

Description

This invention relates generally to golf clubs, and more particularly to connection of a golf club head to a shaft to achieve certain advantages.

Many efforts have been made to reallocate metallic weight from the hosel area of a golf club to the head itself, in order to achieve higher energy availability for transfer when the club is swung. Such greater energy or momentum is then transferred to the golf ball when struck. This requires, for example, reduction of metal at the hosel area of the club.

Such efforts have included configurations wherein a shaft passed through the head of a persimmon wood. Typical of such configurations were: Wilson's staff model "Dynopower Fluid Feel" wood, produced around 1957; Wilson's "Helen Kicks" wood, produced in the 1920's; and certain MacGregor woods produced in the late 1930's. See also U.S. Patent Application Serial No. 204,704 entitled "Iron Golf club Heads", assigned to Calaway Golf Company, disclosing a hosel characterized by reduced mass or weight.

No way was known, to our knowledge, to connect a shaft to a golf club iron head, where the shaft passed to the bottom of the head and was reduced in diameter at or near the sole of the head so as not to interfere with an edge or edges of the sole; also, no way was known to connect such a shaft to a specially non-constant tapered bore in an iron hosel to provide a tight interference fit along the shaft and bore, upon axial assembly, enabling very good tactile "feedback" sensing, to the player, of head to ball impact.

It is a major object of the invention to provide an improved connection between a golf club head and shaft which meets the above needs, the head typically being an iron, such term also referring to a wedge, chipper, putter, wood, or other type.

According to the present invention there is provided a golf club having a head and a shaft, and comprising:

- a) a socket associated with the head, the socket having an inner wall tapering in an endwise direction generally toward the bottom of the head,
- b) the shaft having a lower end portion with circularly spaced cantilevered sections, and endwise extending slots formed between said sections,
- c) said cantilevered sections being forcibly received endwise into said socket causing the sections to be deflected by said socket inner wall to reduce the widths of the slots proximate lower ends of said sections closest to the bottom of the head.

As will be seen, the socket may have intersection with the bottom of the head, the section lower ends closing toward one another at or near that intersection, whereby a limit or resistance to collapse of the cantilever sections is produced along with formation of a frictionally jammed together connection, the latter also enhanced by adhesive bonding. In this regard, the sections lower ends typically may have lateral interengagement proximate the intersection. The lower end of the shaft alternatively may not intersect the bottom of the head.

Another object is the provision of spacial relationship of the hosel/face leading edge junction, characterized by desired continuity while allowing for socket-sole intersection, achieved without interruption of such leading edge continuity.

An object of another aspect of the invention is the provision for connection of a graphite shaft to a head hosel.

According to this aspect of the invention there is provided a golf club having a head and a graphite shaft,

- a) the head having a hosel socket defining an axis, and with an inner wall tapering relative to said axis in an endwise direction generally toward the bottom of the head,
- b) the graphite shaft having a tapered lower end portion received into the socket and connected thereto, the shaft lower end portion defining a bore and having wall thickness which is greater at one side of the bore than at the opposite side of the bore.

These and other objects and advantages of the invention, as well as the details of illustrative embodiments, will be more fully understood from the following specification and drawings, in which:

Fig. 1 is an elevation showing a golf club incorporating the invention;

Fig. 2 is a perspective view of the front and bottom of the Fig. 1 head;

Fig. 3 is a perspective view of a mid-upper section of the hosel;

Fig. 4 is a rear end perspective view of the section of the Figs. 1-3 head and hosel;

Fig. 5 is a top plan view taken at the upper end of the hosel;

Fig. 6 is a perspective view of the shaft lower end before its reception into the hosel and tapered socket;

Fig. 6a is like Fig. 6 but shows shaft cantilever portions closed together at their lower ends;

Fig. 7 is a vertical section taken through the tapered socket in the lower end of the hosel;

Fig. 8 is a fragmentary perspective view of a tapered graphite shaft;

Fig. 9 is an endwise cross section taken through the Fig. 8 shaft; and

Fig. 10 is a view showing the Fig. 8 shaft assembled into a club head.

DETAILED DESCRIPTION

In the drawings, a golf club 10, such as an iron, has a head 11 and a ferrule 12. Also shown is a hosel 13, typically formed or cast as part of the head, the latter consisting of metal or other material. A socket 14 is associated with the head and has an inner wall, the lower extent of which tapers in an endwise downward direction, generally toward the bottom 15 of the head at the heel. In this regard, the socket preferably has intersection at 16 with the head bottom 15, proximate heel 11b, that intersection typically being oval shaped due to angularity of bottom 15 relative to the socket axis.

Figs. 5 and 7 show that the socket taper commences at a zone indicated by line or plane 18 below a lengthwise straight, circular cross section bore 19 in the hosel and that extends from the upper end 21 of the hosel to horizontal plane 18. Bore 19 may be conical. The taper angle of the socket interior wall 22 preferably varies as for example appears in Figs. 5 and 7, though such variable taper may approach zero, defining a cone. Thus, the forward (leading) side 22a of wall 22 has relatively greater taper angularity α , relative to vertical, and the rearward (trailing) side 22b of the wall 22 has relatively lesser angularity β (typically zero) relative to vertical, providing differential tapers, as shown. The taper angles of wall sides 22c and 22d lie between α and β . Thus, the tapered bore 80 is eccentric relative to the cylindrical outer surface 13a of the upper hosel, above plane 18, and relative to the hosel bore 13b above that plane. Further, the socket bore cross sections are circular or near circular, as at planes 18a and 18b parallel to 18, which are normal to hosel axis 91. In this regard, the forward stroking direction is that indicated by arrow 25 in Figs. 4, 5 and 7, i.e., the direction toward which the head front face 11a faces (the ball striking direction). Angle β may be reduced to zero, as for a cylindrical shaft, or may be equal to a standard taper (.00375 cm (or inches) per cm (or inch) of length on one side). Angle α is between about 1 to about 8 degrees.

Further in this regard, the wall thickness of the hosel above plane 18 may also vary, as indicated, and may be circular, conical, or elliptical, for example. Thus, the thickness t_1 at the forward side of the hosel may be about the same as or greater than the thickness t_2 at the rearward side of the hosel. This relationship may be produced by forming bore 19 eccentrically relative to the cylindrical outer surface of the hosel, or it may be non-cylindrical or ellipsoidal. The main axis of the bore/shaft and the main axis of the outer configura-

tion of the hosel proper may be approximately aligned or slightly skewed. These relationships contribute to a spacial relationship of the hosel to the head face leading edge juncture 50 and 51 allowing reallocation of weight to the head itself (i.e., between the toe, top, and sole area) for greater or more focussed momentum during club swinging.

Yet another feature of the invention is the provision of a shaft lower end portion forcibly received into the socket, that shaft lower end portion having recess means whereby the lower end portion is collapsed at least in part into the recess means in response to its forcible reception into the socket. To this end, the lower end portion 30 of shaft 31 may advantageously have circularly spaced, cantilevered sections 32 which extend endwise, and have lower free ends or terminals 33, as seen in Fig. 6. Endwise extending slots 34 are formed between the metallic sections or tongues 32 to allow closure together of the sections (see Fig. 6a) when the sections are frictionally jammed downwardly into the tapered socket. Three to eight slots are workable. Note in Fig. 6a that the edges 32a of successive tongues may interengage at their lowermost locations 32a'. See also Figs. 1 and 2. Such edge interengagement or near interengagement occurs at or near the intersection locus 16; and a plug 36 of material may be filled into the central opening 37 formed by the closing sections. In such instances, the shaft may not physically intersect the head sole itself, although the theoretical intersection still exists. A suitable plastic or powdered metal plug may be used. Also, the lower end portion 30 of the shaft may be bonded to the hosel and socket inner walls, as by a suitable bonding agent, epoxy being one example. Thus a positively jammed together and bonded connection is provided. Shaft 31 typically consists of steel.

If the lowermost ends of the cantilever sections project below the intersection 16 upon assembly, they may be trimmed off, as by grinding.

Accordingly, a very strong, sturdy connection of the shaft to the head is provided, facilitating maximum reallocation or location of weight to or at the head itself, with maximum feel, as well as maintaining continuity of the hosel leading edge 48, and face leading edge 49, with no intersection of exit hole 16 interfering at juncture 50, 51, should such intersection at 16 exist.

The head typically comprises a metal (steel) casting, with:

- a) the head being a cast metal head having a socket with an inner wall tapering in an endwise direction generally toward the bottom of the head,
- b) the shaft having a lower end portion forcibly received into the socket, the lower end portion

deformed by and against the tapering inner wall, which defines casting irregularities acting to further deform the shaft lower end portion.

Likewise, the method of forming shaft to head connection includes:

- a) casting the head to have a bore tapering downwardly with variable taper,
- b) forcing the shaft lower end portion downwardly, into the variably tapered bore to effect partial collapse of the shaft lower end portion against the tapered bore.

Also, the head is typically cast to form surface irregularities at the bore, and against which the shaft lower end portion becomes deformed, as well as locked against twist relative to the bore.

In Figs. 8 and 9, a graphite shaft 60 is tubular and defines a cylindrical bore 61 having an axis 62. The shaft has a lower portion 60a below a plane 63 normal to axis 62, that lower portion 60a tapering toward the lowermost end 60b of the shaft. The shaft wall thickness is greater at one side of the bore (see wall section 64) than at the opposite side of the bore (see wall thickness 65 below level of plane 63). As shown in Fig. 9, the wall section 65 has an outer surface 65a that tapers, toward end 60b, whereas wall section 64 has outer surface 64a that is parallel to axis 62. The degree of taper of the shaft surfaces between 65a and 64a decreases from 65a to 64a, about the axis 62.

Fig. 10 shows the graphite shaft assembled into the hosel socket 66 in iron club head 67. The hosel socket has an upper bore 68, which is cylindrical, to receive cylindrical shaft extent 69 above plane 63. The socket also has a lower bore 70, which is tapered to match the taper of the shaft lower portion 60a. Thus, the hosel socket lower portion also defines an axis, corresponding to axis 62, and has an inner wall 70a tapering relative to that axis in an endwise direction to receive and seat the shaft tapered surface 65a. Socket opposite wall 73 receives sideward jamming engagement with the shaft wall surface 64a, as a result of jamming of shaft surface 65a against hosel tapered wall 70a. Adhesive, such as epoxy, may be used to bond the shaft and hosel walls together. The shaft tapered wall 65 faces forwardly, i.e., in the same direction as the head ball-striking face 82, i.e., in the direction of head swing.

Upon assembly, the protruding lowermost end 60b of the graphite shaft is typically ground off to produce the shaft flush end 60f in Fig. 11; and filler 80 may be introduced into the shaft bore lower end to close and seal the bore, and produce a smooth surfaced, lower surface of the head. The head itself may consist of metal, such as steel.

Claims

1. A golf club (10) having a head (11) and a shaft (31), and comprising:
 - a) a socket (14) associated with the head (11), the socket having an inner wall (22) tapering in an endwise direction generally toward the bottom (15) of the head,
 - b) the shaft (31) having a lower end portion (30) with circularly spaced cantilevered sections (32), and endwise extending slots (34) formed between said sections,
 - c) said cantilevered sections (32) being forcibly received endwise into said socket (14) causing the sections (32) to be deflected by said socket inner wall (22) to reduce the widths of the slots (34) proximate lower ends (33) of said sections closest to the bottom (15) of the head (11).
2. A golf club as claimed in claim 1, wherein said socket (14) has an intersection with the bottom (15) of the head (11), and, said lower ends (33) are displaced into engagement with one another at or near said intersection, said socket inner wall (22) having different portions (22a, 22b) defining differential tapers.
3. A golf club as claimed in claim 2, wherein said section lower ends (33) have proximate lateral interengagement, proximate said intersection.
4. A golf club as claimed in claim 1 wherein the head (11) has an upstanding hosel (13) defining a shaft receiving bore (19) aligned with said socket (14).
5. A golf club as claimed in claim 1, wherein said head (11) has a ball striking face (11a) which faces forwardly, and said socket inner wall (22) has forward and rearward sides (22a, 22b), the forward side (22a) of said inner wall having relatively greater taper angularity α and the rearward side (22b) of said inner wall having relatively lesser taper angularity β relative to an axis defined by the hosel (13).
6. A golf club as claimed in claim 5, wherein β is zero, and α is between about 1° and 8° .
7. A golf club (10) having a head (11) and a shaft (31) with an improved connection of the shaft to the head comprising in combination:
 - a) a socket (14) associated with the head (11), the socket having an inner wall (22) tapering in an endwise direction generally



deformed by and against the tapering inner wall, which defines casting irregularities acting to further deform the shaft lower end portion.

Likewise, the method of forming shaft to head connection includes:

- a) casting the head to have a bore tapering downwardly with variable taper,
- b) forcing the shaft lower end portion downwardly, into the variably tapered bore to effect partial collapse of the shaft lower end portion against the tapered bore.

Also, the head is typically cast to form surface irregularities at the bore, and against which the shaft lower end portion becomes deformed, as well as locked against twist relative to the bore.

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Upon assembly, the protruding lowermost end 60b of the graphite shaft is typically ground off to produce the shaft flush end 60f in Fig. 11; and filler 80 may be introduced into the shaft bore lower end to close and seal the bore, and produce a smooth surfaced, lower surface of the head. The head itself may consist of metal, such as steel.

Claims

1. A golf club (10) having a head (11) and a shaft (31), and comprising:
 - a) a socket (14) associated with the head (11), the socket having an inner wall (22) tapering in an endwise direction generally toward the bottom (15) of the head,
 - b) the shaft (31) having a lower end portion (30) with circularly spaced cantilevered sections (32), and endwise extending slots (34) formed between said sections,
 - c) said cantilevered sections (32) being forcibly received endwise into said socket (14) causing the sections (32) to be deflected by said socket inner wall (22) to reduce the widths of the slots (34) proximate lower ends (33) of said sections closest to the bottom (15) of the head (11).
2. A golf club as claimed in claim 1, wherein said socket (14) has an intersection with the bottom (15) of the head (11), and, said lower ends (33) are displaced into engagement with one another at or near said intersection, said socket inner wall (22) having different portions (22a, 22b) defining differential tapers.
3. A golf club as claimed in claim 2, wherein said section lower ends (33) have proximate lateral interengagement, proximate said intersection.
4. A golf club as claimed in claim 1 wherein the head (11) has an upstanding hosel (13) defining a shaft receiving bore (19) aligned with said socket (14).
5. A golf club as claimed in claim 1, wherein said head (11) has a ball striking face (11a) which faces forwardly, and said socket inner wall (22) has forward and rearward sides (22a, 22b), the forward side (22a) of said inner wall having relatively greater taper angularity α and the rearward side (22b) of said inner wall having relatively lesser taper angularity β relative to an axis defined by the hosel (13).
6. A golf club as claimed in claim 5, wherein β is zero, and α is between about 1° and 8° .
7. A golf club (10) having a head (11) and a shaft (31) with an improved connection of the shaft to the head comprising in combination:
 - a) a socket (14) associated with the head (11), the socket having an inner wall (22) tapering in an endwise direction generally



- toward the bottom (15) of the head (11),
 b) the shaft (31) having a lower end portion (30) forcibly received endwise into said socket (14),
 c) the shaft lower end portion (30) having recess means (34) whereby said lower end portion (30) is collapsed at least in part into said recess means (34) in response to said forcible reception into the socket.
8. A golf club as claimed in claim 7, wherein said socket (14) has oval shaped intersection (16) with the bottom (15) of the head, said shaft lower end portion (30) extending substantially to said intersection.
9. A golf club as claimed in claim 7, wherein the head (11) has an upstanding hosel (13) defining a shaft receiving bore (19), the bore (19) being aligned with said socket (14).
10. A golf club as claimed in claim 4 or claim 9, wherein the hosel (13) has an outer surface which is generally cylindrical, and wherein said bore (19) is eccentric relative to the hosel outer surface.
11. A golf club as claimed in claim 10, wherein the head (11) has a ball striking face (11a) which faces forwardly, and said hosel (13) has wall thickness (t_1) which is greater at the forward side of the hosel, and lesser (t_2) at the rearward side of the hosel.
12. A golf club as claimed in claim 10, wherein said socket intersection (16) with the bottom (15) of the head is oval shaped, the socket inner wall (22) being circular in planes normal to an axis defined by the hosel cylindrical outer surface.
13. A golf club as claimed in claim 7, wherein the head (11) has a ball striking face (11a) which faces forwardly, and said socket inner wall (22) has forward and rearward sides, the forward side (22a) of said inner wall having relatively greater taper angularity than the rearward side (22b) of said inner wall.
14. A golf club as claimed in claim 10, wherein said bore (19), relative to the outer surface of the hosel (13) is one of the following:
 i) non-constant, in cross section
 ii) circular, in cross section.
15. A golf club as claimed in any preceding claim, wherein said head (11) is a golf club iron head.
16. A golf club as claimed in any preceding claim, wherein the shaft (30), when received into the socket (14), has varying endwise taper adjacent the socket.
17. A golf club as claimed in any preceding claim, wherein the shaft (31) is made of metal.
18. A method of forming a connection between a golf club head (11) and band shaft (31), the shaft having a lower end portion (30) capable of partial collapse, the steps that include
 a) casting the head (11) to have a hosel bore (14) tapering downwardly, e.g. with variable taper, and
 b) forcing said shaft lower end portion (30) downwardly into said tapered bore to effect jamming of the shaft lower end portion (30) against said tapered bore (14), the head being cast to form surface irregularities at said bore, and against which the shaft lower end portion (30) becomes jammed.
19. A golf club having a head (67) and a graphite shaft (60),
 a) the head (67) having a hosel socket (66) defining an axis, and with an inner wall (70a) tapering relative to said axis in an endwise direction generally toward the bottom of the head (67),
 b) the graphite shaft (60) having a tapered lower end portion (60a) received into the socket (66) and connected thereto, the shaft lower end portion defining a bore (61) and having wall thickness which is greater at one side of the bore (at 64) than at the opposite side (at 65) of the bore.
20. A golf club as claimed in claim 19, wherein the lowermost end (60f) of the shaft (60) intersects the bottom of the head (11) and is flush therewith.

Patentansprüche

1. Ein Golfschläger (10) mit einem Kopf (11) und einem Schaft (31), der folgendes umfaßt:
 a) eine Hülse (14), die mit dem Kopf (11) verbunden ist, wobei die Hülse eine innere Wand (22) aufweist, die sich in der Richtung zum Ende zu allgemein in Richtung auf den Boden (15) des Kopfes verjüngt,
 b) daß der Schaft (31) einen unteren Endabschnitt (30) mit kreisförmig angeordneten, beabstandeten, freitragenden Abschnitten (32) aufweist und sich zum Ende hin erstreckende Schlitze (34) zwischen diesen Abschnitten ausgeformt sind,



- c) daß die freitragenden Abschnitte (32) zwangsweise am Ende in der Hülse (14) aufgenommen werden, was verursacht, daß die Abschnitte (32) durch die Hülseinnenwand (22) abgelenkt werden, um die Breiten der Spalte (34) in der Nähe der unteren Enden (33) der besagten Abschnitte, die dem Boden (15) des Kopfes (11) am nächsten liegen, zu reduzieren.
2. Ein Golfschläger nach Anspruch 1, bei dem die Hülse (14) eine Schnittstelle mit dem Boden (15) des Kopfes (11) aufweist und die besagten unteren Enden (33) zum Eingriff miteinander an oder nahe der besagten Schnittstelle verschoben sind, wobei die Hülseinnenwand (22) unterschiedliche Abschnitte (22a, 22b) aufweist, die unterschiedliche Verjüngungen festlegen.
3. Ein Golfschläger nach Anspruch 2, bei dem die unteren Enden (33) unmittelbar seitlichen Eingriff miteinander nahe der Schnittstelle haben.
4. Ein Golfschläger nach Anspruch 1, bei dem der Kopf (11) einen hochstehenden Hosel (13) aufweist, der eine den Schaft aufnehmende Bohrung (19) bildet, die mit der Hülse (14) ausgerichtet ist.
5. Ein Golfschläger nach Anspruch 1, bei dem der Kopf (11) eine Ballschlagfläche (11a) aufweist, die nach vorn gerichtet ist, und die Hülseinnenwand (22) nach vorn und nach hinten gerichtete Seiten (22a, 22b) aufweist, wobei die nach vorn gerichtete Seite (22a) der Innenwand eine relativ größere Verjüngungswinkelneigung α aufweist und die nach hinten gerichtete Seite (22b) der Innenwand eine relativ geringere Verjüngungswinkelneigung β relativ zu einer Achse, die durch den Hosel (13) definiert wird, aufweist.
6. Ein Golfschläger nach Anspruch 5, bei dem β null ist und α zwischen etwa 1° und 8° liegt.
7. Ein Golfschläger (10) mit einem Kopf (11) und einem Schaft (31) mit einer verbesserten Verbindung des Schaftes mit dem Kopf, der in Kombination folgendes aufweist:
- a) eine Hülse (14), die mit dem Kopf (11) verbunden ist, wobei die Hülse eine innere Wand (22) hat, die sich in einer Richtung zum Ende hin, allgemein in Richtung auf den Boden (15) des Kopfes (11) verjüngt,
- b) daß der Schaft (31) einen unteren Endabschnitt (30) aufweist, der zwangsweise am Ende in der Hülse (14) aufgenommen wird,
- c) daß der untere Endabschnitt (30) des Schaftes Einschnitteinrichtungen (34) aufweist, durch die der untere Endabschnitt (30) wenigstens zum Teil in diesen Einschnitteinrichtungen (34) als Folge der zwangsweisen Aufnahme in der Hülse zusammengedrückt wird.
8. Ein Golfschläger nach Anspruch 7, bei dem die Hülse (14) eine oval geformte Schnittstelle (16) mit dem Boden (15) des Kopfes aufweist und sich der untere Endabschnitt (30) des Schaftes im wesentlichen zu dieser Schnittstelle erstreckt.
9. Ein Golfschläger nach Anspruch 7, bei dem der Kopf (11) einen nach oben stehenden Hosel (13) aufweist, der eine den Schaft aufnehmende Bohrung (19) bildet, wobei die Bohrung (19) mit der Hülse (14) ausgerichtet ist.
10. Ein Golfschläger nach Anspruch 4 oder Anspruch 9, bei dem der Hosel (13) eine äußere Oberfläche aufweist, die allgemein zylindrisch ist, und bei dem die Bohrung (19) exzentrisch relativ zu der äußeren Oberfläche des Hosels ist.
11. Ein Golfschläger nach Anspruch 10, bei dem der Kopf (11) eine Ballschlagfläche (11a) hat, die nach vorn gerichtet ist, und der Hosel (13) eine Wandstärke (t_1) aufweist, die an der nach vorn gerichteten Seite des Hosels größer und an der nach hinten gerichteten Seite des Hosels kleiner (t_2) ist.
12. Ein Golfschläger nach Anspruch 10, bei dem die Hülse-schnittstelle (16) mit dem Boden (15) des Kopfes oval geformt ist und die Hülseinnenwand (22) in Ebenen normal zu einer Achse, die durch die zylindrische äußere Oberfläche des Hosels definiert ist, kreisförmig ist.
13. Ein Golfschläger nach Anspruch 7, bei dem der Kopf (11) eine Ballschlagfläche (11a) aufweist, die nach vorn gerichtet ist, und die Hülseinnenwand (22) nach vorn und nach hinten gerichtete Seiten aufweist, wobei die nach vorn gerichtete Seite (22a) der Innenwand eine relativ größere Verjüngungswinkelneigung als die nach hinten gerichtete Seite (22b) der Innenwand hat.
14. Ein Golfschläger nach Anspruch 10, bei dem die Bohrung (19) relativ zu der äußeren Oberfläche des Hosels (13) von folgender Beschaffenheit ist:



- i) nicht konstant im Querschnitt
- ii) kreisförmig im Querschnitt.

15. Ein Golfschläger nach einem der vorhergehenden Ansprüche, bei dem der Kopf (11) ein Golfschlägereisenkopf ist.

16. Ein Golfschläger nach einem der vorhergehenden Ansprüche, bei dem der Schaft (30), wenn er in der Hülse (14) aufgenommen wird, angrenzend an die Hülse eine variiierende Endverjüngung aufweist.

17. Ein Golfschläger nach einem der vorhergehenden Ansprüche, bei dem der Schaft (31) aus Metall hergestellt ist.

18. Ein Verfahren zum Ausformen einer Verbindung zwischen einem Golfschlägerkopf (11) und dem Schaft (31), wobei der Schaft einen unteren Endabschnitt (30) aufweist, der teilweise zusammengedrückt werden kann, mit den Verfahrensschritten, die folgendes umfassen:

- a) daß der Kopf (11) so gegossen wird, daß er eine Hoselbohrung (14) aufweist, die sich nach unten, zum Beispiel mit einer variablen Verjüngung, verjüngt, und
- b) daß dieser untere Endabschnitt (30) des Schaftes nach unten in die sich verjüngende Bohrung gedrückt wird, um ein Einklemmen des unteren Endabschnitts (30) des Schaftes gegen die sich verjüngende Bohrung (14) zu bewirken, wobei der Kopf so gegossen ist, daß Oberflächenunregelmäßigkeiten an der Bohrung gebildet werden, gegen die der untere Endabschnitt (30) des Schaftes verklemmt wird.

19. Ein Golfschläger mit einem Kopf (67) und einem Graphitschaft (60),

- a) bei dem der Kopf (67) eine Hoselhülse (66) aufweist, die eine Achse definiert, und mit einer Innenwand (70a) versehen ist, die sich relativ zu dieser Achse in einer Richtung zum Ende hin allgemein in Richtung auf den Boden des Kopfes (67) verjüngt, und

- b) der Graphitschaft (60) einen sich verjüngenden unteren Endabschnitt (60a) aufweist, der in der Hülse (66) aufgenommen wird und mit dieser verbunden ist, wobei der untere Endabschnitt des Schaftes eine Bohrung (61) bildet und eine Wanddicke aufweist, die an einer Seite der Bohrung (bei 64) größer als an der gegenüberliegenden Seite (bei 65) der Bohrung ist.

20. Ein Golfschläger nach Anspruch 19, bei dem das unterste Ende (60f) des Schaftes (60) den Boden des Kopfes (11) schneidet und mit diesem fluchtet.

Revendications

1. Crosse (10) de golf ayant une tête (11) et un manche (31), et comprenant :

a) une douille (14) associée à la tête (11), la douille ayant une paroi interne (22) dont la dimension varie progressivement vers le bout, de façon générale vers la partie inférieure (15) de la tête,

b) le manche (31) ayant une partie d'extrémité inférieure (30) comportant des tronçons en porte-à-faux (32) espacés circulairement, et des fentes (34) disposées vers le bout et formées entre les tronçons,

c) les tronçons en porte-à-faux (32) étant logés à force par l'extrémité dans la douille (14) de manière que les tronçons (32) fléchissent sous l'action de la paroi interne (22) de la douille pour réduire les largeurs des fentes (34) à proximité des extrémités inférieures (33) des tronçons qui sont les plus proches de la partie inférieure (15) de la tête (11).

2. Crosse de golf selon la revendication 1, dans laquelle la douille (14) a une intersection avec la partie inférieure (15) de la tête (11), et les extrémités inférieures (33) sont décalées en coopération l'une avec l'autre à l'intersection ou près de celle-ci, la paroi interne (22) de la douille ayant des parties différentes (22a, 22b) qui présentent des conicités différentes.

3. Crosse de golf selon la revendication 2, dans laquelle les extrémités inférieures (33) des tronçons présentent une imbrication latérale immédiate à proximité de l'intersection.

4. Crosse de golf selon la revendication 1, dans laquelle la tête (11) a un manchon (13) qui dépasse et qui délimite un trou (19) de logement de manche aligné sur la douille (14).

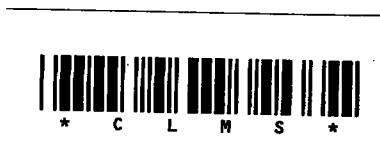
5. Crosse de golf selon la revendication 1, dans laquelle la tête (11) a une face (11a) de frappe de balle qui est tournée vers l'avant, et la paroi interne (22) de la douille a des faces avant et arrière (22a, 22b), la face avant (22a) de la paroi interne ayant un angle relativement grand d'inclinaison α et la face arrière (22b) de la paroi arrière ayant un angle d'inclinaison relativement plus petit β par rapport à un axe déterminé par le manchon (13).



6. Crosse de golf selon la revendication 5, dans laquelle l'angle β est nul et l'angle α est compris entre environ 1 et 8°.
7. Crosse de golf (10) ayant une tête (11) et un manche (31) et ayant un raccord perfectionné du manche à la tête, comprenant en combinaison :
 - a) une douille (14) associée à la tête (11), la douille ayant une paroi interne (22) dont la dimension diminue vers le bout, de façon générale vers la partie inférieure (15) de la tête (11),
 - b) le manche (31) ayant une partie d'extrémité inférieure (30) logée à force par le bout dans la douille (14),
 - c) la partie d'extrémité inférieure (30) du manche ayant une cavité (34) de manière que la partie d'extrémité inférieure (30) s'écrase au moins en partie dans la cavité (34) lors du logement à force dans la douille.
8. Crosse de golf selon la revendication 7, dans laquelle la douille (14) a une intersection (16) de forme ovale avec la partie inférieure (15) de la tête, la partie d'extrémité inférieure (30) du manche rejoignant pratiquement l'intersection.
9. Crosse de golf selon la revendication 7, dans laquelle la tête (11) a un manchon (13) qui dépasse et délimite un trou (19) de logement de manche, le trou (19) étant aligné sur la douille (14).
10. Crosse de golf selon la revendication 4 ou 9, dans laquelle le manchon (13) a une surface externe de forme générale cylindrique, et le trou (19) est excentré par rapport à la surface externe du manchon.
11. Crosse de golf selon la revendication 10, dans laquelle la tête (11) a une face (11a) de frappe de balle qui est tournée vers l'avant, et le manchon (13) a une épaisseur de paroi (t_1) qui est plus grande du côté avant du manchon et plus petite (t_2) du côté arrière du manchon.
12. Crosse de golf selon la revendication 10, dans laquelle l'intersection (16) de la douille avec la partie inférieure (15) de la tête a une forme ovale, la paroi interne (22) de la douille étant circulaire dans des plans perpendiculaires à un axe délimité par la surface externe cylindrique du manchon.
13. Crosse de golf selon la revendication 7, dans laquelle la tête (11) a une face (11a) de frappe de balle tournée vers l'avant, et la paroi interne (22) de la douille a des côtés avant et arrière, le côté avant (22a) de la paroi interne ayant une inclinaison relativement plus grande que le côté arrière (22b) de la paroi interne.
14. Crosse de golf selon la revendication 10, dans laquelle le trou (19), par rapport à la surface externe du manchon (13), présente l'une des deux propriétés suivantes :
 - i) il n'a pas une section constante,
 - ii) il a une section circulaire.
15. Crosse de golf selon l'une quelconque des revendications précédentes, dans laquelle la tête (11) est une tête de fer de crosse de golf.
16. Crosse de golf selon l'une quelconque des revendications précédentes, dans laquelle le manche (30), lorsqu'il est logé dans la douille (14), a une conicité variant en bout près de la douille.
17. Crosse de golf selon l'une quelconque des revendications précédentes, dans laquelle le manche (31) est formé d'un métal.
18. Procédé de formation d'un raccord entre une tête (11) de crosse de golf et un manche (31), le manche ayant une partie d'extrémité inférieure (30) qui peut s'écraser partiellement, le procédé comprenant les étapes suivantes :
 - a) le moulage de la tête (11) afin qu'elle ait un trou (14) dans un manchon, le trou ayant une dimension qui diminue vers le bas, c'est-à-dire ayant une inclinaison variable, et
 - b) l'introduction à force de la partie d'extrémité inférieure (30) du manche vers le bas dans le trou de dimension qui varie afin que la partie d'extrémité inférieure (30) du manche se coince contre le trou (14) de dimension qui varie, la tête étant moulée afin qu'elle forme des irrégularités de surface dans le trou, la partie d'extrémité inférieure (30) du manche se coinçant contre ces irrégularités.
19. Crosse de golf ayant une tête (67) et un manche (60) de graphite,
 - a) la tête (67) ayant une douille (66) de manchon délimitant un axe, et ayant une paroi interne (70a) dont la dimension diminue progressivement par rapport à l'axe vers le bout, de façon générale vers la partie inférieure de la tête (67), et
 - b) le manche de graphite (60) ayant une partie d'extrémité inférieure (60a) de dimen-

sion qui varie progressivement et qui est logée dans la douille (66) et qui lui est raccordée, la partie d'extrémité inférieure du manche délimitant un trou (61) et ayant une épaisseur de paroi qui est plus grande d'un premier côté du trou (en 64) que du côté opposé du trou (en 65). 5

20. Crosse de golf selon la revendication 19, dans laquelle l'extrémité inférieure (60f) du manche (60) recoupe la partie inférieure de la tête (11) et est à son niveau. 10



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