Nov. 5, 1940. A. W. SCOTT 2,220,852

GOLF CLUB SHAFT

Filed March 31, 1937

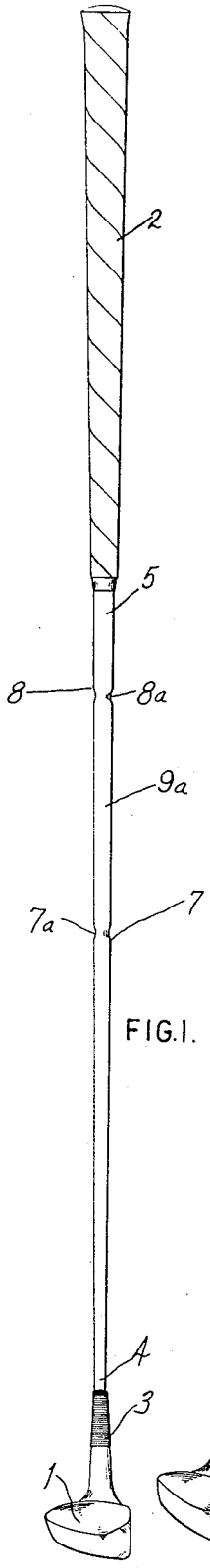


FIG. 1.

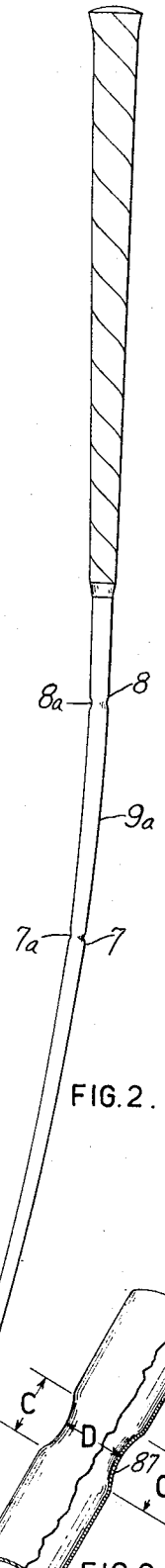


FIG. 2.

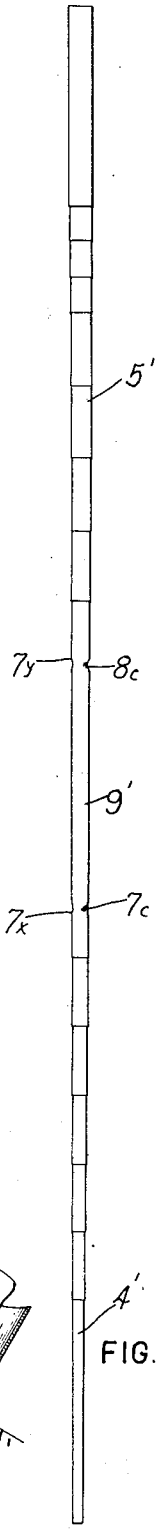


FIG. 4.

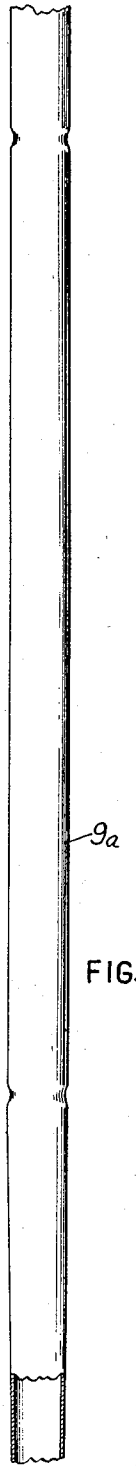


FIG. 3.

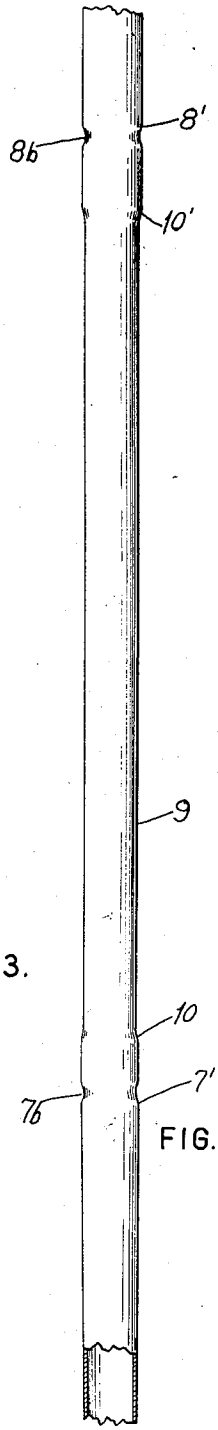


FIG. 5.

FIG. 6.

INVENTOR.
ARCHIE W. SCOTT.

BY Slough & Caufield

ATTORNEYS.

Patented Nov. 5, 1940

2,220,852

UNITED STATES PATENT OFFICE

2,220,852

GOLF CLUB SHAFT

Archie W. Scott, Geneva, Ohio, assignor to The American Fork & Hoe Company, Cleveland, Ohio, a corporation of Ohio

Application March 31, 1937, Serial No. 134,131

10 Claims. (Cl. 273—80)

My invention relates to golf club shafts, and relates more particularly to golf club shafts of the metallic tubular type.

It has been previously proposed to accentuate the flexibility of a tubular metallic golf club shaft in the longitudinal intermediate region substantially below the hand grip carrying portion of the shaft, and more distantly spaced from the club head end of the shaft, in addition to the normal accentuated flexibility existing in shafts which are of progressively reduced diameters towards the club head supporting ends as the result of such reduction of diameter near the club head.

The patent to Barnhart, No. 2,050,554, dated August 11, 1936, represents one such proposal, involving the provision of a shaft having its lower portion tapered rather abruptly from a mid portion of the shaft toward the club head supporting end, and then proceeding in the opposite direction to the hand supporting shaft region the shaft is first substantially reduced in diameter, producing a shoulder followed by a substantially diametrically reduced shaft section which, in one illustrated embodiment, proceeds without any further increase in diameter, i. e., in substantially cylindrical form to the hand grip supporting end of the shaft, and in another embodiment, as it proceeds in the same direction, is progressively increased in diameter so that the hand grip supporting end of the shaft is of substantially larger diameter than the initially reduced portion adjacent the shoulder.

My present invention relates to an improvement in shafts of this kind, in that the flexibility of the shaft is effected in the desired intermediate portion of the shaft at preferably two rather closely but substantially spaced portions of the said intermediate region, whereby I am enabled to secure the desired results so far as accentuation of flexibility in the desired intermediate portion of the shaft is concerned, i. e., remote from the club head, without otherwise disturbing the normal rate of taper of a golf club shaft throughout its length from the extreme end of the handle supporting portion to the extreme club head supporting tip portion of the shaft, and in such manner that the effect of my improvement results in the shaft being more bendable resiliently when in use, at an intermediate portion of its length remote from the club head, thus achieving the so-called "high-whip" characteristic which is highly desirable and at the same time permitting the shaft to flex in other portions progressively more and more, proceeding downwardly from the hand grip supporting portion toward the club head supporting portion.

However, very effective operating results may be secured in a shaft embodying the principles of my invention which is not tapered in its portions either above or below the said shoulder reduced portions.

My invention relates to the general type of golf club shafts disclosed in the said Barnhart patent, and in the pending applications for patent of Norman P. Vickery, Serial Nos. 674,530, 693,935, and 741,116, filed June 6, 1933, October 17, 1933, and August 23, 1934, respectively.

For different players, depending upon the nature of their "stroke", i. e., the pattern of the movement of the club during the stroke and the relatively different velocities at different portions of the stroke, more advantageous results may be achieved in shafts embodying my invention with the said diametrically reduced portions in different numbers and disposed somewhat differently than for other players, and my invention is susceptible for use in embodiments having different placements and different numbers of said diametrically reduced portions.

However, it is important in the making of shafts embodying my invention that the diametrically reduced portions shall be of relatively short lengths, ranging preferably from ⅛" to 1" in preferred embodiments.

An object of my invention, therefore, is to provide an improved golf club shaft having improved distributon of flexibility in the different longitudinally disposed portions of its length.

Another object of my invention is to provide an improved golf club shaft achieving the aforesaid object and which may be durable in use.

Another object of my invention is to provide an improved golf club shaft susceptible of achieving the aforesaid objects without otherwise changing the shaft diameters in other than very restricted portions of the length of the shaft, so that the results of the reduction of diameter in the very short diametrically reduced portions will be superimposed on the usual results achieved in the usual shafts which are progressively tapered throughout the major portion of their length.

Other objects of my invention and the invention itself will become more apparent to those skilled in this art by reference to the following drawing illustrating certain embodiments of my invention, and which are described in the fol-

lowing specification as examples of the manner in which my invention may be carried out.

Referring to the drawing:

Fig. 1 illustrates a complete golf club in elevation, which embodies the principles of my invention;

Fig. 2 is a similar view of the golf club of Fig. 1 in, though somewhat exaggerated for purposes of illustration, a resiliently bent form occasioned during use of the club in play;

Fig. 3 is a similar view of a fragment of the length of a golf club shaft like that of the foregoing figures, but of such enlarged size as to more proportionally illustrate its formation;

Fig. 4 is a similar view of a shaft per se, similar to the shafts of the foregoing figures, but involving the step-taper formation of the main portions of the shaft instead of a smooth continuous taper, and which embodies my invention;

Fig. 5 is a view similar to that of Fig. 3, of a similar shaft fragment of a shaft, which is another embodiment of my invention; and

Fig. 6 is a relatively larger view of a fragment of shaft, partially in elevation and partially in section, illustrating more clearly than in the preceding views a preferred formation of a diametrically reduced tubular neck portion of a shaft embodying my invention.

Referring now first to the embodiment of my invention illustrated in Figs. 1, 2, and 3, I illustrate therein a golf club having a head 1 and hand grip 2 affixed in any known manner to the lower and upper ends of the shaft, the head 1 preferably having a tubular hosel 3 into which the lower end 4 of the shaft is projected and into which it is tightly secured.

The hand grip 2 comprises wrappings of a leather strip or otherwise comprises a layer of fabric, leather, rubber, or like material, placed exteriorly on the upper end 5 of the shaft. The shaft comprises the portions 4 and 5, and portions intermediate such portions, and is, as indicated at 6, Fig. 3, of tubular construction, made of chrome molybdenum steel or other metallic material; the walls of such shaft are relatively thin, ordinarily varying in thickness according to the reduction of diameter of the shaft which ordinarily is tapered from the handle end towards the tip end, and preferably the more diametrically reduced portions of the shaft, ordinarily being at the tip end, have wall thicknesses in excess of that at the diametrically larger portions at the hand grip end of the shaft.

The shaft of this embodiment of my invention may be, as illustrated, tapered at a uniform rate per unit portion of its length, or the rate of taper may be varied as for instance as disclosed in the patent to Hackett, No. 1,974,271, dated September 18, 1934, which illustrates a conoidally tapered shaft. The portions of the shaft above the point indicated at 7 may be otherwise than of conoidally tapered formation, and very efficient results are secured if the conoidally tapered form is employed only from the point 7 to the tip portion 4.

Between the points indicated at 7 and 8, I have provided what I herein term a "high-whip" zone of flexibility, which comprises relatively longitudinally short diametrically reduced portions 7*a* and 8*a*, each preferably having walls of circular cross-sectional form and longitudinally of progressively increasing diameters in both longitudinal directions proceeding from the middle of each of said portions 7*a* and 8*a*.

Fig. 3 illustrates the preferred formation of these diametrically reduced portions which may be conveniently termed "neck" portions. The junctions of the said "neck" portions with the adjacent portions of the shaft are preferably smoothly curvilinearly formed so as to avoid any abrupt break in the continuity of the curved surface extending longitudinally of the shaft, whereby bending stresses imposed upon the shaft, being accentuated in these "neck" portions, will not be so severely localized as to crystallize the metal at said junctions or elsewhere, but whereby when the shaft is subjected to such bending stresses as illustrated in somewhat exaggerated form in Fig. 2, these "neck" portions will yield to shorten their longitudinal extent at the concave side of the bent shaft and to lengthen their longitudinal extent at the convex side of the bent shaft. In effect, these "neck" portions provide miniature bellows effects in the operation of the shaft, such effect being limited by the degree of shallowness of such "neck" portions and the thickness of the material of the walls of the shaft comprised in said "neck" portions.

The provision of a plurality of these relatively short "neck" portions in the "zone of flexibility" achieves substantially the same result as is achieved in the shafts of the said Vickery applications where there is provided a considerable length of intermediate portion of the shaft which is of reduced diameter, except that in the shaft of the present invention the bending is more severely localized and the two "neck" portions are sufficiently close together that the combined effect of the two "neck" portions spaced somewhat apart, as shown, is to accomplish the same amount of "high-whip" which would preferably be provided in shafts of the Vickery type.

In Fig. 4 I show, as a matter of further refinement, another embodiment of my invention, wherein a fragment of the length of the shaft comprising the said "zone of flexibility" between the points 7' and 8' is shown, and having the "neck" portions 7*b* and 8*b* located respectively adjacent the said points 7' and 8', and both between said points, and in addition I provide a relatively longer shaft portion of somewhat less reduced diameter shown at 9 extending between the shoulders 10 and 10', whereby the portion 9 is adapted to flex more readily and to a greater degree for a given bending stress than is the similarly placed portion 8*a* of the shaft of Figs. 1 to 3 inclusive.

I find that this construction is a further refinement, effecting greater continuity in curvature as a result of flexing stress in the said zone of flexibility, and I further find that by diametrically reducing the shaft both in the portion 9 and the portions 7*b* and 8*b* in the same shaft, that none of these portions are required to be decreased in diameter to the same extent as would otherwise be the case. I find, also, that vibrations of the shaft which would strain the hands of the user in the ordinary type of tubular steel golf club shafts, resulting from impact with the ball of the club head during the making of a stroke, are subdued as they are transmitted longitudinally of the shaft, by the break in the continuity of the otherwise relatively longitudinally straight side walls of the tube forming the shaft, at the neck portions 7*a* and 8*a* of Figs. 1 to 3 inclusive, so that this effect is still more pronounced in a shaft comprising the diametrically reduced neck portions 7*b* and 8*b* in addition to the relatively longer reduced portion 9.

In Fig. 4 I show another embodiment of my

invention, which will be readily understood as its construction is or may be similar to the embodiments already described, it having the "neck" portions 7c and 8c included in the said zone of flexibility between the points 7x and 7y.

The portion 9', shown as being of the type shown in Figs. 1 to 3 inclusive at 9a, may also be of reduced diameter as shown at 9, Fig. 4, such construction being readily understood without the necessity of illustration in view of Fig. 4.

The shaft of Fig. 4 differs in its main portions comprising the grip supporting portion 5' and the portion between the club head supporting tip 4' and excluding the said zone of flexibility between 7x and 7y, in that instead of the said shaft being of smooth tapered form, the tapering is accomplished by providing a relatively large number of successive cylindrical sections each of successively reduced diameters according to the teachings of the prior patent to Robert H. Cowdery, No. 1,670,530, dated May 22, 1928. This construction has become known in the art as the step-taper construction, as distinguished from the smooth tapered construction of such shaft portions as illustrated in Figs. 1 and 2.

In Fig. 6 I have illustrated a short fragment of the shaft to illustrate more particularly the result of the curvature of the outer wall of the shaft in and adjacent to one of the said "neck" portions, to show the smooth curvilinear merging of the said "neck" portion of the shaft walls with the adjacent shaft wall portions, better than it could be done in the other necessarily reduced views, it being understood that a shaft may be from 33 to 44 inches long and the shaft diameters ordinarily varying from ¼" to $\frac{5}{16}$" at the one end to from ½" to ⅝" at the other end.

In Fig. 6, I have shown a very short section of any of the shaft previously described and illustrated in the foregoing figures, said section comprising more particularly a view in elevation and section, to illustrate the formation of the tube at the said "neck." In this view I have applied the reference characters C and C' at the two sides of the shaft to indicate a proposed length of said "neck" and at D I have indicated the outside diameter of the shaft in the "neck" portion of least diameter, the "neck" being generally indicated by the reference character 87.

Although my invention in its broader aspects is not to be construed as being limited thereto, I find that most efficient results are secured in embodiments of my invention wherein the length of the said "neck," as indicated at C and C', is not linearly in excess of the circumference of the shaft as at the intermediate or portion of the "neck" which is of least outside diameter. In other words, where the "neck" C is made longer than would be represented by a length equal to the linear distance around the circumference at the most restricted portion of the "neck," then there begins to be a localization of crystalizing stress in portions of the "neck" during use of the shaft in a golf club, and one of the principal functions of such a "neck" as shown and described is to avoid severe localization of such stress as would tend toward crystallization.

Preferably I make the "neck" even shorter than would be thus indicated, with the side walls of the shaft continuously concavely curved with well rounded shoulders at the extremities of the "neck," as I have found that such a construction, and which is illustrated in the drawing, is the preferable construction in view of the considerations hereinabove outlined.

By the definitely located "necks" occupying but a small portion of the length of the shaft, the club head is largely caused to swing more nearly about such a restriction without so much variation during portions of the swing which impose different degrees of flexing stresses on the shaft, and one of the objects of my invention is to achiieve a more accurate positioning of the portions of the shaft which are of maximum flexibility and which are located relatively nearer the hand grip portion than to the club head portion.

The shaft portions which are adjacent the club head are of course preferably reduced in diameter so that the diameters of such portions are, if anything, somewhat less in diameter than the portions of either or both of the "necks" located relatively high in the shaft, so that such lower portions adjacent the head may be made flexible, but with such portions it is desirable that the flexure be more distributed over a longer length of the shaft due to the greater tendency towards breakage of the shaft in portions near the club head. At the same time, it is desirable that considerable flexibility be afforded in some portions of the shaft, in order to respond to the rebound effect of the club head hitting a ball and which effect is very rapid. Such rebound effect may be had without the face of the club head leaving contact with the ball due to the velocity at which the club head travels when the ball is struck, and yet the rebound effect just mentioned is experienced and involves flexing more particularly of the lower portion of the shaft at an extremely high velocity rate of flexure.

Having described my invention in different embodiments, I am aware that other embodiments of the invention may be made involving the use of a greater or lesser number of said "neck" portions and in combination with other structural changes, for instance that illustrated in Fig. 5. The "neck" portions may be varied in degree of diametrical reduction and longitudinal length, and to some extent in placement longitudinally of the shaft, and within the pervue of my invention the scope of which is to be construed in view of the claims which follow the specification.

I claim:

1. A tubular metallic golf club shaft comprising oppositely disposed club head and hand grip supporting end portions, and an intermediate portion comprising a zone of increased flexibility, said zone disposed longitudinally of the shaft at least in part below the lower limit of said hand grip supporting portion and substantially medially of the shaft, said zone characterized by the provision of at least one "neck" portion of the length of the tubular shaft which is of substantially reduced diameter relative to the adjacent portions and of a length not substantially in excess of a linear dimension represented by the circumference of the portion of said "neck" which is of least outside diameter, and said neck comprising longitudinally concaved shaft side walls comprising substantially an arc of a circle and curvilinearly merging with the adjacent shaft wall portions whereby lateral flexing of the shaft is substantially intensified within the longitudinal extent of said neck, and the shaft diameters equidistant from the most restricted part of the neck portion and adjacent the neck portion being substantially equal.

2. A tubular metallic golf club shaft comprising oppositely disposed club head and hand grip supporting end portions, and an intermediate portion comprising a zone of increased flexibility, said zone disposed longitudinally of the shaft at least in part below the lower limit of said hand grip supporting portion and substantially medially of the shaft, said zone characterized by the provision of at least a pair of "neck" portions each being of such a portion of the length of the tubular shaft which is not in excess of the circumferential distance around the shaft in the most diametrically reduced portion of said "neck," and said neck comprising longitudinally concaved shaft side walls comprising substantially an arc of a circle and curvilinearly merging with the adjacent shaft wall portions whereby lateral flexing of the shaft is substantially intensified within the longitudinal extent of said neck, and the shaft diameters equidistant from the most restricted part of the neck portion and adjacent the neck portion being substantially equal.

3. The golf club shaft substantially as set forth in claim 1, characterized by said shaft being of substantially tapered form throughout most of its length with said "neck" portion imposed between sections of said tapered shaft, and said neck comprising longitudinally concaved shaft side walls comprising substantially an arc of a circle and curvilinearly merging with the adjacent shaft wall portions whereby lateral flexing of the shaft is substantially intensified within the longitudinal extent of said neck, and the shaft diameters equidistant from the most restricted part of the neck portion and adjacent the neck portion being substantially equal.

4. A tubular metallic golf club shaft comprising oppositely disposed club head and hand grip supporting end portions, and an intermediate portion comprising a zone of increased flexibility, said zone disposed longitudinally of the shaft at least in part below the lower limit of said hand grip supporting portion and substantially medially of the shaft, said zone characterized by the provision of at least one "neck" portion of the length of the tubular shaft which is of substantially reduced diameter relative to the adjacent portions and of a length less than a linear dimension represented by the circumference of the portion of said "neck" which is of least outside diameter, and said neck comprising longitudinally concaved shaft side walls comprising substantially an arc of a circle and curvilinearly merging with the adjacent shaft wall portions whereby lateral flexing of the shaft is substantially intensified within the longitudinal extent of said neck, and the shaft diameters equi-distant from the most restricted part of the neck portion and adjacent the neck portion being substantially equal.

5. A tubular metallic golf club shaft comprising oppositely disposed club head and hand grip supporting end portions, and an intermediate portion comprising a zone of increased flexibility, said zone disposed longitudinally of the shaft at least in part below the lower limit of said hand grip supporting portion and substantially medially of the shaft, said zone characterized by the provision of at least a pair of "neck" portions each being of such a portion of the length of the tubular shaft which is less than the circumferential distance around the shaft in the most diametrically reduced portion of said "neck," and said necks comprising longitudinally concaved shaft side walls comprising substantially an arc of a circle and curvilinearly merging with the adjacent shaft wall portions whereby lateral flexing of the shaft is substantially intensified within the longitudinal extent of said necks, and the shaft diameter equi-distant from the most restricted part of the neck portion and adjacent the neck portion being substantially equal.

6. The golf club shaft substantially as set forth in claim 5, characterized by said shaft being of substantially tapered form throughout most of its length with said "neck" portions imposed between sections of said tapered shaft, and said necks comprising longitudinally concaved shaft side walls comprising substantially an arc of a circle and curvilinearly merging with the adjacent shaft wall portions whereby lateral flexing of the shaft is substantially intensified within the longitudinal extent of said necks, and the curvature from the most restricted part of said neck portion in each longitudinal direction to the juncture with adjacent shaft portions being substantially uniform.

7. The golf club shaft substantially as set forth in claim 2, characterized by said shaft being of substantially tapered form throughout most of its length, and said "neck" portions imposed between sections of said tapered shaft.

8. The golf club shaft substantially as set forth in claim 4, characterized by said shaft being of substantially tapered form throughout most of its length, and said "neck" portion imposed between sections of said tapered shaft.

9. A golf club shaft of tubular metallic construction throughout, having in its portion intermediate the head and hand grip supporting end portions at least one "neck" portion formed by deflecting an annular transversely extending portion of the wall of said shaft, radially inwardly, said inwardly deflected portion comprising an annular groove of the outer surface of the shaft, the said groove being of a width measuring less than the circumferential dimension of the shaft portions bordering said grooved portion, and said grooved portion being of curvilinear form in directions longitudinally of the shaft, and with its border portions merging with the adjacent portions of the shaft curvilinearly whereby said border portions are convexly curved relative to the concavely curved portion of the intermediate portion of the groove.

10. A golf club shaft of tubular metallic construction throughout, having in its portion intermediate the head and hand grip supporting end portions at least one "neck" portion formed by deflecting an annular transversely extending portion of the wall of said shaft, radially inwardly, said inwardly deflected portion comprising an annular groove of the outer surface of the shaft, the said groove being of a width measuring less than the circumferential dimension of the shaft portions bordering said grooved portion, and said grooved portion having groove sides of curvilinear form in directions longitudinally of the shaft, and with its border portions merging with the adjacent portions of the shaft substantially curvilinearly whereby said border portions are convexly curved relative to the concavely curved portions disposed inwardly thereof at the sides of the groove.

ARCHIE W. SCOTT.