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METHOD OF MANUFACTURING RACKET FRAMES

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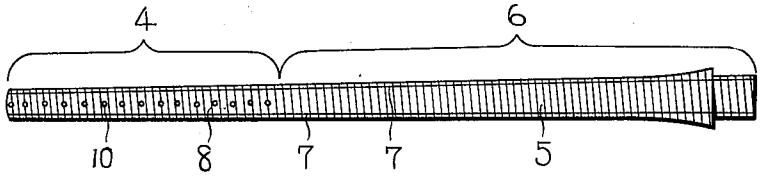

FIG. 1

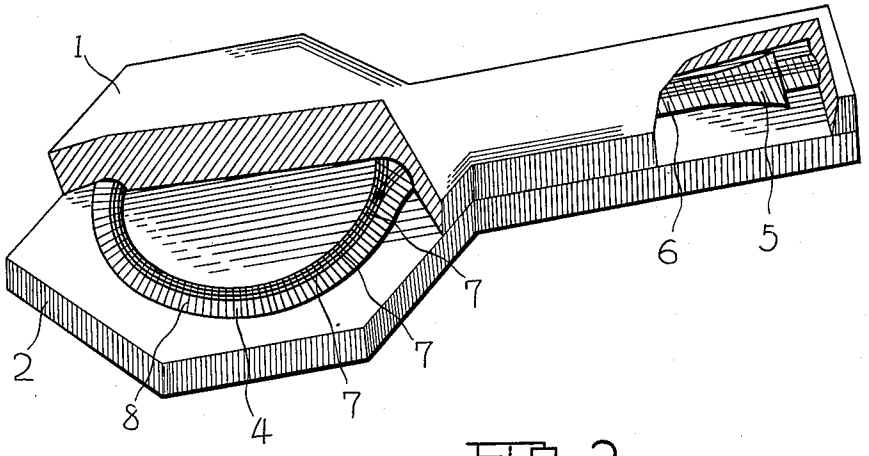

FIG. 2

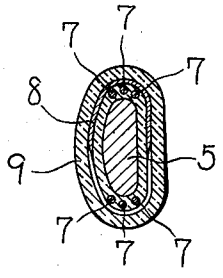

FIG. 3

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METHOD OF MANUFACTURING RACKET FRAMES

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1 Claim. (Cl. 154—90)

The present invention relates to sport rackets, such as are used for tennis, badminton, squash, etc., and particularly to a method of manufacturing the bow and shank frame thereof.

Sidewise motion refers to motion of the bow with respect to the handle in the plane defined by the stringing. Rotary motion refers to motion of the bow with respect to the handle about the longitudinal axis of the handle. Backward and forward motion refers to motion in a plane including the longitudinal axis of the handle, said plane being perpendicular to the plane of the stringing. It is absolutely necessary for sport rackets to have the combined resiliency of sidewise, rotary, and forward-backward motion. Heretofore, there has never been any satisfactory method of manufacturing a racket frame for providing the desired requirement to meet the above-mentioned toughness and resiliencies.

Heretofore the oval frame of a sport racket has been made of bent wood. The manufacturing process has been so complicated that it includes many steps, such as, bending high quality wood, gluing it together, and surface finishing by abrasion. Although the manufacturing cost has been very expensive, the racket frames so manufactured have not satisfied the desired requirements in hard play. Cracks and destruction are very frequent. Wear is severe.

Furthermore, the most important problem of manufacturing a high quality racket frame with the desired toughness is to select a suitable wood material for use in the frame thereof. Heretofore, the wood material best fitted for use in a racket frame is one of the rarest natural resources found in the high mountains. Accordingly, the cost of the best wood material is very high. I have solved the hardest problem in choosing material in the process of my invention. In accordance with my invention, any kind or quality of wood can be used. High quality wood of the rarest kind is not necessary.

I can choose whatever wood is available in the market as a frame material for a sport racket. I can convert the most inferior quality of wood into the highest quality material for the frame of a sport racket.

It is one object of the invention to provide a method of manufacturing a racket frame of superior quality in an inexpensive manner.

It is another object of the invention to provide a method of manufacturing a racket frame in which mass production thereof is possible.

Another object of the invention is to provide a very simple method of manufacturing a racket frame of great strength almost equal to that of metal.

Another object of the invention is to reduce the manufacturing cost of racket frames and improve the quality thereof.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more fully understood by following the detailed description, the appended claims, and the views illustrated in the accompanying drawings, in which:

Fig. 1 is a side view of a bow frame and shank thereto, showing a string of glass fiber superposed on both sides thereof and another string of glass fiber coiled on and around it.

Fig. 2 is a perspective view of a mold in which the bow frame and shank coiled with glass fiber is inserted, with the mold partly broken away.

Fig. 3 is a section of the bow frame and shank manufactured in accordance with my invention, showing wood core 5, coiled glass fiber 8, and superposed thermosetting resin 9.

In the preferred method of manufacturing a racket frame in accordance with my invention, the wood material for use in an oval frame of a sport racket is a very insignificant matter. As described hereinbefore, I can choose whatever wood is available in the market as a racket frame. The selection of material is a very important problem in any manufacturing industry, particularly in manufacturing high quality racket frames.

Heretofore the bow frame of a sport racket has been formed by bending a peripheral member such as a laminated ash strip into a closed curvilinear shape such as an oval. I can dispense with such a difficult step of bending wood. I punch a flat sheet of cheap wood into an oval shape by the punch press. I punch not only an oval frame, but also a shank thereto. Next I put a string of glass fiber on both sides of the frame and shank, and wind another string of glass fiber around the frame and shank into a coil, the core of which is the wooden frame and shank. Then I pour a liquid polyester resin into the lower half of the metallic mold into which a bow frame and shank can be inserted, insert the bow frame and shank coiled completely with the glass fiber into the mold, pour the liquid polyester resin again on it, cover it with the upper half of the mold, and heat the mold to cure the resin therein. Lastly I take the cured molded bow frame and shank out of the mold and I polish it, according to the method of my invention.

Referring more particularly to Fig. 1, I punch a bow frame 4 and shank 6 thereto out of a flat sheet of wood, superpose a string of glass fiber 7 on both sides of the bow frame and shank, and coil another string of glass fiber 8 on and around not only the bow frame 4, but also the shank 6 closely and tightly. The amount of glass fiber depends on the desired strength and weight of an athlete. I have found, however, that about 50 parts of glass fiber based on the weight of wood as 100 parts is favorable and suitable for a light weight racket for use in badminton. The glass fiber is preferably treated with chromium sulphate.

Referring to Fig. 2, I put the bow frame and shank coiled with glass fiber in the lower half part 2 of a metallic mold, the recess of which corresponds to the shape of the bow frame and shank. The recess of the mold has a clearance into which a suitable amount of thermosetting resin, such as polyester resin, is filled. I prefer to pour some thermosetting resin prior to inserting the bow frame and shank. Furthermore, the metallic mold is preferably first coated with chromium or silicone resin in order to impart good separability. Besides, I prefer to preheat the mold to the temperature of 80° C. Having put the bow frame and shank coiled with glass fiber into the mold, I pour the rest of the resin on it. The amount of resin also depends upon the desired strength and weight of a racket. I have found, however, that about 50 parts of resin based on the weight of wood as 100 parts is suitable and sufficient for a light weight racket for use in badminton. Then I cover it with the upper half part 1 of the mold and press it slowly with the pressure of about ten pounds per square centimeter. The pressure does not matter in my invention. A pressure to squeeze excess resin out of the clearance of the mold is sufficient for

my purpose. I heat the mold including the bow frame and shank therein to a temperature between 140° C. and 150° C. for a time sufficient to cure the resin, preferably between one and two minutes. After the completion of polymerization in the mold, I take the molded product out of the mold.

In the event the polymerization is delayed, it can be speeded up by means of a peroxide catalyst, such as, benzoyl peroxide, etc. I prefer to use amines, e.g., triethanolamine, triisopropanolamine, as an additive in order to accelerate the polymerization action. In this case, however, particular attention must be paid to the molding process, because the molding time is considerably reduced.

The above description of my invention is for illustrative purposes only, and not limited thereto. Of course, I can develop much more strength in a bow frame made of bent wood or laminated bent wood than the above-mentioned bow frame and shank punched out of the flat sheet of wood by the method of my invention.

The manner of coiling a string of glass fiber on and around the bow frame and shank may be variously changed and modified, such as, coiling glass fiber closely and tightly, coiling it roughly in spaced intervals, coiling it in an oblique manner, etc., except that one must leave uncovered the spaced apertures **10** in which catgut string is received.

From the foregoing description, taken in connection with the accompanying drawings, it is considered that the novel details of construction, and the advantages of the invention, will be apparent to those skilled in the art to which it relates.

It is of course, to be understood that the details of

structure may be variously changed and modified without departing from the spirit and scope of my invention as set forth in the appended claim.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, are:

In a method of manufacturing a bow frame for sports rackets comprising the steps of punching a frame and shank from a stock of wood material, applying strings of glass fiber on both sides of said frame and shank, winding another string of glass fibers into a coil around the wooden frame and shank, pouring a liquid polyester resin into the lower half of a mold, inserting said bow frame and shank coiled with said glass fibers into the lower half of said mold, pouring a second application of liquid polyester resin on said frame and shank, covering the lower half of said mold with the upper half thereof, heating said mold to cure said resin, removing said cured molded bow frame and shank from said mold, and polishing said bow frame and shank.

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