

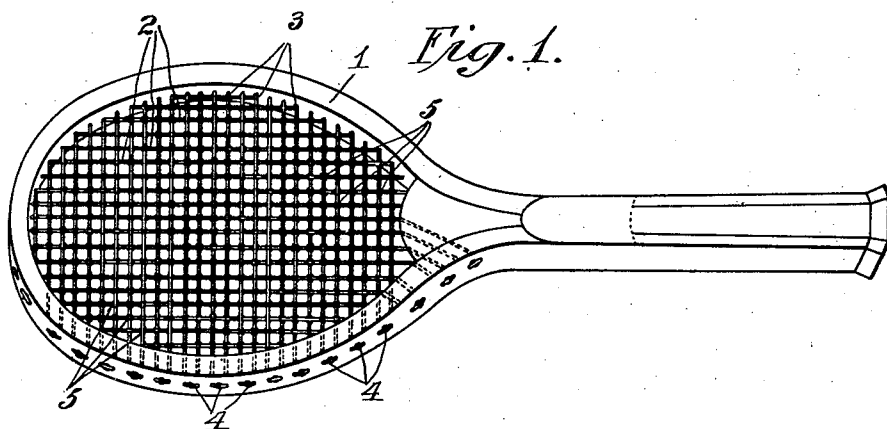
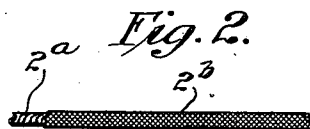
July 3, 1923.

1,460,665

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TENNIS RACKET AND THE LIKE

Filed Nov. 7, 1922



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TENNIS RACKET AND THE LIKE.

Application filed November 7, 1922. Serial No. 599,495.

To all whom it may concern:

Be it known that I, EDSON F. GALLAUDET, a citizen of the United States, residing at East Greenwich, in the county of Kent and State of Rhode Island, have invented certain new and useful Improvements in Tennis Rackets and the like, of which the following is a specification.

The invention relates to tennis rackets and the like, and more particularly to the strings used therein and to a method of preparing the same; and the present application is a continuation in part of an earlier application, Serial No. 518,000, filed by me on November 26, 1921.

Gut strings are practically the only kind of strings used at present for the stringing of tennis rackets, although the gut, which is very strong and possesses the required resilience, is extremely sensitive to moisture,—so much so that a newly strung racket will go bad of itself in bad weather, the strings frequently breaking even when the racket is supposedly protected and carefully put away, while the stringing is almost certainly ruined by the wetting it gets when playing in rain or on a wet court or even if the racket is merely forgotten and left out over night.

To obviate this defect, the coating of the gut with rubber has been proposed and various substitutes for gut have been tried. But no practical solution of the problem has heretofore been found. Gut has remained, as stated, the material almost universally used in the stringing of rackets, and, indeed, for certain of the strings of musical instruments.

The object of my present invention is to provide for the purpose a stringing which is not only waterproof but is the equal, or substantially the equal, of gut both in strength and in resilience.

To this end I employ, in place of gut, strings made of silk, linen, or other similar fiber, and I apply thereto by dipping or in any suitable manner, preferably after a preliminary stretching to take up the apparent looseness in the particles of the fiber and while held under a tension approximating that under which they will be held when finally strung for service, a waterproofing composition which will permeate the fiber

and, drying hard and tight, will give to the strings a protective coating serving as a wearing surface and at the same time render them substantially impervious to moisture.

For the waterproofing composition, a good spar varnish is preferred. Any other waterproof varnish or composition which will similarly permeate the fibers of the strings, dry hard, and not disintegrate may, however, be used.

The strings may be made of any fibrous material which has the required strength and is capable of taking the waterproofing composition; but silk not only takes the waterproofing well but, of all the different fibers, has been found to be the strongest and most resilient, and hence is preferably used. They may be either plain twisted or braided strings, or may be enclosed within a braided sheath, of the same or of a different material, which will give them a smooth cylindrical surface and enable them to be drawn without difficulty through the holes in the racket frame and over and under the strings already in place.

I have found, further, that silk, in its first stretching, yields considerably more than any of the other fibers with which I have experimented, due seemingly to a looseness of its particles. For example, if on one end of a silk string a weight of about half its breaking strength is suspended the string elongates fairly rapidly for a few seconds and then more and more slowly, until, at the end of an hour or so, there is a total maximum elongation of some eight to twelve per cent, and all of the looseness of the particles, or what may be called the free stretching of the strings, appears to have been taken out of it; and if, without removing the stretching weight, the string is soaked in water a further elongation, or water stretching, takes place, also rapidly at first and then more slowly which reaches a permanent maximum of an additional eight to twelve per cent. Consequently, if the only stretching of the silk strings, before applying the waterproofing thereto, is that given in stringing them in the racket, the tension will ease off considerably after the stringing and waterproofing. If, however, the strings are given a suitable preliminary stretching, either with or without the water

stretch described, this apparent looseness of the particles in the fiber is taken up. In the case of dry stretched strings, the tension secured in stringing the racket will be permanent so long as they are completely protected from moisture by the waterproofing, whereas, if water stretched, the strings will maintain all the tension given them in stringing even though the waterproofing may be more or less defective. I accordingly recommend, for the preliminary treatment of my silk strings, that they be first soaked in water and then, thoroughly stretched and allowed to dry under a tension of approximately fifty per cent. of their breaking strength, which is substantially one hundred and fifty pounds for ordinary silk racket strings, as by clamping one of their ends and passing the other end with a weight attached over a pulley or roll. The wetting of the silk with water seems to have a marked softening action, resulting in a weakening of the strings sometimes as much as twenty-five per cent. When thoroughly dry, however, it will be found that the strings have recovered their former strength, have elongated from fifteen to twenty per cent, with a corresponding reduction in diameter, and are much stiffer and harder than in their original condition, resembling somewhat limber whalebones. This stiffness can, if desired, be taken out by bending the strings back and forth, but it will be found to be an excellent property, since it increases the resistance of the strings to abrasion and makes easier their stringing in the racket frame.

After receiving the combined free and water stretching described, the strings are taken down, and may then be strung at once in the racket frame in the usual manner and waterproofed by dipping the entire racket head in the spar varnish, preferably slightly thinned with turpentine, or other waterproofing composition. On the withdrawal of the racket head the loose varnish is blown or shaken off, as by a few quick strokes of the racket, to prevent the formation of clots or lumps in the corners, but leaving, if desired, little bridges or globules of varnish at the intersections of the strings to cement together the strings at these points. The varnish on drying gives an excellent finish to the frame of the racket and, having permeated their fibers, leaves the strings clear and nearly transparent, very similar to gut in appearance.

In case the strings are not to be strung immediately after the water stretching and hardening treatment they should, as soon as the stretching weights are removed, be wound upon spools under such tension as will keep them in their stretched condition and prevent any loosening of the particles, since I have found that silk, even though

thoroughly stretched and hardened, always tends gradually to go back to its original untreated condition and a loosening of the fibers can only be prevented by maintaining it in its stretched condition.

Should it be desired to apply the waterproofing to the strings before they are strung in the racket, the stretched and hardened strings should be dipped without delay in the waterproofing composition and then put up with the same weight as before, wiped off, and kept thus under tension until the varnish or other waterproofing composition has become thoroughly set and hardened. When thoroughly dry, the strings are taken down and should then either be strung immediately or be wound upon spools under tension, as above described, thus permitting them to be shipped or stored without deterioration until they are to be strung. If it should be found, however, that the fibers of the finished strings so contract, when the tension on the strings is removed and before they can be strung, as to be loosened from the hardened varnish filling and covering, thereby giving the strings an opaque appearance and injuring the waterproofing quality of the covering, the tension under which the strings are held while the waterproofing composition is drying may be reduced somewhat, say by one-quarter or one-half that above named. The difference in tension between the fibers of the string and the hardened waterproofing composition may thus be kept within the limits of the adhesive power of the latter both when the strings are subjected to the maximum or stringing tension and when released therefrom.

Long continued tests made of rackets strung with silk strings waterproofed under tension after a preliminary stretching, as above described, seemed to prove that they are absolutely as good in every way as rackets strung with gut, while, in addition, they are unaffected by moisture. While intended and used primarily for the stringing of tennis and similar rackets, these strings may also be substituted with entire satisfaction for the gut strings used on violins and other musical instruments.

Referring to the accompanying drawing, in which Fig. 1 is a perspective view of a tennis racket strung with strings made and treated according to my invention, and Figs. 2 and 3 show two forms of the fiber strings used therein, 1 indicates the frame of the racket, and 2 the strings, shown in Fig. 2 as having a twisted center 2^a of fiber enclosed in a braided sheath 2^b and in Fig. 3 as a plain twisted fiber string 2^c, after the application of the waterproofing composition by the dipping of the racket head therein, which composition, besides permeating and coating the strings, may fill the holes

3 in the frame and both cement the strings, at 4, to the outside of the frame and form little bridges 5 (somewhat exaggerated in the drawing) cementing the strings together at the points where they cross one another.

What I claim as new, and desire to secure by Letters Patent, is—

1. The method of preparing strings of a fiber having properties of silk for the stringing of tennis and similar rackets which comprises thoroughly stretching the strings to remove the looseness of their particles and permanently stringing them in the racket in such stretched condition.

2. The method of preparing strings of a fiber having properties of silk for the stringing of tennis and similar rackets which comprises stretching the strings before they are strung to thoroughly remove the looseness of their particles and thereafter maintaining them in stretched condition until they are to be strung.

3. The method of preparing strings of a fiber having properties of silk for the stringing of tennis and similar rackets which comprises wetting the strings and stretching them while wet and allowing them to dry while under a stretching tension.

4. The method of preparing strings of a fiber having properties of silk for the stringing of tennis and similar rackets which comprises wetting the strings and stretching them while wet and while drying to remove the looseness of their particles and thereafter maintaining them in stretched condition until they are to be strung for use to prevent any substantial loosening of the particles.

5. The method of preparing strings of a fibrous material for the stringing of tennis and similar rackets which comprises stretching them thoroughly before they are strung to remove the looseness of their particles and thereafter maintaining them in their stretched condition and treating them with a waterproofing composition adapted to permeate the strings, to dry hard and not to disintegrate.

6. The method of preparing silk strings for the stringing of tennis and similar rackets which comprises wetting the strings and stretching them while wet and while drying to remove the looseness of the particles and thereafter maintaining them in stretched condition and treating them with a suitable waterproof varnish.

7. A stringing for tennis and similar rackets comprising strings of a fibrous material which before being strung are thoroughly stretched to remove the looseness of their particles and thereafter are maintained under tension sufficient to prevent any substantial loosening of the particles until they are to be strung for use and are treated with a suitable waterproofing composition

which is dried while the strings are held under tension.

8. A stringing for tennis and similar rackets comprising strings of a fibrous material which are first wetted and then stretched and allowed to dry while under stretching tension to remove the looseness of the particles and thereafter are maintained in stretched condition until they are to be strung for use and are treated with a waterproofing composition adapted to permeate the strings, to dry hard and not to disintegrate which is dried while the strings are held under tension.

9. A stringing for tennis and similar rackets consisting of strings of a fiber having properties of silk which before being strung have been stretched, hardened and stiffened.

10. A stringing for tennis and similar rackets consisting of strings of a fiber having properties of silk which before being strung have been hardened and stiffened by wetting and stretching until dry.

11. A stringing for tennis and similar rackets consisting of strings of a fiber having properties of silk which before being strung have been hardened and stiffened by a water stretching and have been kept in such condition until they are strung for use.

12. A tennis or similar racket strung with strings, of a fiber capable of absorbing a waterproofing composition, stretched to a tension sufficient to largely remove the looseness of their particles and while in such stretched condition treated with a waterproofing composition which will harden within and upon the strings thereby rendering them resistant both to moisture and to wear.

13. A tennis or similar racket strung with strings having properties of silk from which the looseness of their particles has been largely removed and the fabrication of which has been completed after stringing by impregnation with a waterproof varnish which hardens within and upon the strings.

14. A tennis or similar racket strung with strings having properties of silk whose tension is sufficient to largely remove the looseness of their particles and whose fabrication has been completed after stringing by impregnation with a waterproofing and wear-resisting composition.

15. A tennis or similar racket strung with silk strings under tension sufficient to largely remove the looseness of their particles and treated with a waterproof varnish which will permeate the strings and dry hard therein and thereupon.

16. A tennis or similar racket with frame strung with waterproofed fiber strings which before being strung or treated with the waterproof composition were thoroughly stretched to remove the looseness of their

particles and thereafter were maintained in stretched condition until strung to prevent any substantial loosening of the particles.

17. A tennis or similar racket with frame 5 strung with waterproofed silk strings which before being strung or treated with the waterproofing composition were thoroughly stretched to remove the looseness of the particles and thereafter were kept until strung 10 under tension sufficient to prevent any substantial loosening of the particles.

18. A tennis or similar racket with frame strung with silk strings enclosed in a braided sheath which strings have been treated 15 with a suitable waterproof varnish and which, before such treatment and before be-

ing strung, were wetted and thoroughly stretched while drying to remove the looseness of the particles and were thereafter kept in such stretched condition until they 20 were strung.

19. A tennis or similar racket having a frame strung with strings of twisted silk enclosed in a braided sheath which were first given a preliminary stretching to 25 thoroughly remove the looseness of their particles and then, after being strung without allowing any substantial loosening of the particles, were treated with a suitable waterproof varnish.

EDSON F. GALLAUDET.