Aug. 9, 1949. G. W. YEARLEY 2,478,554

GOLF CLUB

Filed Oct. 11, 1946 2 Sheets-Sheet 1

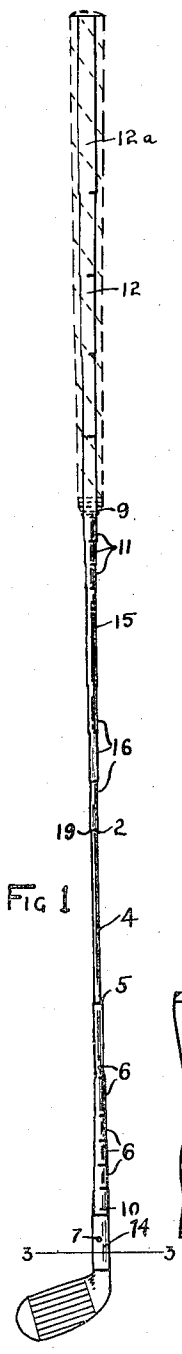


Fig 1

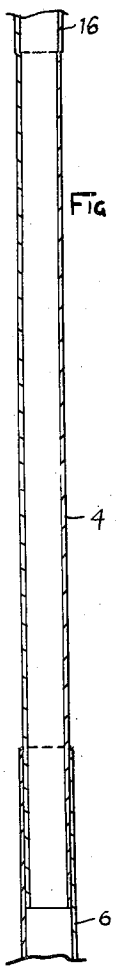


Fig 5



Fig 4

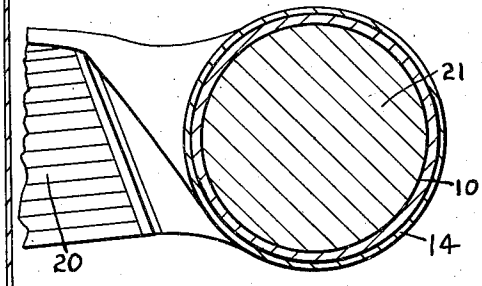


Fig 3

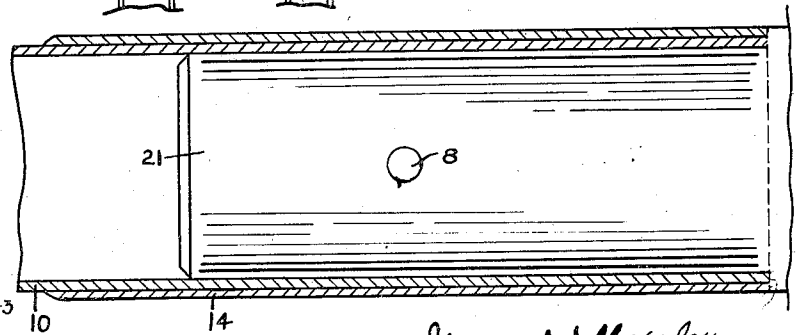


Fig 2

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GOLF CLUB

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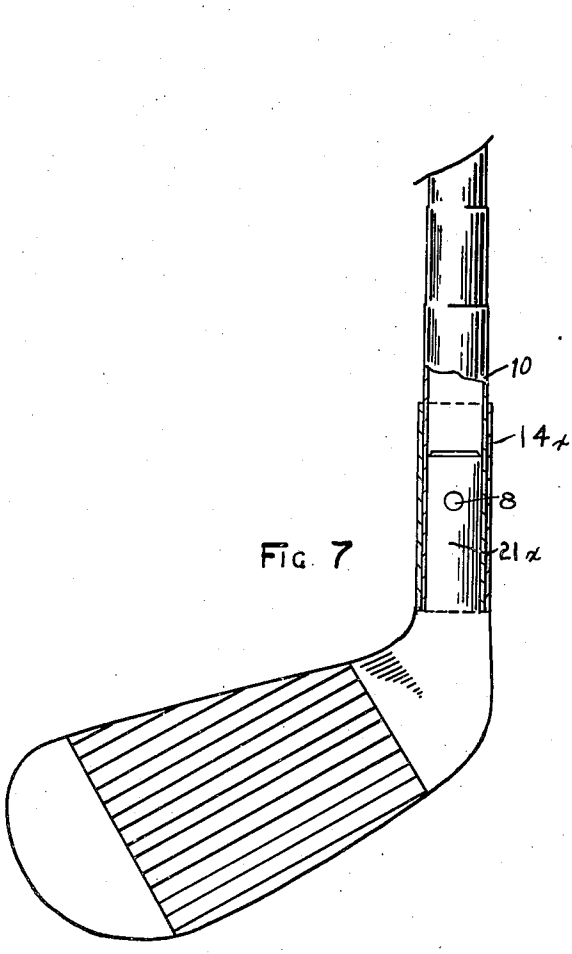


FIG. 7

FIG 6

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GOLF CLUB

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Application October 11, 1946, Serial No. 702,690

2 Claims. (Cl. 273—80)

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My invention relates to golf clubs and relates more particularly to golf clubs of the type employing a metallic tubular shaft, whose diameter is least in a relatively short section of its length, disposed medially its ends and preferably medially of that half of the club length which, at its lower end is adapted to be affixed to and support golf club head, and to improved means for relatively interconnecting the head and shaft.

Golf club shafts having a medial reduced, longitudinally extending, relatively flexible section are known, reference therefore being had to U. S. Letters Patent 2,250,428, to Norman P. Vickery, dated July 22, 1941. Formerly, the nature of the response of a golf club shaft, and the shock imposed upon its lower end, caused by the improper striking of a golf ball by an off-center face portion of the golf club head when travelling at a high velocity, had become the subject of widely variant explanations.

As a result of the taking of a rapid succession of a large number of almost instantaneous photographs, it is now known that said response starts with a substantially sharp bend of the shaft just above the hosel of the golf club head and thereafter, due to the relative inertia of the heavy golf club head, more upwardly disposed portions of the shaft become deflected, until finally, by what may be termed a "crack the whip" operation, the handle end of the shaft is violently thrown forward to cause the fingers of the player's hands to sting smartly.

The lower end portion of the shaft being commonly of least diameter, is frequently bent beyond the elastic limit, by the effect of off-center shots, and takes a "set," or is broken.

Again, the diametrically reduced lower end portions of most prior steel tubular shafts being tightly fitted into a tubular recess of the head shank, are with difficulty efficiently, rigidly secured to said shank.

Although there have been prior proposals to telescope a solid head shank into the lower end of the shaft, the commercial methods for forming the shafts in quantity production do not permit the lower shaft end to have sufficiently thick strong walls to rigidly hold the head shank and to sufficiently protect the shaft against breakage.

Accordingly, the present invention is directed in part to the strengthening of the lower end portion of the shaft, and the relative weakening of a portion of the shaft disposed approximately one-fourth to one-third of the distance towards the upper end, and the making of the strengthened portion of such substantial length that the

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sharp bending of the lowermost and now strengthened end of the shaft is reduced to substantially negligible proportions, particularly since by the provision of the weakened portion, such shaft portion in substance invites bending in such a region.

However, the bending in the intentionally provided weakened portion being effected by relative movement of the club head, with respect to such portion, on a much longer radius, the bending is not nearly so sharp as in the case of the conventional golf club shaft.

The shaft of the present invention also involves the provision of a shaft and head connection which possesses advantages over prior art construction.

An object of my invention is to provide:

A golf club comprising a tubular shaft having a lower end portion of such construction that an iron type golf club head may be secured thereto, in such a manner as to avoid localization of bending stresses in that region of the shaft length which is disposed in the region which extends upwardly from the head and is initiated immediately above the upper end portion of the golf club head shank.

Another object of my invention is to provide an improved means for joining a metallic tubular golf club shaft, to the upper end portion of an iron golf club head.

Other objects of my invention and the invention itself will be apparent to those skilled in the golf club playing and manufacturing arts, to which my invention pertains, by reference to the following description of certain preferred embodiments of my invention, and to the drawings illustrating the said embodiments wherein:

Fig. 1 is a side elevational view of a golf club which is an embodiment of my invention;

Fig. 2 is a longitudinal medial sectional view of the lower end portion of the shaft of the said embodiment;

Fig. 3 is a transverse section taken on the line 3—3 of Fig. 1 through section 10 and sleeve 14;

Fig. 4 is a view, mostly in side elevation, but partially in medial sectional view of a fragment of a golf club shaft wherein a downwardly expanding lowermost portion of the shaft is secured to the lower end of an upwardly extending reduced section thereof, by a drive fit telescoping connection.

Fig. 5 is a view similar to that of Fig. 4 showing a similar drive-fit connection between the lower end portion of a downwardly progressively reduced upper shaft portion and the most re-

duced end section of a downwardly progressively expanded lower shaft portion.

Figs. 6 and 7 are relatively enlarged views of the lowermost portion of the golf club of Fig. 2, partially in elevation and partly in section, respectively showing variant constructions.

Referring now to the drawings in all of which like parts are designated by like reference characters, the golf club head of my invention is provided with a suitable striking portion 20 and an upwardly extending solid shank 21, which is outwardly of preferably cylindrical form, and preferably said shank is provided with a transverse medially disposed retaining pin bore 8.

The shank 21 is adapted to be rigidly secured to the lower end of a tubular shaft by press fitting the shank within the walls of said lower shaft portion; by the adoption of this method of interconnecting the shank to the shaft, the shank may be made much shorter than the usual alternative head hosel into which the lower end of the shaft is projected, and being shorter and of lesser diameter than the said hosel, the center of mass and weight of the shank may be reduced to lower the center of gravity of the complete head which may be thus lowered so as to be disposed much closer to the center of the striking face of the head.

Referring now to the first embodiment of my invention comprising Figs. 1, 4, and 5, the shaft thereof comprises a metallic thin-walled tube, onto the lower end 10 of which a sleeve 14 is drive fitted.

The shaft tube comprises a lowermost club head supporting portion, which proceeds downwardly of the shaft towards its head supporting end from a point 2, the shaft being of least diameter from the point 2 over a substantially cylindrical short section 4, whose lower limit is indicated at 5 where the tube is substantially abruptly enlarged, and then proceeds downwardly by other successive cylindrical sections 6.

The sections 6 are each of successively larger diameter than the immediately preceding section, until the terminal cylindrical section 10 of largest diameter, is provided to afford a socket for the reception of the club head shank 21, of the head 20.

The shank 21 being outwardly of cylindrical form is of such outside diameter as to make a drive-fit within the walls of the terminal section 10 of the tube. Although such a drive-fit may be relied upon to maintain the head shank and shaft end relatively rigidly secured together, I prefer to add to the security of the connection by projecting a retaining pin 7 through aligned transverse bores 8 of said tube section 10 and said shank 21, both ends of said pin being preferably headed over, exteriorly of the shaft bore.

The upper portion of the shaft may be progressively decreased in diameter from the lower end 9 of its hand grip supporting portion, to the shoulder 19 which adjoins the lower shaft portion of least diameter at the point 2 in any suitable manner, and in the embodiment shown the reduction is effected by providing the shaft tube with a suitable number of successive cylindrical sections 11, seven of which are employed in the present emodiment, to gradually achieve the desired reduction in diameter.

The hand grip supporting portion 12 of the shaft may be of any suitable form such as cylindrical, downwardly or upwardly tapered, but in the embodiment shown, I prefer to achieve a reduction of its diameter proceeding from its upper end to its lower end indicated at 9 by providing a plurality of successively reduced sections 12*a* in such number as to provide the usual degree of reduction, with the uppermost section 12*a* being preferably longer than the more downwardly disposed sections 12*a*.

Although such shafts may be made in widely varying dimensions, I prefer that the degree of reduction throughout the hand grip supporting portion 12, which may be 15½" long, should be in the ratio of .57" for the uppermost section to .5" for the lowermost hand grip supporting section 12*a*.

I prefer to make the section between the points 9 and 2 in varying ratios of diametrical reduction and this I accomplish by providing this portion of the length of the shaft with an uppermost group 11 of three sections, each ¾" in length, an intermediate section 15 being 3" long, and a relatively lower group 16 comprising three sections each 1½" long. The amount of reduction between any two of such adjacent sections being in the amount of .017", therefore, where a plurality of such step sections each of relatively short length are arranged in a group, the rate of diametrical change per unit of shaft length is increased with respect to another group having longer sections.

Therefore, although the diameter of the uppermost section 11 is .483", the intermediate section 15 will be .432" and the lowermost section of the group 16 will be .381".

Similarly, the lower portion of the shaft proceeding downwardly from the point 2 comprises the section 4, of .366" in diameter, being 5⅜" long followed by the uppermost section of the group 6 which is 5⅜" long as compared to the more downwardly disposed three sections of the same group 6 which are each ¾" in length and arranged from .432" to .466" in diameter.

The lowermost section 10 is 2⅛" long and has a diameter of .483".

Having hereinabove described the integral tube comprising upper and lower portions which are merged by the shoulder 19 at the point 2 in the length of the shaft, I place a tubular reinforcing sleeve 14 over the final lowermost cylindrical section 10 of the shaft, and the diameter of its bore being such as to make the fit of the inner surfaces of the sleeve, with the outer surfaces of the tube section 10, a driving or press fit.

The presence of the sleeve 14 increases the diameter of the lower end portion of the shaft, by an amount equal to the combined thickness of opposite wall portions and by making the wall thickness of the lowermost section of the shaft .015", and by providing a sleeve 14 whose wall has a thickness of .012", the outside diameter of said sleeve will be .507" and the inside diameter of the lowermost portion of the tube section 10, which may be 2⅛" long, will be .453"; thus the reinforced lower end of section 10 of the shaft tube 1, into which the head shank 21 is press fitted to a longitudinal extent of 1⅝", will have an aggregate wall thickness of .027", which dimension corresponds to the radial dimension of the shoulder, or shelf 20*a* (Fig. 6), whereby smoothness of longitudinal contour as between the outer surface of the sleeve 14, and the lower adjacent portion of the shank is achieved.

The club head shank will project upwardly from an annular shelf 20*a*, of the club head, which shelf is preferably of the same diameter as the outside diameter of the sleeve 14 at the lower end of the shaft. As previously stated, medially of

its ends, the shank 21 has a transverse bore 8 extending therethrough for the reception of the pin 7 which passes through similar bores 8 and 8a of the shaft tube section 10 and sleeve 14 respectively.

Although definite dimensions are above given for the various portions of a shaft embodying my invention, it will be understood such are merely exemplary, and may be widely departed from in other embodiments.

The head shank being thus secured to the lower end of the shaft tube and the connection being reinforced by the presence of the enclosing sleeve 14, when an off-center portion of the face 20b of the head is improperly caused to strike a golf ball during the making of a golf stroke, the mass and inertia of the ball will tend to deflect said head rearwardly of a downward projection of the axis of the hand grip portion of the shaft, but due to the progressive downward enlargement of the club head supporting portion of the shaft 2, the effect of the blow will merely cause the larger, more downwardly disposed sections 10 and 6 of the shaft to be deflected, without bending them to any objectionable degree, but the bending effort being transmitted thereby, mainly to the shaft section 4, and to portions of the shaft disposed upwardly of the section 4.

Although the shaft, of Figs. 1 to 3, inclusive, is described as being formed from a single length of formed tubing, such shafts may be conveniently adapted to be formed by such machines as disclosed in the patent to R. H. Cowdery 1,963,047, dated June 12, 1934, when the downwardly reduced upper shaft portion, and downwardly expanded lower portion are separately formed and then telescoped tightly together, either at 5 or at 2, to produce the complete shafts as respectively shown in Figs. 4 and 5.

Fig. 4 shows the resulting juncture of an upper and lower shaft portion, as being located at the upper end of the most reduced shaft section 4, whereas Fig. 5 shows such a junction at the lower end of said most reduced shaft section.

The interfitted shaft portions in either case with one inch or more overlapping may be made to effect a tight junction, which, if desired, may be supplemented by a transverse pin of the nature of that shown at 27 Fig. 4, though I find such a pin not necessary in an otherwise well made telescoping joint, and instead of using such a pin, my preference is to make interconnected shaft portions functionally integral by applying a film of so called silver solder in the joint between the engaged surfaces of the relatively telescoped shaft portions.

I also prefer to more securely integrally join the sleeve 14 on to the enlarged lower end of the shafts involving the present invention by the application of such a film of silver solder between the relatively telescoped outer shaft and inner sleeve surfaces.

An additional advantage of employing the sleeve 14 is that such a sleeve may be made in any desired thickness, and of any desired material and may advantageously be given a different heat treatment than the rest of the shaft on to whose lower end said sleeve is telescoped; in any event the thickness of the sleeve may be made sufficiently thin as to substantially decrease the weight, per unit of length, of the relatively telescoped head shank, tube section 10, and sleeve 14, as compared to that of the relatively telescoped shaft end portion and tubular hosel, as now usually employed.

In the embodiment of Figs. 1 and 6, the sleeve

and club head shank are co-extensive in length, and shorter than the tube section 10.

However, in the shaft illustrated in Figs. 2 and 7, I have shown the sleeve 14x which is substantially longer than the head shank 21x, which is telescoped into the lower end portion of the section 10, and the upper end of said sleeve is disposed longitudinally between the end of the head shank and the upper end of the lowermost tube thus strengthening the portion of the lowermost tube section which is disposed immediately above the upper end of the head shank.

By thus providing a sleeve 14x which extends upwardly beyond the head of the shank and terminates substantially below the upper end of the lowermost shaft tube section 10, the strength of the shaft is more gradually reduced proceeding from the upper end of said shank in the upward direction, and thus affords further insurance against breakage, or permanently bending of, the shaft in the region just above the head shank terminus.

In the embodiment of Figs. 1 and 6, the illustrated club shank and the sleeve 14 may each be 1⅝'' long, and in Figs. 2 and 7 the said shank, is shorter, and embodiments of my invention wherein the shank is only ¾'', in length, are contemplated since such a short length shank is conducive to the lowering of the center of gravity of the head end of the golf club, thereby minimizing shaft bending vibrational efforts even under conditions of a "half-topped" shot.

Having described my invention in different embodiments and with varying elements of structure, I am aware that within the spirit of my invention other variations may be had but without departing from the principles of my invention.

I claim:

1. A golf club comprising a tubular metallic shaft and a metallic head, said head comprising an uppermost shank stem whose lateral surfaces are cylindrical throughout, a lowermost striking blade, and an intermediate connector portion integrally joining said blade and said stem, the upper end of said connector portion being circular and of greater diameter than the stem so as to afford an upwardly facing shoulder surrounding the lower end of the stem at the upper end of the connector portion, the lower end of said shaft terminating in a cylindrical portion of greater length than said shank and being press-fitted over said shank, a cylindrical metallic sleeve press-fitted over the exterior surface of the lower end portion of said shaft whereby said shaft is rigidly relatively immovably secured to, and between, said stem and said sleeve, to make tight fitting metal-to-metal engagement with the relatively opposing wall surfaces of both said stem and sleeve, the wall thicknesses of the lower ends of said shaft and of said sleeve being such as to be disposed in abutting relation to said shoulder and to present a substantially smooth longitudinally extending surface for the junction between said sleeve and said connector portion.

2. A golf club comprising a tubular metallic shaft having a cylindrical lowermost section, an integral metallic striking blade having an upstanding lug extending upwardly from its heel end, said lug comprising an upper end tang portion whose outer surface is of cylindrical form and a connector portion interposed between and joining said tang portion and said blade, said connector portion having its upper end portion of circular outline and of greater diameter than

the adjoined lower end of the said cylindrical tang portion whereby to afford an upwardly facing laterally narrow shoulder ledge, a steel or like cylindrical sleeve of at least as great length as said tang portion, the lower portion of said lowermost shaft section being press-fittingly forced over said tang portion of said blade lug and press-fittingly confined within said sleeve to make tight fitting metal-to-metal engagement with the relatively opposing wall surfaces of both said tang and sleeve, the lower end edges of said sleeve and of said shaft section abuttingly engaging said shoulder ledge, and the aggregate wall thickness of the lower ends of said sleeve and of said shaft being substantially equal to the lateral width of said shoulder ledge.

GEORGE W. YEARLEY.

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