this end, in some embodiments the hollow grip body **12** of the respective golf club grip **9**, **10**, **11** is associated with a density or specific gravity that smoothly varies along the longitudinal axis **14**, as explained below. The golf club grips **9**, **10**, **11** can thus achieve a predetermined mass or swing weight regardless of their dimensions, shapes, and volumes, which can potentially improve the balance, stability, and performance of the golf clubs when the golf club shaft **13** is received within the hollow grip body **12**.

[0018] In some embodiments, the hollow grip body **12** is associated with a density or specific gravity that increases along the longitudinal axis **14** from the shaft-receiving end **16** toward the butt end **18**. Density refers to an object's mass per unit volume, and specific gravity refers to a ratio of the object's density to the density of water at 4°C. Referring also to **FIG. 3**, increasing the density or specific gravity of the hollow grip body **12** may assist in achieving a predetermined mass or swing weight regardless of its dimension, shape, and volume, which can potentially improve the balance, stability, and performance of the golf club when the golf club shaft **13** is received within the hollow grip body **12**. By way of example only, the center of gravity (Grip CG) of the hollow grip body **12** may relate to the mass or grip weight of the hollow grip body **12** as follows:

$$(GripCG) = 0.47 \times (Grip\ Weight) - 14.773 \qquad [1]$$

Thus, the predetermined mass or grip weight achieved with the varying density of the hollow grip body **12** may assist in advantageously positioning the center of gravity at a desired location of the golf club. In other embodiments, the density or specific gravity may decrease along the longitudinal axis **14** from the shaft-receiving end **16** toward the butt end **18**. In still other embodiments, the hollow grip body **12** may contain sections or portions with different densities or specific gravities, as explained below.

[0019] In some embodiments, the density may vary substantially linearly along the longitudinal axis **14**. "Substantially linear" variation as used herein includes values within 15% (including all values to within 1%) of the particular density

according to a linear gradient or progression along the longitudinal axis **14**. In other embodiments, the density may vary linearly along the longitudinal axis **14**. A "linear" variation typically includes values within 1% of the particular density according to a linear gradient or progression along the longitudinal axis **14**, or alternatively within the known tolerance/error of the particular density value. The density or specific gravity of the hollow grip body **12** may thus vary along the longitudinal axis **14** proportional to a distance from the shaft-receiving end **16** or the butt end **18**.

[0020] In some embodiments, the density or specific gravity of the hollow grip body **12** may smoothly vary along the longitudinal axis **14** according to a linear, exponential, or other gradient or progression, excluding a stepped gradient or progression. The hollow grip body **12** may be associated with a specific gravity that smoothly varies from approximately 0.1 to approximately 20.0. In further embodiments, the hollow grip body **12** may be associated with a specific gravity that smoothly varies from 0.1, from 0.2, from 0.3, from 0.4, from 0.5, from 0.6, from 0.7, from 0.8, from 0.9, from 1.0, from 2.0, from 3.0, from 4.0, from 5.0, from 6.0, from 7.0, from 8.0, from 9.0, from 10.0, from 11.0, from 12.0, from 13.0, from 14.0, from 15.0, from 16.0, from 17.0, from 18.0, or from 19.0, to 20.0, to 19.0, to 18.0, to 17.0, to 16.0, to 15.0, to 14.0, to 13.0, to 12.0, to 11.0, to 10.0, to 9.0, to 8.0, to 7.0, to 6.0, to 5.0, to 4.0, to 3.0, to 2.0, to 1.0, to 0.9, to 0.8, to 0.7, to 0.6, to 0.5, to 0.4, to 0.3, or to 0.2. The smoothly varying density can facilitate achieving a predetermined swing weight when a golf club shaft is received within the hollow grip body **12**. The predetermined swing weight may assist in enhancing the performance of the golf club. For example, a center of gravity may be advantageously positioned at a desired location of the golf club to potentially improve the balance, stability, and performance. Depending on the use requirements or preferences for the particular golf club grip **10**, a hollow grip body **12** that is associated with a density or specific gravity varying along the longitudinal axis **14** according to a stepped gradient or progression may not provide the balance, stability, and performance of the golf club.

[0021] Referring also to **FIG. 4**, for example, the hollow grip body **12** is associated with a cross section **20** substantially perpendicular to the longitudinal axis **14**, and in some embodiments the cross section **20** tapers along the longitudinal axis **14**. Other configurations are possible depending on the use requirements or preferences for the particular golf club, including configurations where the hollow grip body **12** has a substantially uniform thickness in cross section. In some

embodiments, the hollow grip body **12** may be associated with a tapering outer diameter. For example, a hollow grip body **12** associated with an outer diameter of approximately 1.55 cm at the butt end **17** may be further associated with the taper profile summarized in the following Table 1. In particular, Table 1 lists a taper profile in which the outer diameter of the hollow grip body **12** is kept constant from the butt end **18** through approximately 12.7 cm toward the tip end **16** and then decreased substantially linearly through approximately 25.4 cm toward the tip end **16**. However, in other embodiments the taper profile of the hollow grip body **12** may vary from the butt end **18** through the tip end **16** according to any other gradient progression, including, but not limited to, linear, exponential, or other gradient or progression.

TABLE 1

	Length (cm)	Hollow grip body outer diameter (cm)
BUTT END	**0**	1.5494
	1.27	1.5494
	2.54	1.5494
	3.81	1.5494
	5.08	1.5494
	7.62	1.5494
	10.16	1.5494
	12.7	1.5494
	15.24	1.524
	17.78	1.524
	20.32	1.4986
	22.86	1.4732
	25.4	1.4478
TIP END	**45.72 (20.32 parallel OD section)**	1.4478

[0022] The hollow grip body **12** may comprise a plurality of synthetic resins or elastomers, such as butyl rubber, chloroprene rubber, ethylene propylene rubber, ethylene-propylene-diene monomer (EPDM) rubber, ethylene-vinyl acetate, halogenated butyl rubber, nitrile rubber, chloroprene rubber, polypropylene, polyurethane, and styrene-butadiene rubber, or a combination thereof, or can be made from other man-made and naturally occurring materials. For example, a golf grip can be comprised of wrapped leather, full cord material, a combination of elastomeric rubber and cord, or strictly rubber. In some embodiments, the plurality of

synthetic resins or elastomers is associated with a mix ratio, which may smoothly vary along the longitudinal axis **14**. In some embodiments, the mix ratio may vary substantially linearly along the longitudinal axis **14**. In other embodiments, the mix ratio may vary linearly along the longitudinal axis **14**. As explained below, in still other embodiments, the hollow grip body **12** may contain sections or portions with different densities.

[0023] In some embodiments, the hollow grip body **12** may be formed by injection molding, compression molding, or blow molding the plurality of synthetic resins, smoothly varying the density along the longitudinal axis **14** to achieve a predetermined swing weight when the golf club shaft **13** is received within the hollow grip body **12**. In particular, for injection molding the hollow grip body **12**, a two-piece outer shell may form the external shape of the hollow grip body **12** and a core bar such as a steel mandrel may establish the internal dimensions of the hollow grip body **12**. Once molded the shell can be separated and the core bar can be removed. Parting lines may be removed from the hollow grip body **12** and final grip dimensions may be achieved through buffing to final shape. In other embodiments, the hollow grip body **12** may be molded or formed by any suitable manners.

[0024] In some embodiments, an end cap **22** is integrally formed (e.g., molded or otherwise formed as one piece) with the butt end **18**. In further embodiments, the hollow grip body **12** is substantially seamless. In still further embodiments, the hollow grip body **12** and the end cap **22** may be integrally formed during the same molding process (e.g., injection molding process). This is a departure from known golf club grip production procedures, in case of which the end cap is pre-molded, and the injection-molding steps, on the one hand, and assembly steps, on the other hand, are kept very much separate. In contrast, the hollow grip body **12** and end cap **22** may be formed throughout the course or duration of the same molding process, which can make the manufacturing of the golf club grip **10** less cumbersome and more efficient. Other configurations are possible depending on the use requirements or preferences for the particular golf club, including configurations where the hollow grip body **12** is molded or otherwise formed separately with the butt end **18**, or including seams.

[0025] In some embodiments, the end cap **22** may include an infill material or disc-like weight **24**. The infill material or weight **24** may be associated with a density that varies from the densities of the hollow grip body **12**. In some

embodiments, the infill material or weight **24** may be associated with a density or specific gravity that is higher than the densities or specific gravities of the hollow grip body **12**. The higher density or specific gravity of the infill material or weight **24** may assist in positioning a center of gravity of the golf club at a desired location to improve the balance, stability, and performance. For example, the golf club grip **9** may be associated with an outer diameter of approximately 1.8 cm and co-molded with an end cap **22** including an infill material or weight **24** weighing up to approximately 3 grams more compared to the larger golf club grip **10**, so as to weigh approximately the same in aggregate. A further smaller golf club grip **9** associated with an outer diameter of approximate 1.7 cm may be co-molded with an end cap **22** including an infill material or weight **24** weighing from approximately 5 grams to approximately 10 grams more compared to the larger golf club grip **10**, so as to weigh approximately the same in aggregate.

[0026] In some embodiments, the infill material or weight **24** may be associated with a density or specific gravity that is lower than the densities or specific gravities of the hollow grip body **12**. In other embodiments, the infill material or weight **24** may be associated with a density or specific gravity that overlaps with the densities or specific gravities of the hollow grip body **12**. In still other embodiments, the end cap **22** may be made of the same material as the butt end **18** and may not include the infill material or weight **24**.

[0027] **FIGS. 5** and **6** illustrate the golf club grip **100** according to another embodiment. This embodiment employs much of the same structure and has many of the same features as the embodiment of the golf club grip **10** described above in connection with **FIGS. 1–4**. Accordingly, the following description focuses primarily upon the structure and features that are different than the embodiment described above in connection with **FIGS. 1–4**. Reference should be made to the description above in connection with **FIGS. 1–4** for additional information regarding the structure and features, and possible alternatives to the structure and features of the golf club grip **100** illustrated in **FIGS. 5** and **6** and described below. Structure and features of the embodiment shown in **FIGS. 5** and **6** that correspond to structure and features of the embodiment of **FIGS. 1–4** are designated hereinafter with like reference numbers.

[0028] The golf club grip **100** in this embodiment comprises a hollow grip body **112** that includes no more than two sections **114**, **116** along the longitudinal axis **14**. A first section **114** is associated with a first density, a second section **116** is

associated with a second density, and the first density is less than the second density to achieve a predetermined swing weight when the golf club shaft is received within the hollow grip body **112**. Depending on the use requirements or preferences for the particular golf club grip **100**, a hollow grip body that includes three or more sections along the longitudinal axis **14** may not provide the requisite efficiency in manufacturing. In contrast, the methods, apparatus, etc. described herein provide methods to manufacture a single molded golf club grip.

[0029] Rather than pre-forming each section **114**, **116** and then assembling the two sections **114**, **116** together, the two sections **114**, **116** may be formed throughout the course or duration of the same molding process. Single molding the two sections **114**, **116** can make the manufacturing of the golf club grip **100** less cumbersome and more efficient. Moreover, single molding the two sections **114**, **116** may require a single molding machine or equipment without requiring further parts for assembling the two sections **114**, **116** together, and thus may be cost-effective. In some embodiments, an end cap **22** may be integrally formed (e.g., molded or otherwise formed as one piece) with the second section **116** during the same molding process (e.g., injection molding process).

[0030] The hollow grip body **112** defines a first end, shaft-receiving end, or open tip end **118** and a second end or a butt end **120** positioned distal to the shaft-receiving end **118**. In some embodiments, the first section **114** extends from the shaft-receiving end **118** up to a position spaced approximately 0.1 cm to approximately 15.0 cm from the butt end **120**. In some embodiments, the first section **114** extends from the shaft-receiving end **118** up to a position spaced 0.1 cm or more, 0.2 cm or more, 0.3 cm or more, 0.4 cm or more, 0.5 cm or more, 0.6 cm or more, 0.7 cm or more, 0.8 cm or more, 0.9 cm or more, 1.0 cm or more, 2.0 cm or more, 3.0 cm or more, 4.0 cm or more, 5.0 cm or more, 6.0 cm or more, 7.0 cm or more, 8.0 cm or more, 9.0 cm or more, 10.0 cm or more, 11.0 cm or more, 12.0 cm or more, 13.0 cm or more, or 14.0 cm or more from the butt end **120**. In other embodiments, the first section **114** extends from the shaft-receiving end **118** up to a position spaced 15.0 cm or less, 14.0 cm or less, 13.0 cm or less, 12.0 cm or less, 11.0 cm or less, 10.0 cm or less, 9.0 cm or less, 8.0 cm or less, 7.0 cm or less, 6.0 cm or less, 5.0 cm or less, 4.0 cm or less, 3.0 cm or less, 2.0 cm or less, 1.0 cm or less, 0.9 cm or less, 0.8 cm or less, 0.7 cm or less, 0.6 cm or less, 0.5 cm or less, 0.4 cm or less, 0.3 cm or less, or 0.2 cm or less from the butt end **120**.

[0031] In some embodiments, the first section **114** is associated with a specific gravity of approximately 0.1 to approximately 2.0, and the second section **116** is associated with a specific gravity of approximately 2.0 to approximately 20.0. In some embodiments, the first section **114** is associated with a specific gravity of 0.1 or more, 0.2 or more, 0.3 or more, 0.4 or more, 0.5 or more, 0.6 or more, 0.7 or more, 0.8 or more, 0.9 or more, 1.0 or more, 1.1 or more, 1.2 or more, approximately 1.3 or more, 1.4 or more, 1.5 or more, 1.6 or more, 1.7 or more, 1.8 or more, or 1.9 or more. In further embodiments, the first section **114** is associated with a specific gravity of 2.0 or less, 1.9 or less, 1.8 or less, 1.7 or less, 1.6 or less, 1.5 or less, 1.4 or less, 1.3 or less, 1.2 or less, 1.1 or less, 1.0 or less, 0.9 or less, 0.8 or less, 0.7 or less, 0.6 or less, 0.5 or less, 0.4 or less, 0.3 or less, or 0.2 or less. In some embodiments, the second section **116** is associated with a specific gravity of 2.0 or more, 3.0 or more, 4.0 or more, 5.0 or more, 6.0 or more, 7.0 or more, 8.0 or more, 9.0 or more, 10.0 or more, 11.0 or more, 12.0 or more, 13.0 or more, 14.0 or more, 15.0 or more, 16.0 or more, 17.0 or more, 18.0 or more, or 19.0 or more. In further embodiments, the second section **116** is associated with a specific gravity of 20.0 or less, 19.0 or less, 18.0 or less, 17.0 or less, 16.0 or less, 15.0 or less, 14.0 or less, 13.0 or less, 12.0 or less, 11.0 or less, 10.0 or less, 9.0 or less, 8.0 or less, 7.0 or less, 6.0 or less, 5.0 or less, 4.0 or less, 3.0 or less, or 2.0 or less.

[0032] The specific gravities of the first and second sections **114**, **116** can facilitate achieving a predetermined swing weight when a golf club shaft is received within the hollow grip body **112**. The predetermined swing weight may assist in enhancing the performance of the golf club. For example, a center of gravity may be advantageously positioned at a desired location of the golf club to potentially improve the balance, stability, and performance.

[0033] In some embodiments, the hollow grip body **112** comprises a plurality of synthetic resins or elastomers. In further embodiments, the first section **114** comprises a first synthetic resin or elastomer, and the second section **116** comprises a second synthetic resin or elastomer. In some embodiments, the first and second sections **114**, **116** comprise a plurality of synthetic resins or elastomers mixed at respective ratios. In some embodiments, the hollow grip body **112** may be formed by compression molding or blow molding the plurality of synthetic resins. In other embodiments, the hollow grip body **112** may be molded or formed by any suitable manners.

[0034] Referring also to **FIG. 5**, for example, the hollow grip body **112** is associated with a cross section **122** substantially perpendicular to the longitudinal axis **14**, and in some embodiments the cross section **122** tapers along the longitudinal axis **14**. Other configurations are possible depending on the use requirements or preferences for the particular golf club, including configurations where the hollow grip body **112** has a substantially uniform thickness in cross section.

[0035] It should be understood from the foregoing that, while particular embodiments have been illustrated and described, various modifications can be made without departing from the spirit and scope of the disclosure as will be apparent to those skilled in the art. Such changes and modifications are within the scope and teachings of this disclosure as defined in the claims appended hereto.

CLAIMS

What is claimed is:

1. A golf club grip comprising:

a first end configured to receive a golf club shaft;

a second end opposite of the first end; and

a hollow grip body associated with a longitudinal axis and a density that smoothly varies along the longitudinal axis to achieve a predetermined swing weight when a golf club shaft is received within the hollow grip body.

2. The golf club grip of claim 1, wherein the density varies substantially linearly along the longitudinal axis.

3. The golf club grip of claim 1 further comprising an end cap integrally formed with the second end.

4. The golf club grip of claim 1, wherein the density increases along the longitudinal axis from the first end toward the second end.

5. The golf club grip of claim 1, wherein the hollow grip body is associated with a cross section substantially perpendicular to the longitudinal axis, and wherein the cross section tapers along the longitudinal axis.

6. The golf club grip of claim 1, wherein the hollow grip body comprises a plurality of synthetic resins.

7. The golf club grip of claim 1, wherein the hollow grip body comprises a plurality of synthetic resins, wherein the plurality of synthetic resins is associated with a mix ratio, and wherein the mix ratio smoothly varies along the longitudinal axis.

8. The golf club grip of claim 1, wherein the hollow grip body comprises a plurality of synthetic resins, wherein the plurality of synthetic resins is associated with a mix ratio, and wherein the mix ratio varies substantially linearly along the longitudinal axis.

9. The golf club grip of claim 1, wherein the hollow grip body is dimensioned to fittingly receive the golf club shaft.

10. A golf club grip comprising:
a first end configured to receive a golf club shaft;
a second end opposite of the first end; and
a hollow grip body associated with a longitudinal axis and including no more than two sections along the longitudinal axis, wherein a first section is associated with a first density, wherein a second section is associated with a second density, and wherein the first density is less than the second density to achieve a predetermined swing weight when a golf club shaft is received within the hollow grip body.

11. The golf club grip of claim 10 further comprising an end cap integrally formed with the second end.

12. The golf club grip of claim 10, wherein the first section extends from the first end up to a position spaced approximately 0.1 cm to approximately 15.0 cm from the second end.

13. The golf club grip of claim 10, wherein the first section is associated with a specific gravity of approximately 0.1 to approximately 2.0, and wherein the second section is associated with a specific gravity of approximately 2.0 to approximately 20.0.

14. The golf club grip of claim 10, wherein the hollow grip body is associated with a cross section substantially perpendicular to the longitudinal axis, and wherein the cross section tapers along the longitudinal axis.

15. The golf club grip of claim 10, wherein the hollow grip body comprises a plurality of synthetic resins.

16. The golf club grip of claim 10, wherein the first section comprises a first synthetic resin, and wherein the second section comprises a second synthetic resin.

17. The golf club grip of claim 10, wherein the first and second sections comprise a plurality of synthetic resins mixed at respective ratios.

18. The golf club grip of claim 10, wherein the hollow grip body is dimensioned to fittingly receive the golf club shaft.

19. A method of manufacturing a golf club grip, comprising:

molding a hollow grip body associated with a longitudinal axis and a density, wherein the density is smoothly varied along the longitudinal axis to achieve a predetermined swing weight when a golf club shaft is received within the hollow grip body.

20. The method of claim 19, wherein the hollow grip body includes no more than two sections along the longitudinal axis, wherein a first section is associated with a first density, wherein a second section is associated with a second density, wherein the first density is less than the second density to achieve a predetermined swing weight when a golf club shaft is received within the hollow grip body, and wherein the first and second sections are formed during the same molding process.

FIG. 1

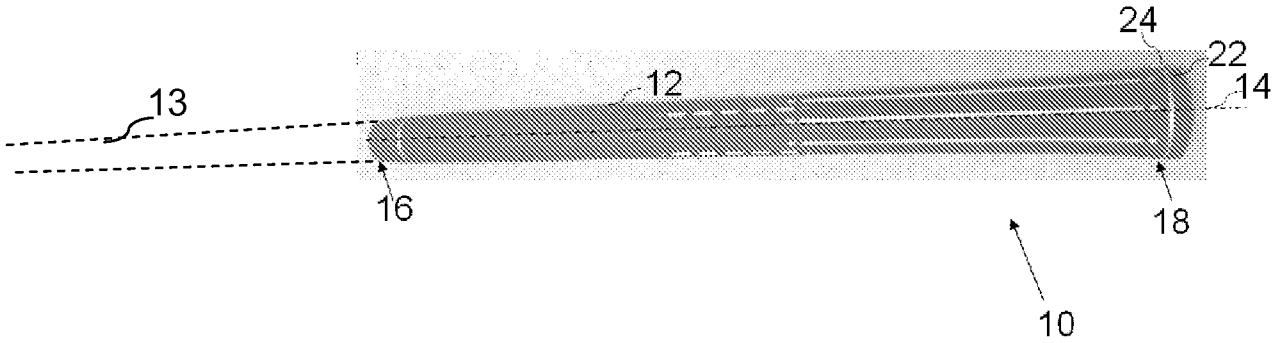


FIG. 2

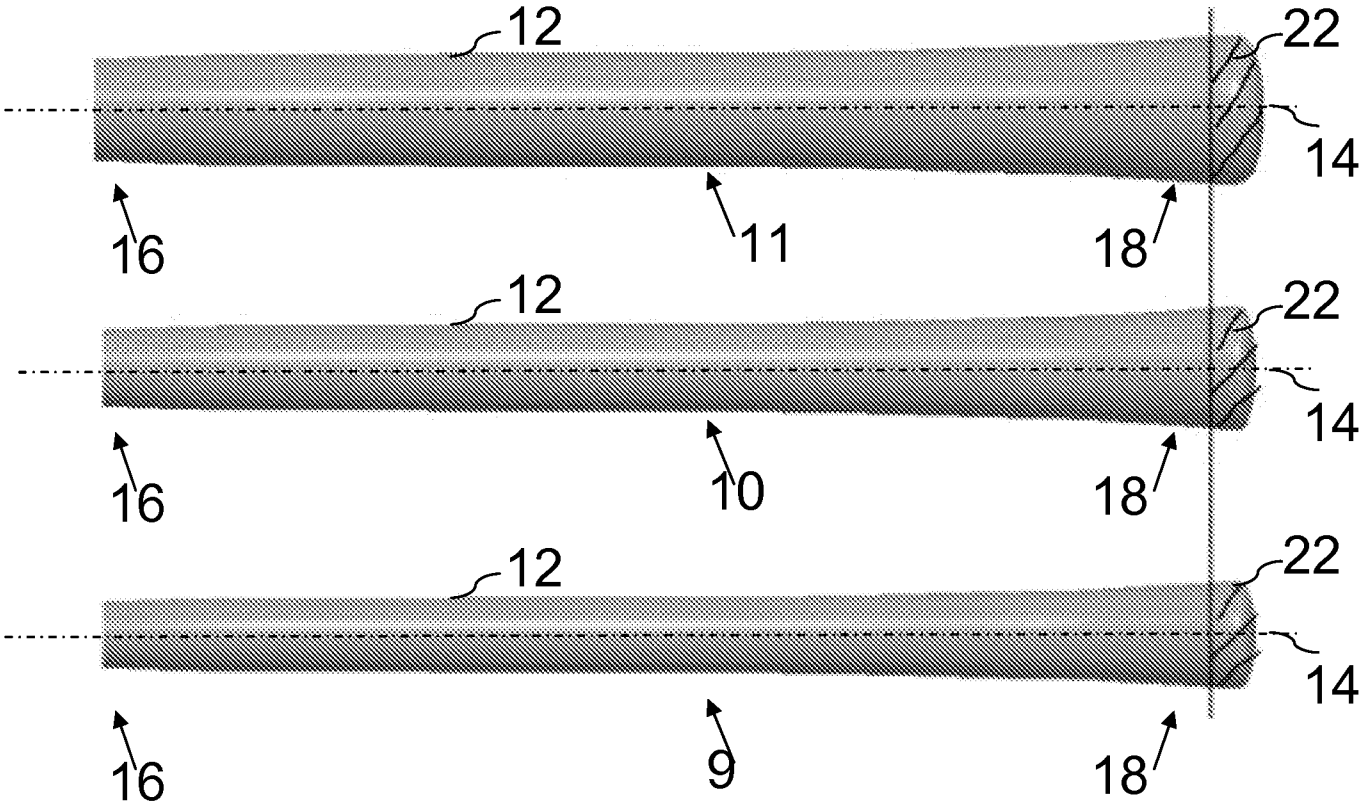


FIG. 3

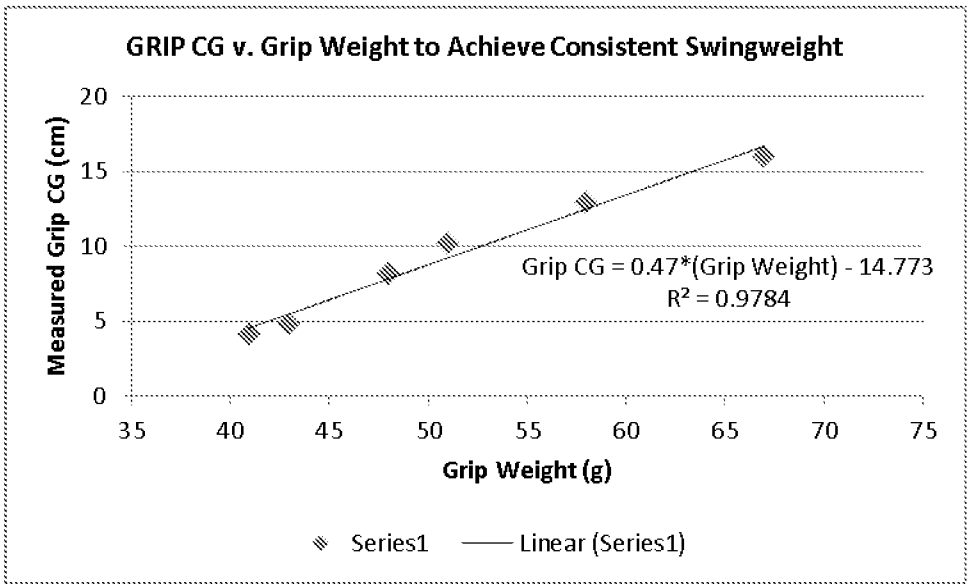

GRIP CG v. Grip Weight to Achieve Consistent Swingweight
Measured Grip CG (cm)
20
15
10
5
0
35
40
45
50
55
60
65
70
75
Grip Weight (g)
Grip CG = 0.47*(Grip Weight) - 14.773
R² = 0.9784
Series1
Linear (Series1)

FIG. 4

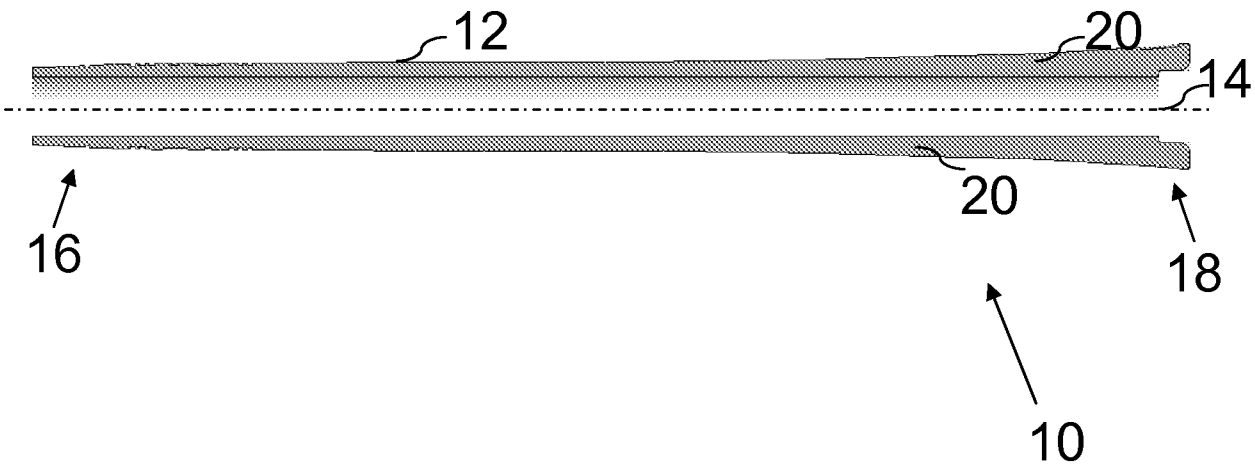


FIG. 5

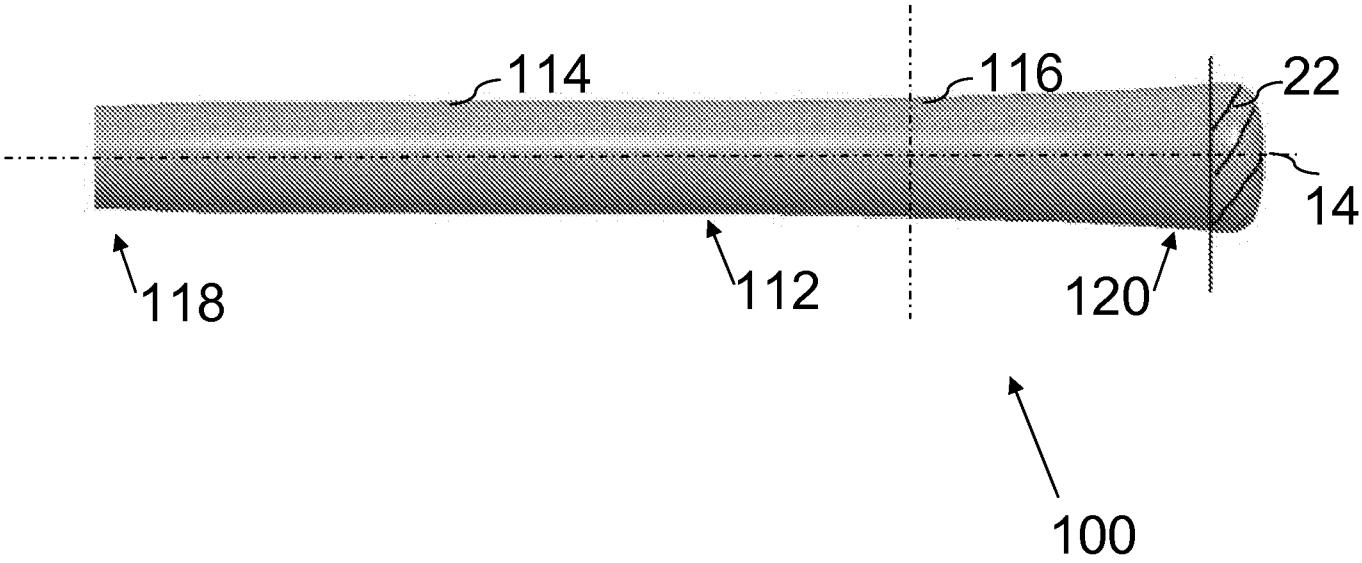
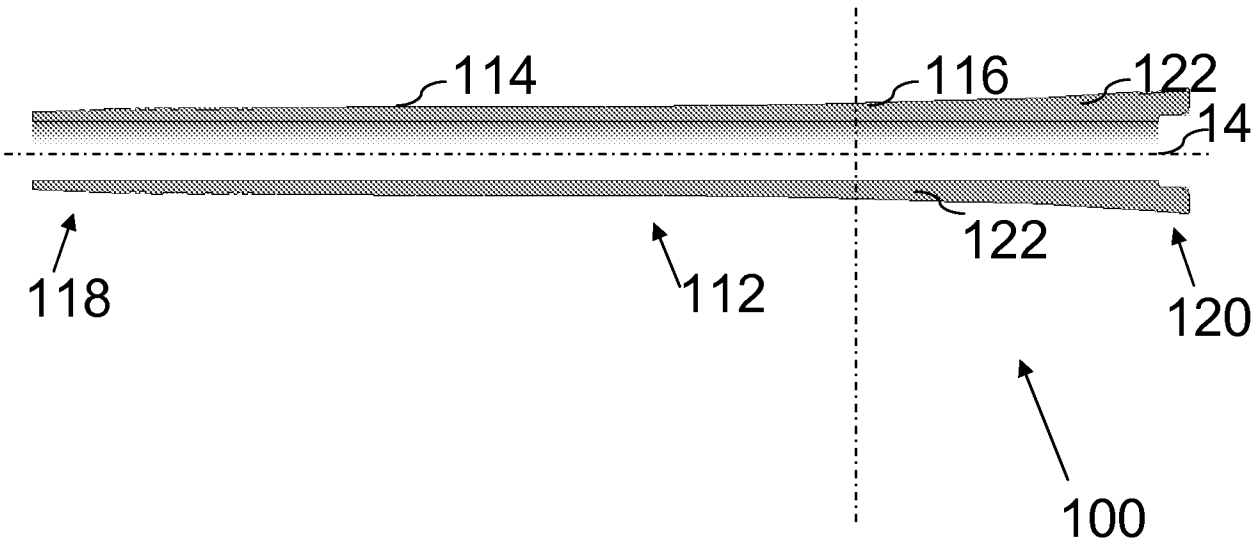


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/012199

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A63B 53/14 (2014.01)
USPC - 473/300
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - A63B 53/14; B23B 37/12; B28B 21/00; B29B 7/00; B29C 45/00, 45/14 (2014.01)
USPC - 156/293; 249/105; 264/273, 328.1, 328.14; 473/300

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC - A63B 53/14, 53/145, 53/16 (2014.02)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Orbit, Google Patents, Google

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X – Y	US 2009/0075747 A1 (KOU) 19 March 2009 (19.03.2009) entire document	10-18 --- 1-9, 19, 20
Y	US 2010/0001231 A1 (LOUKUS et al) 07 January 2010 (07.01.2010) entire document	1-9, 19, 20
A	US 2011/0053704 A1 (HUANG) 03 March 2011 (03.03.2011) entire document	1-20

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 April 2014	12 MAY 2014
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774