April 26, 1960 A. L. SCOTT 2,934,345

GOLF STICK AND SHAFT

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Fig. 1.

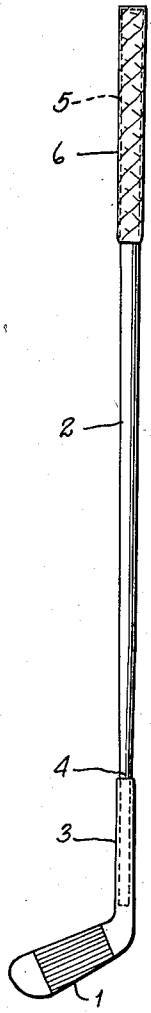

Fig. 2.

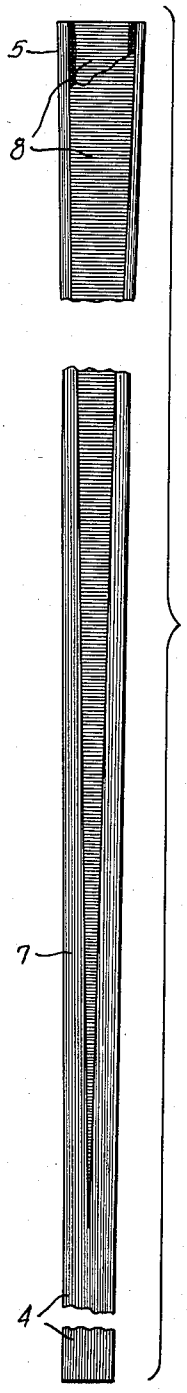

Fig. 3.

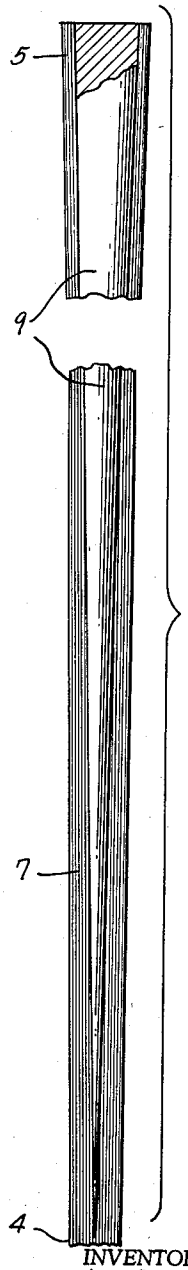

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Fig. 4.

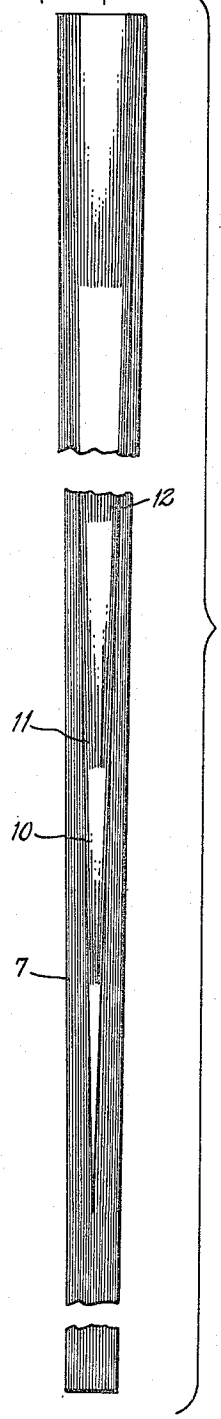
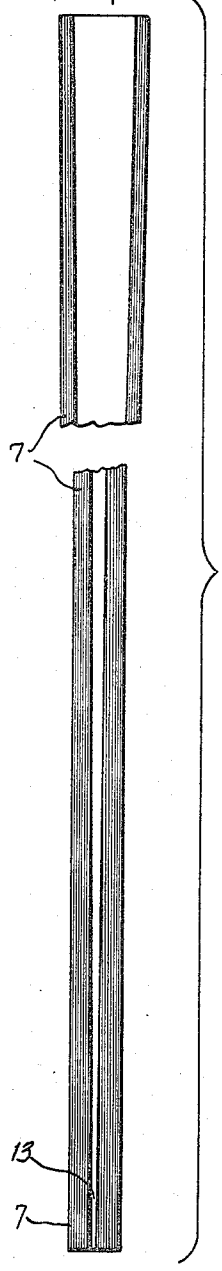


Fig. 5.



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GOLF STICK AND SHAFT

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Application April 23, 1957, Serial No. 654,516

2 Claims. (Cl. 273—80)

This invention relates to golf clubs and particularly to those in which the shaft is made from fiber glass.

Heretofore, it has been suggested that fiber glass be employed in the manufacture of golf clubs, but the limitations of weight and size have made it impracticable to produce a golf club with a fiber glass shaft having the requisite stiffness and weight.

For instance, the hosel of the head of the golf club presents a problem of size limitation in that it limits the diameter of the shaft and hence the amount of glass fiber that can be utilized. Thus, with a limited number of glass fibers, it is necessary to achieve the stiffness necessary to make a golf stick having the desired feel and efficacy.

Furthermore, the weight of the shaft cannot be increased beyond certain limits because too heavy a shaft would not give a satisfactory golf club. Thus, the weight limitation requires consideration.

Furthermore, it is essential to provide a shaft with a suitable shank for insertion and securing in the hosel of the head of the club while imparting at this critical point in the shaft, the requisite strength and stiffness.

The net result of these factors and others is that a saisfactory golf shaft cannot be made by simply forming a plurality of glass fibers into a shaft.

In practicing the present invention these difficulties are overcome and the golf club of this invention may be made with the desired shaft weight and stiffness, giving a club with the desired feel and effectiveness in use.

One of the objects of the present invention is to produce a golf club having a fiber glass shaft which is of the required size, weight and stiffness.

Another object of the invention is to provide such a golf club in which the shaft is made of fiber glass which is disposed and distributed in the shaft in a novel way as to provide the necessary size and stiffness without excessive weight by disposing the fiber glass to fully utilize its high tensile properties.

Another object is to provide such a shaft in which the shaft increases sharply in diameter from the shank to a relatively larger diameter hollow shaft and then tapers more gradually for the balance of the shaft.

Another object of the invention is to provide a golf club with a glass shaft in which the ratio of glass fibers to binder is so controlled as to give a relatively high modulus of elasticity, thus making it possible to maintain the size and weight of the shaft within permissible limits.

In the accompanying drawings, preferred forms of the invention are shown.

Fig. 1 is a view in elevation of a golf stick embodying the invention;

Fig. 2 is a broken sectional view through the shaft in Fig. 1;

Fig. 3 is a broken sectional view of another form of shaft contemplated by the invention;

Fig. 4 is a sectional view of a shaft partly broken showing a different form of the invention, and

Fig. 5 is a broken view in section showing a still different form of the invention.

In accordance with the preferred form of the present invention, the golf stick which consists of a head having a hosel to receive the shaft is provided with a fiber glass shaft. This shaft is made up of a plurality of fibers, all of which extend substantially longitudinally of the shaft and which are bound together by a suitable binder. The shaft consists of a shank portion, and in the preferred form of the invention the shank portion, which fits into the hosel of the club head, is a solid portion made up of the glass fibers, all compacted together to form a solid shank. The lower end of the solid shank portion extends into the hosel of the club head. The remainder of the shaft is preferably hollow, and the same glass fibers which are compacted near their ends to form the shank are distributed around the periphery of the shaft to form a hollow shell. The fibers are uniformly distributed and are bound one to another by the binder.

In the preferred form of the invention, the hollow portion of the shaft forms the major portion thereof. The fibers extend from the grip end, which has the largest diameter, on a very gentle taper substantially the entire length of the shaft. At a point adjacent the shank these fibers taper inwardly on a much quicker taper and then are compacted together to form the shank. The number of fibers available, if the fibers all extend for the full length of the shaft, as in the preferred form of the invention, is limited by the size of the hosel. By flaring them outwardly, on the quicker taper above described, they are moved farther out from the neutral axis of the shaft where they are able to fully develop their tensile and compressive strengths to give the desired stiffness without adding excessive weight to the shaft.

It is preferred to employ about 70 parts by weight of glass fibers to 30 parts by weight of binder because a material made in this proportion will have a modulus of elasticity of about 6,000,000, which is materially stiffer than normally produced glass reinforced plastic material.

In the preferred form of the invention, a plurality of spirally wound glass fiber members are employed within the hollow shaft. These are wound spirally and tend to hold the longitudinally extending fibers against separation and also serve to hold them out away from the axis of the shaft, so that they can develop their full compressive and tensile strengths.

It will be appreciated that one may depart from the preferred form of the invention and still produce a desirable shaft incorporating many of the advantages of the preferred form. For instance, if the shank is not completely solid or if all of the fibers do not extend the full length of the shaft but other features of the preferred form of the invention are retained, the shaft will be superior to those heretofore extant.

In Fig. 1 the golf stick shown consists of a head 1 and a shaft 2. The head has a hosel 3 into which the shaft is fitted. The shaft consists of a shank end 4 and a grip end 5, on which a suitable grip 6 is fixed in the usual way. The shaft itself is made up of a plurality of glass fibers 7, all of which extend longitudinally of, and for the full length of, the shaft. These fibers are secured together by a suitable binder. It may be a suitable flexible type plastic. It may be of the polyester type, which can be cured by the application of heat at approximately 190° F. for approximately four hours. Other binders which have been used in connection with glass fibers may also be employed.

The glass fibers are very fine and may have diameters of approximately 2 micro inches. These fibers have a tensile strength of approximately 300,000 lbs. per square

inch. In making up the shaft the uncured binder may be applied to the fibers which are then formed into the shaft. Thereafter, the shaft is cured by heat to give it its final form.

In the preferred form of the invention, 30 parts of resin are used to coat 70 parts by weight of glass fibers. When this proportion is employed, the great preponderance of glass fibers gives the final material a modulus of elasticity of about 6,000,000.

The lower or shank end of the shaft is solid, being made up of the lower ends of the fibers 7. This shank end of the shaft may extend for about 6 inches, and in a typical shaft the diameter may be about 0.4 inch. This size is suitable for insertion in the hosel of the average golf stick and forms a desirable portion for affixing the shaft to the head. When the shank is inserted the lower portion of the solid shank is fitted in the hosel and a portion of the solid shaft extends upwardly from the hosel.

The fibers forming the main portion of the shaft are disposed circumferentially about the shaft and are equally distributed, as indicated in Fig. 2. The diameter of the shaft at this point may be approximately .7 inch. The shaft tapers from the grip end for most of the length of the shaft in a very gentle taper. For example, in a shaft about 3 feet, 6 inches long, the taper may be from a diameter of .7 inch to a diameter of about .5 inch in the top 2½ feet of the shaft. The shaft then tapers more sharply so that in the next 6 inches it may taper down from .5 inch to .4 inch at the beginning of the solid shank portion.

It will be appreciated, since the same number of fibers are used throughout, that as the diameter of the shaft increases the shell of fibers at the periphery of the shaft will be thinner.

When the fibers are arranged as above described, the shaft has a weight suitable for use in a golf stick, and by disposing the members as described they are positioned so that they can develop their full compressive and tensile strengths to give the desired stiffness, while the shaft is solid at the point of insertion in the hosel of the head.

In the preferred form of the invention, the shaft is formed by using a mandrel which has the desired taper. About this mandrel there are first wound spirally a series of glass fibers which have been coated with a binder. These fibers are indicated at **8** in Fig. 2. They form a very small portion of the weight of the shaft, being not over 20% of the glass fibers. The fibers **7** are then disposed over the mandrel with the spirally wound fibers **8** and are distributed evenly. The whole is then wound in cellophane and subjected to heat sufficient to set the resin. The mandrel is then removed and the cellophane wrapping is also removed.

The centrally disposed, spirally wound fibers are then securely formed into the shaft and adhere to the longitudinally extending fibers. The spirally wound fibers tend to prevent separation of the longitudinally etxending fibers, and also serve to maintain the longitudinally extending fibers out in position away from the axis of the shaft, where they can develop their tensile and compressive strengths and give the desired stiffness to the shaft.

In Fig. 3 is shown another form of the invention, in which balsa wood or paper **9** may be employed to give the above described form and taper to the shaft, and

the longitudinally extending fibers are then distributed as above described.

In Fig. 4 a different form of the invention is disclosed. There in addition to the longitudinally extending fibers **7** shown in Fig. 2, there are a plurality of fibers **10, 11** and **12** which do not extend the full length of the shaft. These fibers are disposed inside of the fibers **7** and tend to increase the stiffness of the shaft.

The spirally wound fibers **8** may be placed within such a shaft as shown in Fig. 2.

In this form of the invention these fibers **10, 11** and **12** are all disposed in the upper two-thirds of the shaft.

In the form of invention shown in Fig. 5, the fibers forming the shank do not form a completely solid shank. An opening **13** about pinhole in size is left at the center of the shank, otherwise the shaft is substantially the same as that shown in Fig. 2 having the longitudinally extending fibers **7** disposed on substantially the same taper. A shaft such as this can be used satisfactorily on some iron clubs where the hosel of the shaft may be of a larger diameter than the hosel on the normal wood club.

The golf club above described has a shaft having all of the advantages of fiber glass. It resists corrosion and rust. It has the necessary light weight for a golf shaft without sacrificing stiffness and the stiffness is at the points where stiffness is necessary to give the desired feel and useful qualities to a golf shaft.

I claim:

1. A golf stick comprising a head having a hosel and a shaft having a shank portion at one end fitted in said hosel and a grip end, said shaft comprising a plurality of longitudinally extending glass fibers, each extending the full length of said shaft and each joined to the next adjacent fibers by a binder, said fibers at the shank portion being compacted together to form a solid shank and for the major portion of said shaft being distributed uniformly circumferentially of said shaft to form an outer shell tapering gently from a maximum diameter at the grip end of the shaft to a point adjacent said shank end and said hosel and then tapering more abruptly to the shank portion and a substantially uniform inner layer consisting of spirally wound contiguous glass fiber members, each bonded to adjacent glass fiber members and maintained in position with a binder to prevent separation of said longitudinally extending fiber members and to maintain the longitudinally extending fiber members in sheath-like form.

2. A golf stick comprising a head having a hosel and a shaft having a shank portion at one end fitted in said hosel and a grip end, said shaft comprising a plurality of longitudinally extending glass fibers, each joined to the next adjacent fibers by a binder, said fibers at the shank portion being compacted together to form a shank and for the major portion of said shaft being distributed uniformly circumferentially of said shaft to form an outer shell tapering gently from a maximum diameter at the grip end of the shaft to a point adjacent said shank end and said hosel and then tapering more abruptly to the shank portion.

References Cited in the file of this patent

UNITED STATES PATENTS

2,602,766	Francis	July 8, 1952
2,749,643	Scott	June 12, 1956