May 14, 1935. H. M. WILCOX 2,001,643

METHOD OF FORMING GOLF SHAFTS AND THE LIKE

Original Filed Oct. 3, 1930 2 Sheets-Sheet 1

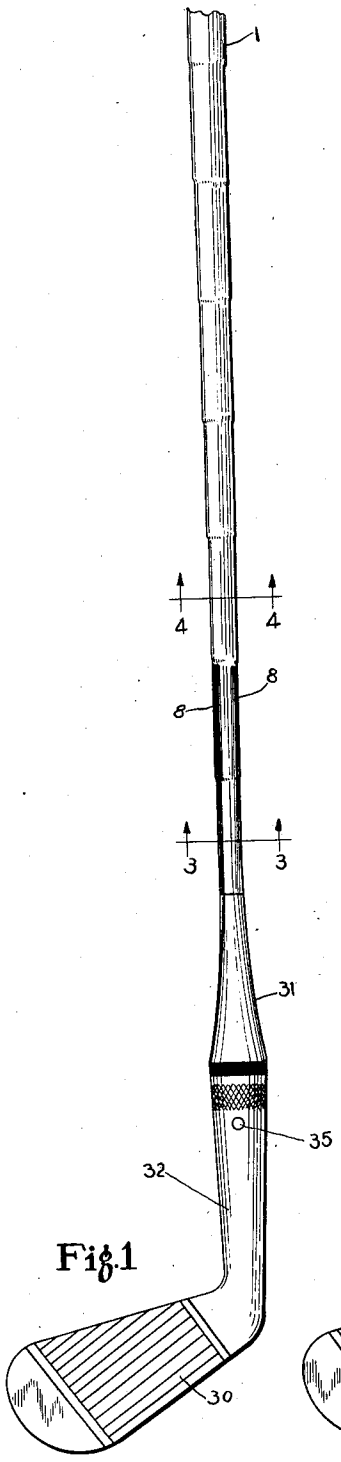


Fig. 1

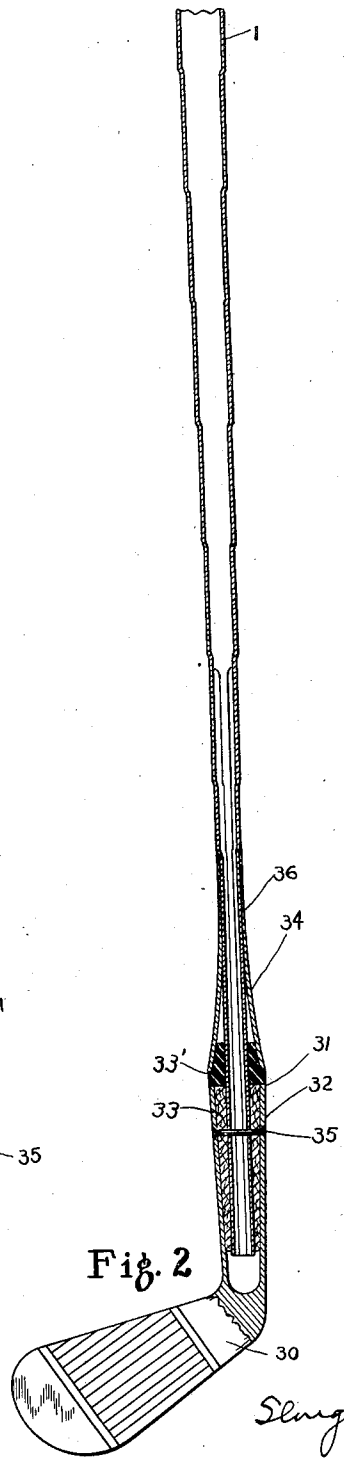


Fig. 2

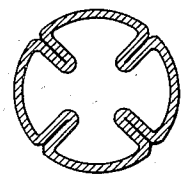


Fig. 3

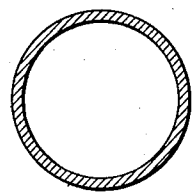


Fig. 4

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METHOD OF FORMING GOLF SHAFTS AND THE LIKE

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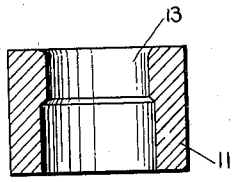


Fig. 6

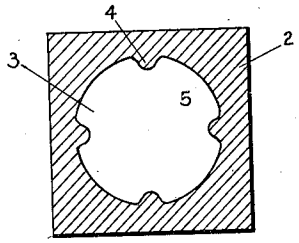


Fig. 8

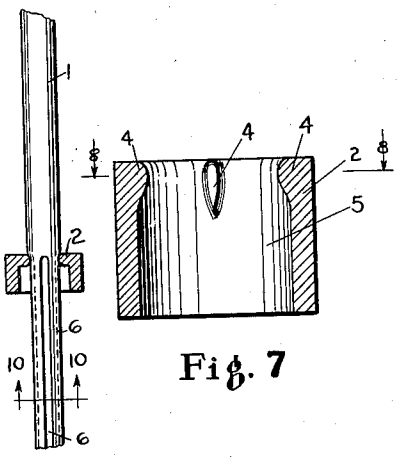


Fig. 7

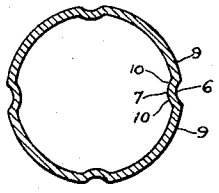


Fig. 10

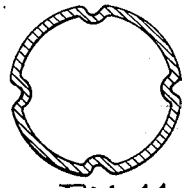


Fig. 11



Fig. 12



Fig. 13

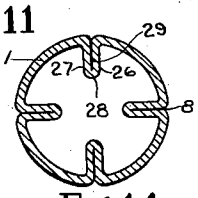


Fig. 14



Fig. 5

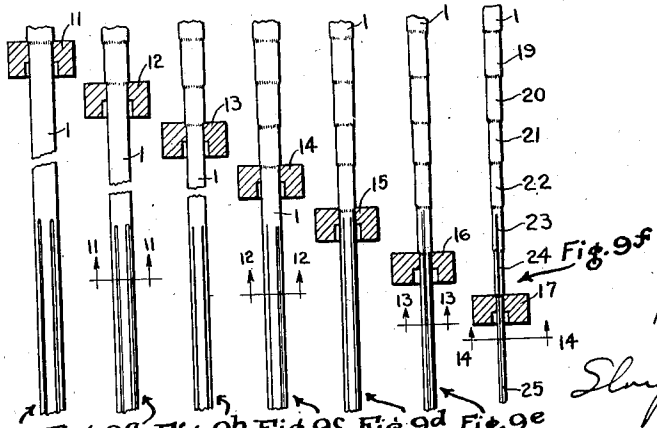


Fig. 9 Fig. 9a Fig. 9b Fig. 9c Fig. 9d Fig. 9e Fig. 9f

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UNITED STATES PATENT OFFICE

2,001,643

METHOD OF FORMING GOLF SHAFTS AND THE LIKE

Hallie M. Wilcox, Geneva, Ohio, assignor to The American Fork & Hoe Company, Cleveland, Ohio, a corporation of Ohio

Original application October 3, 1930, Serial No. 486,178. Divided and this application January 17, 1933, Serial No. 652,184

8 Claims. (Cl. 29—156)

My invention relates to golf clubs and relates more particularly to the provision of improved handle shaft means for golf clubs.

This application is divisional of my copending application Serial No. 486,178, filed October 3, 1930.

Prior to my present invention, it has been found desirable to provide golf clubs with tubular steel shafts, the club heads being supported on a reduced end of the shaft, and it has been moreover found that when the head supporting reduced ends of the shaft are of relatively small diameter, within reasonable limits, the efficiency of the shaft is increased.

However, it has been found that so reducing the diameter of the head supporting ends of the shaft, causes them to be more susceptible to breakage or to permanent distortion of form, depending upon the temper of the steel and the force of the blow or stress imparted to the shaft causing the breakage or deformation.

Various efforts have been made to provide golf club shafts having their smaller ends of small diameter, but wherein the liability to breakage and/or deformation incidental to the hard usage of practice, is reduced, but all such efforts, so far as I am aware, have not satisfactorily solved the problem, and it is an object of my invention, therefore, to more completely solve the problem above stated than has been heretofore found possible to do.

An object of my invention is to provide a method of forming an improved shaft for golf clubs, the shaft possessing considerable resistance to breakage and/or deformation, but not being unduly heavy or of unduly large diameter.

Another object of my invention is to provide a method of forming an improved shaft for golf clubs wherein susceptibility to breakage is avoided in an improved manner.

Another object of my invention is to provide a method of forming an improved shaft for golf clubs having considerable resistance to laterally acting deflecting forces.

Another object of my invention is to provide an improved shaft for golf clubs which offers a considerable resistance to torsional stresses exerted upon the smaller end of the shaft during play and a method of making the same.

Another object of my invention is to provide a method of forming an improved shaft for golf clubs.

Other objects of my invention and the invention itself will become more apparent from the following description of an embodiment of my invention, and from the drawings illustrating the said embodiment, reference being had to the said drawings in the said description.

In the drawings:

Fig. 1 is an elevational view of a golf club with a portion of a shaft therefor, embodying the principles of my invention;

Fig. 2 is a view of the club and the portion of the shaft of Fig. 1, with the shaft portion and a part of a golf club head being shown in longitudinal medial sectional view;

Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is an elevational view of the golf club shaft, per se;

Fig. 6 is a longitudinal medial sectional view of one of a plurality of die elements having die apertures of relatively graduated diameters, employed in the forming of the shaft of Fig. 5;

Fig. 7 is a longitudinal medial sectional view of a different kind of die element employed for a special purpose in the forming of the embodiment shaft of the foregoing figures;

Fig. 8 is a transverse sectional view of the die of Figure 7 taken on the line 8—8 of Fig. 7;

Figs. 9, 9a, 9b, 9c, 9d, 9e and 9f are views illustrating diagrammatically the successive operations imparted to a tube to form the shaft, which is an embodiment of my invention, by forming dies, such as that shown in Figs. 6, 7 and 8;

Fig. 10 is a section taken on the line 10—10 of Fig. 7, showing in transverse sectional view the tube operated upon after an initial operation involving the use of the die of Figs. 7 and 8;

Figs. 11, 12, 13 and 14 are transverse sectional views taken on the lines 11—11, 12—12, and 13—13 and 14—14 of Fig. 9;

The different views are not necessarily on the same scale, for instance, the transverse sectional views of the tube are shown to a larger scale than the longitudinal medial sectional views, and the elevational views thereof.

Referring now to all of the figures of drawing, in all of which like parts are designated by like reference characters, the handle shaft for golf clubs of my invention is preferably produced from a cylindrical tube of a diameter, preferably, equal to that desired to be obtained at the largest or grip supporting end of the shaft illustrated in Fig. 5, which is an elevational view of a finished shaft with the grip shown thereon.

Reference should be had in connection with that part of the following description relating to the stepped tapered nature of the shaft illustrated in the drawings and the method and means for forming such a shaft, to the prior patent to Robert H. Cowdery, No. 1,670,530, for Golf club shafts.

Although my invention is not limited to being embodied in a shaft of the character described in the said Letters Patent, it is susceptible to use in connection with such a shaft, and therefore, the shaft illustrated and described herein is of such a general character.

Referring to the drawings, Figs. 7 and 8 illustrate a forming die having a tubular body portion 2 with a bore 3 to provide a die aperture, the bore 3 being of generally circular outline, varied however, by the provision of inwardly extending projections 4 equally spaced around the walls 5 of the bore, these in the embodiment illustrated being four in number, arranged 90° apart, and preferably disposed adjacent an end of the body portion.

In the process of forming a shaft, such as illustrated in Fig. 5 from a cylindrical tube, an end portion of the tube is first projected through the aperture of the die of Figs. 7 and 8 to a degree whereby the die projections 4 will provide longitudinally extending grooves 6, in the outer surface of the tube, by bodily displacing portions 7 of the outer wall inwardly for a short distance; preferably, the grooves 6 are straight, being arranged in parrallel relation with the axis of the tube and equi-distant from each other.

The grooves proceed from an end of the shaft towards the other end to such a distance as it is desired to effect reinforcement of the tube, and in the embodiment shown in Fig. 1, the position of the grooves and their length is indicated by the seams 8, which are visible to a careful observer on the exterior surface of the tube after the grooves have been closed, progressively as indicated in Figs. 10 to 13 inclusive, Fig. 13 showing the seams 8, though perhaps in a more exaggerated manner than usually attained in practice.

The grooving operation is illustrated at the extreme left of Fig. 7, where the die 2 is shown with an end portion of the tube projected therethrough with resultant grooves 6 formed on the exterior surface of the tube end.

Fig. 10 illustrates a transverse section taken on the line 10—10 of the shaft portion after grooving by the projection through the die element 2.

Referring more particularly to Fig. 10, it will be seen that the projections 4 effect bodily movement of longitudinally extending loops 7 of the sheet metal material of the tube 1, tapering the outer surface of the deflected portions inwardly from the adjacent outer surfaces 9 of the tube, and the inwardly disposed surface portion 10 of said loop portions projected to an equal distance beyond the adjacent inner wall surfaces of the tube.

For such elongated shallow loops 7 being thus formed for the predetermined portion of the length of the end of the tube 1, the tube 1 so deformed is removed from the die 2, and is then successively projected through a series of dies such as the dies 11, 12, 13, 14, 15, 16, and 17, each of which is substantially formed like the die 11, which is reproduced in enlarged view in Fig. 6, except that the successively higher numbered dies have die apertures indicated at 18, Fig. 6, of successively less and less diameters, whereby when successively shorter portions of an end of the tube 1, previously grooved, are projected through the successive dies 11 to 17 inclusive, the walls of the tube 1, are compressed inwardly to progressively greater degrees towards the extreme end of the tube to effect a progressive decrease of diameter and increase of wall thickness.

The operation involving the use of the dies 11 to 17 inclusive is more completely described in my above said prior patent, and in the copending application of Robert H. Cowdery, Serial No. 314,650, filed October 24, 1928, for Press for tubes, to which reference may be had for a more complete description of the press operations involving the use of such reducing dies, whereby the tube is deformed to provide successively reduced successive portions, such as 19, 20, 21, 22, 23, 24, and 25 of successively greater wall thickness.

Broadly considered, the present invention is independent of whether or not the tube is formed with steps, such as the steps 19 to 24 inclusive. But when steps are formed, the successive dies 11 to 17 inclusive, preferably will be of such a number as is required by the physical characteristics of the tube material. The end portion of the tube which was previously provided with the groove 6 is progressively reduced in diameter by projection through the successively smaller die openings, and the effect of such compressive stresses as are had incidental to pushing the groove end portion of the tube through successively smaller dies, is to cause a bodily movement of the portions of the tube comprising, the elongated loops 7 in such manner as is illustrated in Figs. 10 to 13 inclusive, wherein it may be seen that as a result of such progressive reduction in diameter, compressively achieved, the loops are made deeper and coincidentally narrower. Thus ultimately, the loops each comprises a pair of thicknesses 26 and 27 of sheet metal material originally a part of the circumferential walls of the tube 1, joined together by an integral portion 28 of such wall material, the two wall portions 26 and 27 being in intimate closely contacting engagement, as at 29, to produce what has previously been termed herein the seamed lines 8, which alone are visible on the exterior surfaces of the tubes, the seam being substantially entirely closed from the outer surface at 8 to the integral connecting portion 28, and the tube so formed, as shown in cross-sectional view in Fig. 14, is provided with a substantially preferably cylindrical outer surface.

Although for various purposes, the length of the grooves 8 may be varied, I preferably provide grooves in the small end of the tube, forming the handle shaft for a golf club having a head such as that shown at 30, Figs. 1 and 2, to project perhaps 6 inches or more above the hosel end of said club head.

However, within the purview of my invention this distance may be varied and within the purview of my invention, broadly considered, the groove may extend for the entire length of the tubes forming the handle shafts.

The tube operated upon by the dies described, will preferably be heat treated, before and after the different operations, to insure that when the inwardly extending portions forming the internal ribs for the tube reach the ultimate form

shown in Fig. 13, that no crystallization tending towards fracture may occur. As is well known in the art of drawing sheet metal, the number and character of heat treatments required depends upon the kind of steel employed, and the amount of the deformation effected at each operation.

After the tube has reached its final form, it may receive a carburizing heat treatment to case harden its outer surface, so as to give to the tube that degree of temper which is desired in steel tubular handle shafts for golf clubs.

After the shaft is completed, the heads are applied thereto in any well known manner and in Figs. 1 and 2, I have illustrated a so-called "iron" striking head **30** applied to the reduced end of the shaft by providing the tubular hosel **32** with a tubular adapter **33** of wood or other non-resonant material, projected partially within the hosel recess, its outer surface being suitably tapered to conform to the shape of said recess.

In the embodiment illustrated, the portion **33'** of the adapter projecting above the upper edge **31** of the hosel has its outer surface likewise tapered, but in the opposite direction and a metal sleeve **34** telescoped over the shaft end has its larger end projected over a tapered end of the outer portion **33'** of the adapter into abutting engagement with an annular flange of the said adapter which engages with the top edge **31** of the hosel. The hosel, tube and adapter are rigidly secured together by a rivet pin **35** projected from side to side therethrough and headed over on the outside of the hosel.

The tapered tubular sleeve **34** preferably projects for a short distance towards the large end of the shaft, and preferably at its smaller end engages with a shoulder **36** formed at the junction of two steps of the tube.

Having thus described my invention in a given embodiment, I am aware that numerous and extensive departures may be made from the embodiment herein illustrated and described, but without departing from the spirit of my invention.

I claim:

1. The method of forming a tubular shaft for golf clubs from a metal tube which includes infolding the wall of the tube to substantially uniform depth at circumferentially spaced intervals and longitudinally over a portion of the length of the tube proceeding from one end, and drawing the tube to taper it toward the said end and close up the folds to produce inwardly radially extending longitudinal ribs substantially continuous in cross-section.

2. The method of forming a tubular shaft for golf clubs from a metal tube which includes infolding the wall of the tube to substantially uniform depth at circumferentially spaced intervals and longitudinally over a portion of the length of the tube proceeding from one end, and drawing the tube in a succession of stepped dies to step-taper it toward the said end and to close up the folds to produce inwardly radially extending longitudinal ribs substantially continuous in cross-section.

3. The method of forming a tubular shaft for golf clubs from a metal tube which includes infolding the wall of the tube to substantially uniform depth at circumferentially spaced intervals and longitudinally over a portion of the length of the tube proceeding from one end, and drawing the tube in a succession of stepped dies to step-taper it toward the said end and to close up the folds to produce inwardly radially extending longitudinal ribs substantially continuous in cross-section, and to cause the ribs to extend from said end beyond the first step.

4. A method of forming a tubular shaft for golf clubs comprising the steps of infolding circumferentially spaced portions from a metal tube in a longitudinal direction proceeding from one end, drawing the tube through a succession of dies to taper the tube toward the said end, the infolded portions being substantially wholly collapsed to form longitudinal ribs extending inwardly through lateral walls of the tube.

5. A method of forming a tubular shaft for golf clubs comprising the steps of infolding spaced circumferential portions of the tube in a longitudinal direction proceeding from one end of the tube, and drawing the tube through a succession of dies to effect a progressive decrease in diameter and increase of wall thickness toward the said end.

6. A method of forming a tubular shaft for golf clubs comprising the steps of infolding spaced circumferential portions of the tube in a longitudinal direction proceeding from one end, drawing the tube through a succession of successively smaller dies, the tube portions drawn through each of said dies being of successively less and less length in the case of dies having successively smaller throats, to provide step-taper portions toward said end and a successively greater wall thickness.

7. A method of forming a tubular shaft for golf clubs comprising the steps of infolding spaced circumferential portions of the tube in a longitudinal direction proceeding from one end of the tube, drawing the tube through a succession of dies to effect a progressive decrease in diameter and increase in wall thickness toward the said end, and heat-treating the shaft after each drawing operation.

8. The method of forming a tubular shaft for golf clubs substantially as outlined in claim 7, characterized by heat-treating the shaft after the final operation to carburize the shaft surface.

HALLIE M. WILCOX.