

Feb. 21, 1933.

H. W. HALL

1,898,485

TENNIS RACKET AND METHOD OF MANUFACTURING

Filed Feb. 26, 1931

3 Sheets-Sheet 1

Fig. 1.

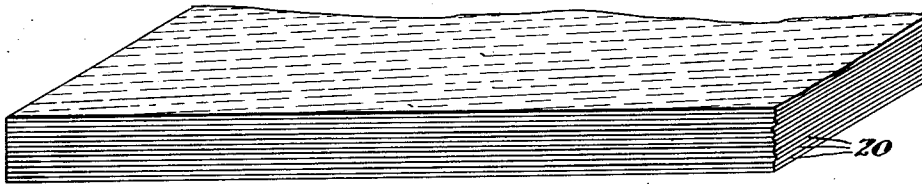


Fig. 2.

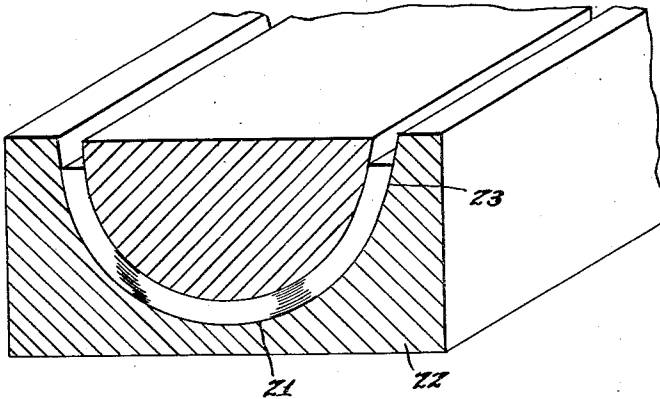


Fig. 4.

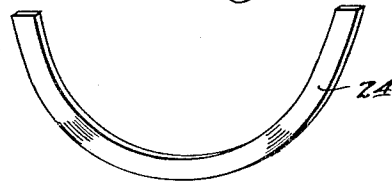


Fig. 3.

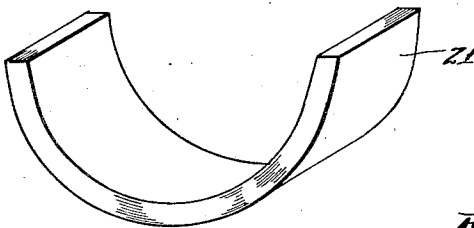
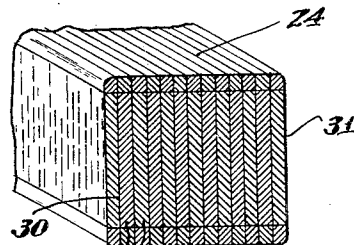


Fig. 5.



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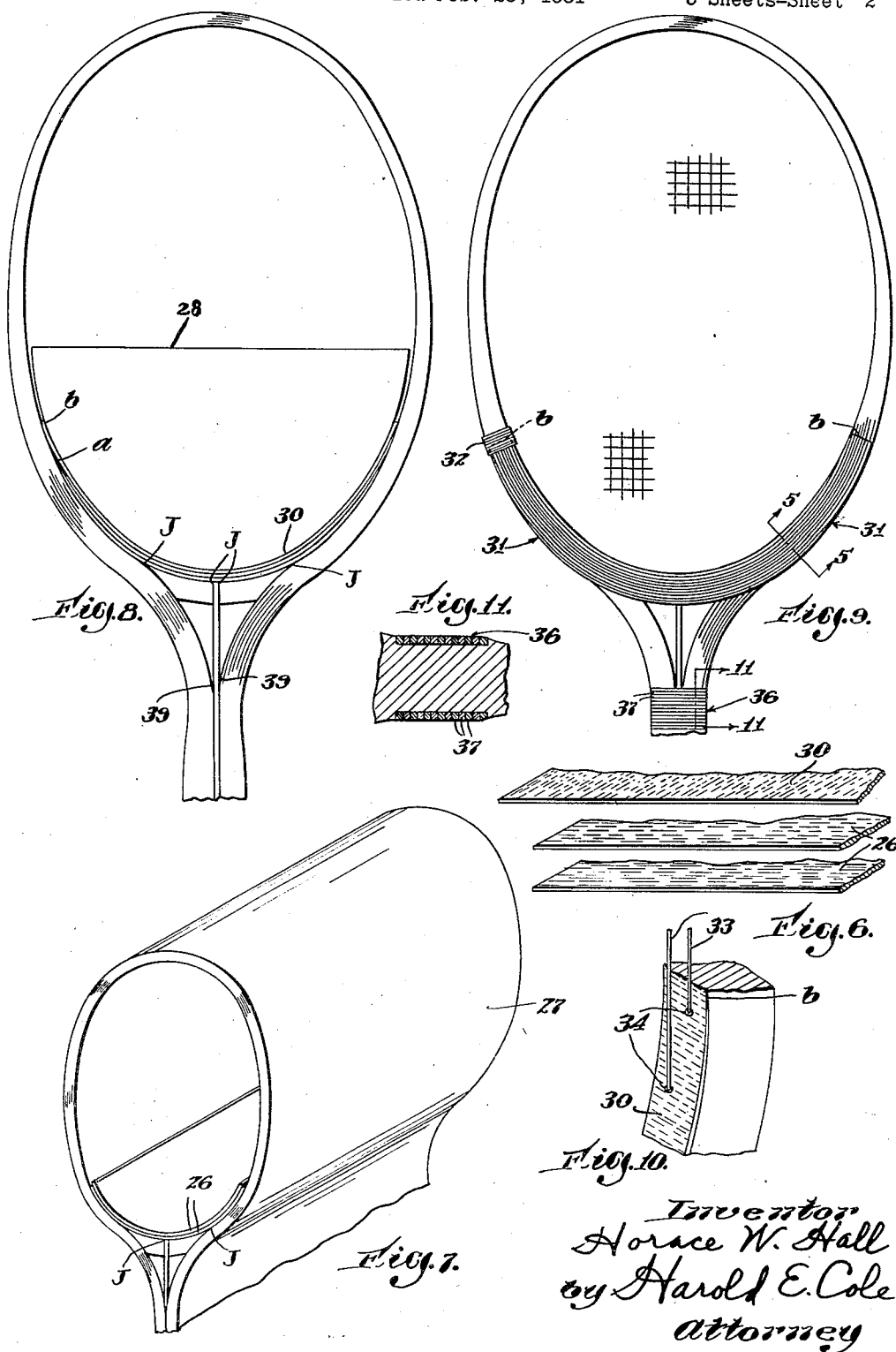
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TENNIS RACKET AND METHOD OF MANUFACTURING

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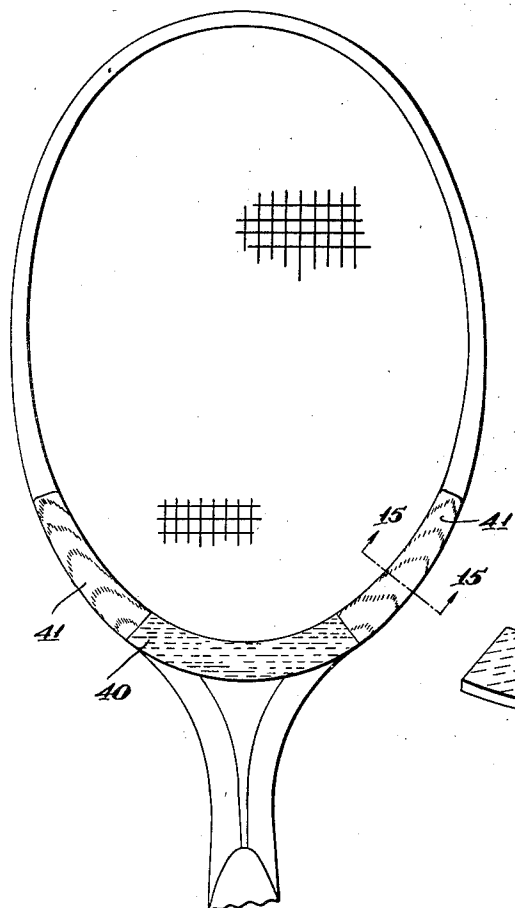


Fig. 12.

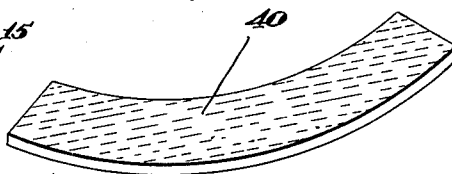


Fig. 13.

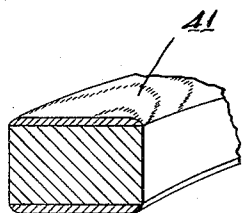


Fig. 15.

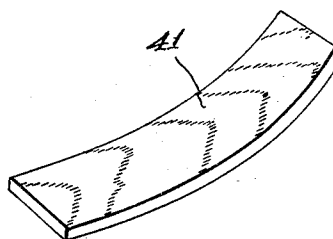


Fig. 14.

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UNITED STATES PATENT OFFICE

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TENNIS RACKET AND METHOD OF MANUFACTURING

Application filed February 26, 1931. Serial No. 518,382.

This invention relates to the strengthening of tennis rackets and methods whereby such strengthening may be done effectively and yet inexpensively. In accordance with the rules of the Patent Office reference is made to my application, Serial Number 460,591, filing date June 12, 1930.

For many years it has been the custom of tennis racket manufacturers to strengthen the throat and shoulder portions of the racket by laying reinforcing pieces on both faces of the shoulder portions of the bow head, said pieces also usually covering in whole, or in part, the upper portion of the throat. This was done to strengthen portions of the racket likely to weaken as a result of long continued or vigorous play.

One object of my invention is to make this shoulder and throat reinforcement face piece of wood veneers or laminations made integral with each other by gluing, extending from one shoulder across the throat to the opposite shoulder as one piece, and which need not be steamed or similarly treated in order to properly shape it.

Another object has been to make this shoulder and throat reinforcing face piece of laminations of wood which substantially correspond in size and color with the laminations used in forming the bow of the racket, so that my reinforcement piece not only strengthens the racket where strength is needed; but also adds to the beauty, symmetry and balance of the racket.

Another object of my invention has been to provide inside crescent reinforcement pieces which extend from shoulder to shoulder across and above the throat, of wood veneers or laminations, which are cross banded and exceedingly strong. Another object is to provide a method for inserting these sheets in place in the individual rackets or while the rackets are still in the form of a large block out of which a number of rackets are later sawed. Still another object has been to make said inside laminations of such length as to enable a relatively unskilled person to insert them in their place.

Another object of my invention has been to provide a reinforcement plate at, or just

below, the lower portion of the open throat made of a plurality of wood veneers, which possesses great strength and also great beauty, and which will synchronize in appearance with the laminations forming the bow of the racket.

The foregoing and other objects which will appear as the nature of the invention is better understood, may be accomplished by a construction, combination and arrangement of parts such as is disclosed by the drawings. The nature of the invention is such as to render it susceptible to various changes and modifications, and, therefore, I am not to be limited to the methods and construction disclosed by the drawings and specification but am entitled to all such changes therefrom as fall within the scope of my claims.

In the drawings:—

Figure 1 is a perspective view of an assembly of wood veneers from which shoulder and throat face reinforcement pieces are made.

Figure 2 is a perspective view shown in cross section showing said assembly bent to the desired shape by means of male and female forms.

Figure 3 is a perspective view of said assembly removed from the forms after having been bent to the proper shape.

Figure 4 is a perspective view of one shoulder and throat face reinforcement face piece ready to be superimposed upon a racket, which has been sawed from the assembly shown in Figure 3.

Figure 5 is a cross section on line 5—5 of Figure 9 showing the inside crescent reinforcement pieces in position and the shoulder and throat reinforcement face pieces covering the bow laminations and said inside crescent reinforcement pieces and the outside shoulder reinforcing strip.

Figure 6 is a perspective view of the inside crescent reinforcement pieces (broken away) before they are inserted in position in the tennis racket block, which illustrates the grains of the three different pieces of wood.

Figure 7 is a perspective view of a composite racket sheet or block showing the two lower inside crescent reinforcement pieces in

position in the block before being sanded down.

Figure 8 is a front elevation of my tennis racket block showing the three inside crescent reinforcement pieces forced into position by the form, the top piece not having been sanded down.

Figure 9 is a front elevation of a completed tennis racket showing the shoulder and throat face reinforcement pieces in position and also showing the throat strengthening plate in its place at the base of the open throat.

Figure 10 is a fragmentary view of a portion of a shoulder of the bow at a point where some of the vertical strings pass through holes made in said bow portion, illustrating the resistance to string cutting provided by the cross grain of the upper inside reinforcement piece.

Figure 11 is a cross section taken on line 11—11 of Figure 9 showing the throat reinforcing plate of wood veneers on both faces of the handle of the racket.

Figure 12 is a front elevation of another form of shoulder and throat face reinforcement pieces.

Figure 13 is a perspective view of the throat reinforcement face piece shown in Figure 12, sawed to shape and ready to be superimposed across the throat of the racket.

Figure 14 is a perspective view of one of the shoulder reinforcement face pieces shown in Figure 12, sawed to shape and ready to be superimposed upon the shoulder of a racket.

Figure 15 is a cross section on line 15—15 of Figure 12 showing shoulder reinforcement face pieces in place on both faces of the racket of Figure 12.

As illustrated I take a number of wood laminations or veneers 20, about 1/16 inch or 1/15 inch in thickness, chosen and arranged as to thickness and color to correspond with veneers used in the bow. I need not define exactly the thickness or thinness of said veneers, except to point out that they must be thin enough to bend easily into the required bow portion shape without steaming or otherwise treating them. In case the bow of the racket is made of a single piece of wood such as ash, the veneers chosen to reinforce the throat and shoulder portions of the faces of the bow may be of any kind of suitable wood, light or dark, or any combination of woods.

In Figure 1 of the drawings I show a plurality of said wood veneers 20, the size of which in actual manufacture may be as follows: one foot wide, about 11 inches long, which measurement is determined solely by whatever length is required to cover the face of the racket shoulder and throat portions, and 1/16 inch thick or of any thickness which will permit the necessary bending without treatment, such as steaming. When used to

correspond with a laminated bow this thickness should be the same as that of said bow laminations. These veneers 20 are covered with glue and laid together, and while the glue is still wet the resulting composite structure 21 is placed in a female form 22 and it is bent to the required shape by a male form 23 under pressure. It is kept in said forms 22 and 23 until the glue has set (usually a few hours are sufficient to set it). It is now of approximately the same shape as that portion of the racket portion it is designed to cover, namely, from one shoulder across the throat to the other shoulder. Inasmuch as but two of these shoulder and throat face reinforcement pieces are needed for a racket (one on each face) it will be obvious that out of said composite structure 21 a large number may be sawed.

The glue used in uniting the various reinforcing parts shown and described in this application is preferably casein waterproof glue, which itself is stronger than wood, so that the resulting joint is stronger than if a solid piece of wood were used.

Figure 3 of the drawings shows said composite structure 21 removed from said forms, and Figure 4 shows a single shoulder and throat reinforcement face piece 24 which has been sawed out of said structure 21 ready to be superimposed upon and glued to the bow of the racket. This piece 24 must be wide enough to cover not only the face of the bow structure, but also the outside shoulder reinforcing strip and any inside crescent reinforcement pieces used, which I shall later mention, and the number of wood veneers may be varied according to their thickness and the width of the bow and other parts to be covered. Said face pieces 24 cross band the throat joints *j*, for it will be noted that the grain of the wood runs practically at right angles to said joints, thereby furnishing the maximum reinforcement where it is most needed. They are sanded down at their ends in the finished racket.

In my earlier patent application Serial Number 460,591, filing date June 12, 1930, I disclosed a new means for strengthening the inside of the bow head from shoulder to shoulder across the top of the throat by using wood veneers, preferably three in number. I have further improved this means by providing a stronger composite inside reinforcement piece, and by developing a superior method of inserting it in place in an individual racket, or in a racket block out of which a number of rackets are later sawed. To accomplish this I select two pieces 26 of wood laminations slightly less in length than the maximum inside width of the head of the bow, sometimes called the string area, so that they may be inserted into this wide portion of the bow head without bending. In tennis rackets this maximum inside width

is approximately eight inches so these pieces 26 should be a fraction of an inch less than said inside width. These two inside pieces 26, which are the lower ones, are covered with glue and while the glue is still wet they are inserted into the bow head portion of the racket block 27 shown in Figure 7 of the drawings and pressed down by means of a form 28 until they rest on the inside surface of the bow head and throat of said racket block. It will be noted that the grain of the wood in said lower pieces 26 runs longitudinally and parallel with the grain in the veneers which form the bow of the racket block, consequently sharp bending may split them, although these pieces 26 are only about 1/15 or 1/16 inch thick. They, of course, must bend freely enough to correspond to the shape of the bow head, and they are shown in place in said Figure 7, and before the ends are sanded down to the customary feather edge. I have found that if said lower inside pieces 26 are longer than the maximum inside width of the head of the bow it is very difficult to put them into the bow head of said racket block 27, and the bending required not only to insert them, but also to force them down into their proper place has sometimes split them.

Said form 28 is kept under pressure until the glue is set between said veneers 26 and the portion of the bow head on which they rest, which usually takes several hours, after which they are ready to receive the next piece. The grain in said lower pieces 26, running longitudinally as it does, cross bands the previously mentioned joints *j* from the top, again furnishing the maximum reinforcement to the racket where most needed. After said form 28 is removed said pieces 26 are sanded down to a feather edge at their extremities so that their ends taper off into the racket bow, this being done before the racket block 27 is sawed into individual rackets, and before the next inside crescent piece is superimposed.

On top of said two lower pieces 26, I next place an upper inside piece 30, the grain of which runs transversely, as illustrated in Figure 6 of the drawings. This piece is longer than the said lower pieces 26 for reasons later described, and inasmuch as the grain runs across the wood veneer instead of lengthwise, it may be freely bent when it is inserted in the racket block 27, and the extra length is no handicap in this operation. Its grain running opposite to the grain in said lower pieces 26 cross bands said lower pieces, further adding strength to the racket bow, and cross banding renders this inside reinforcement practically unbreakable under the severest tennis play. Said form 28 forces said piece 30 on top of said lower pieces 26 in said racket block 27 and it is held under pressure until the glue sets, which usually

takes a few hours. Before said piece 30 is sanded down at the ends said racket block is sawed into individual rackets, and then the ends of said upper inside piece 30 are sanded to a feather edge.

Another distinct advantage resulting from the transverse grain in the upper inside piece 30 is the resistance it furnishes to cutting or splitting of the wood by the strings especially where there are two strings extending through the same hole. This is illustrated in Figure 10 of the drawings in which are shown vertically running strings 33 which pass through holes 34 made in the bow head of the racket, the cross grain of said piece 30 preventing said strings 33 from splitting the wood. Where the grain of an upper inside reinforcing piece runs parallel with the grain in the bow of the racket the strings often cut into the grain splitting the wood and spoiling the racket.

It is customary to reinforce the outer side of the shoulders of the bow head by using a wood lamination or veneer 31 shown in Figure 5 of the drawings. In this connection it should be noted that said face pieces 24, said upper inside piece 30 and said outside wood lamination 31 all end at practically the same point, marked *b* on Figure 9 of the drawings. This is a very important feature because the winding of silk strings 32 around the bow at its upper shoulder portions cover all three ends or joints. Should these ends be separated so three different joints showed, the whole appearance of a high grade racket would be spoiled from a commercial point of view. While the ends of the lower inside pieces 26 end short of the upper inside piece 30, as indicated at *a* in Figure 8 of the drawings, inasmuch as these ends are sanded down to a feather edge thereby appearing to run into the bow head of the racket, and are covered as well as cross banded by said upper inside piece 30, they leave no visible joints.

This said multi-ply construction for the inside of the bow is a distinct innovation. If all three laminations 26 and 30, or any number of laminations, ended at substantially the same point, then when they were beveled down or feather edged to curve with the bow, three or more different visible and unsightly joints would result on each side of the bow.

In further reference to my said previous patent application wherein I showed and described a thin reinforcing plate to prevent any spreading of the joint or joints at the lower portion or just below the bottom of the throat, I have found that this plate 36 may advantageously be made of laminations or veneers 37, sometimes using as many as thirteen or more. As with other pieces made of wood laminations glued together the glue joints greatly strengthen the wood with the result that such a laminated reinforcing plate is stronger than a plate consisting of a single

piece of wood. Both the glue joints and the grain of said laminations 37 run across the handle of the racket, cross-banding the joint or joints 39 at the base of the throat. Making this plate 36 of said wood laminations 37 enables me to use different colored woods so that the laminations of different colored woods used in the bow of the racket and also in the shoulder and throat face reinforcing pieces, previously described, may correspond in color and material with the laminations in said reinforcing plate, or at least if they do not correspond they may harmonize, so that a beautiful effect is obtained.

In Figures 12 to 15 of the drawings, I show another type of face reinforcement pieces which may be used to good advantage on tennis racket bows made of either ash or wood veneer. In this construction of shoulder and throat face reinforcement pieces I use a center piece 40 and two shoulder pieces 41. It will be observed that the direction of the grain in said center piece 40 is across the racket, thereby cross banding the upper throat joints and greatly strengthening the racket at the points where reinforcement is needed. This plan of using three separate pieces of wood to reinforce the shoulder and throat portions avoids steaming or bending as is necessary now when a single piece of wood such as ash is used. Using three separate pieces also enables a color scheme to be carried out. For instance, the two shoulder pieces 41 may be of relatively dark wood and the center piece 40 of a relatively light wood thereby obtaining a color contrast which greatly adds to the beauty of the racket. These pieces 40 and 41 are sawed to the desired shapes as illustrated in Figures 13 and 14, and then superimposed and glued on both faces of the bow and throat as shown in Figure 12. The grain of the wood in said shoulder pieces 41 should preferably run substantially parallel with the length of said pieces, or otherwise stated, substantially parallel with the curve of the bow portion which they cover, as shown in said Figure 12.

All of these improvements are adaptable to tennis racket bows made of one piece of wood, such as ash, as well to those made of wood laminations, although being particularly advantageous in some instances when used with laminated rackets, as previously pointed out. Where laminations are used the number may be varied somewhat without departing from my invention.

What I claim is:

1. A racket comprising a plurality of wood laminations superimposed upon the inside surface of the shoulder and throat portions of the racket, the lower of said laminations being shorter in length than the maximum inside width of the head of the racket bow and the grain of which being substantially parallel with said length, the upper of said

laminations being cross-grained and longer than said maximum inside width.

2. A racket comprising three wood laminations glued together and upon the inside surface of the shoulder and throat portions of said racket, the two lower of said laminations being longitudinally grained and of a length shorter than the maximum inside width of the head of said racket, and the upper of said laminations being cross grained and of greater length than said maximum inside width.

3. A racket comprising three wood laminations on the inside surface of the shoulder and throat portions of said racket, the two lower of said laminations being of a length which is shorter than the maximum inside width of said racket head, and the upper of said laminations being of a length greater than said maximum inside width, the grain of said shorter laminations running approximately longitudinally, and the grain of said longer laminations running approximately transversely, said upper lamination being so positioned as to completely cover said lower laminations.

4. A racket comprising a plurality of wood laminations glued together and to the inside surface of the shoulder and throat portions of the racket, said laminations being thin enough to bend without treatment, the lower of said laminations being of a length shorter than the maximum inside width of the head of the racket bow, and the upper of said laminations being of greater length than said maximum inside width and cross-grained.

5. A racket comprising reinforcing pieces united to the shoulder and throat face portions of said racket, said pieces embodying a plurality of wood laminations united together, said laminations extending parallel with the shape of said portions and being of such thinness as to be bent to said shape while in natural condition.

6. A racket comprising crescent-shaped reinforcing pieces superimposed upon the shoulder and throat face portions of said racket, said pieces embodying a plurality of thin wood laminations glued together adapted to be bent to the desired shape without treatment, each lamination extending from one shoulder across the throat to the other shoulder of said racket.

7. A racket bow composed of a plurality of wood laminations, comprising a reinforcing piece superimposed on each face of the shoulder and throat portions of said bow, said reinforcing pieces embodying a plurality of wood laminations thin enough to be bent to shape while in their natural state the grain of which latter-mentioned laminations runs substantially parallel with the curve of said portions of said bow.

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