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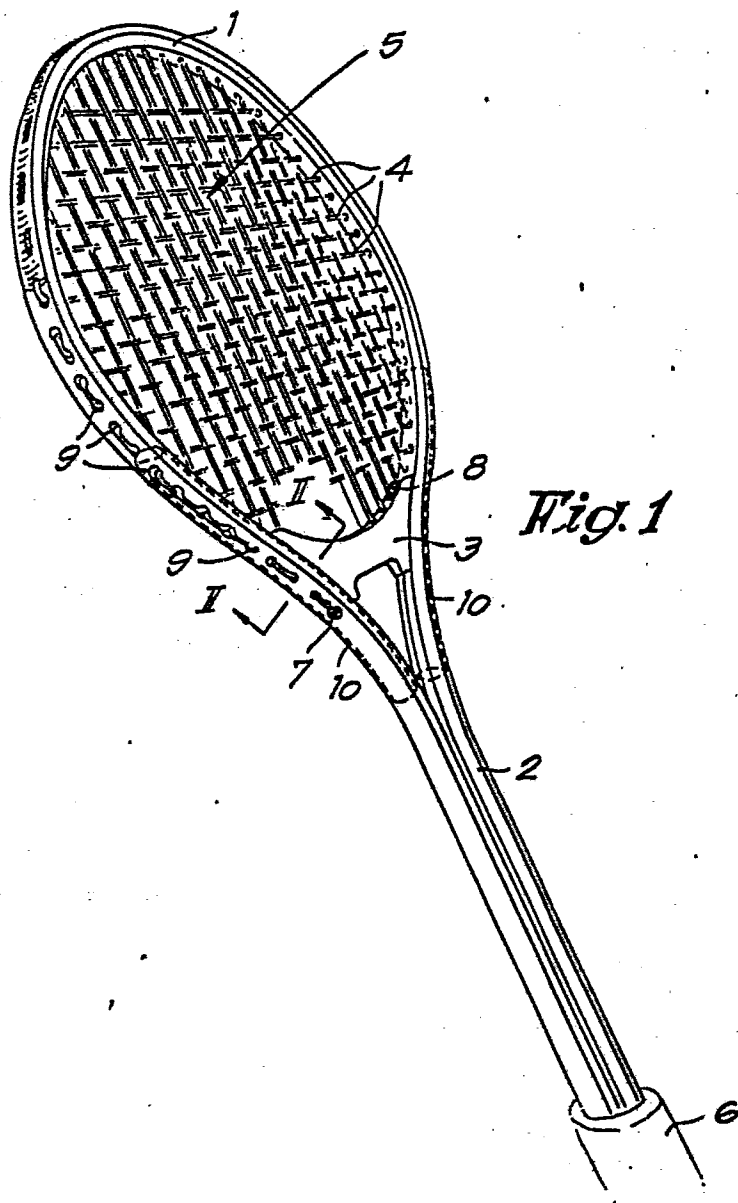
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(54) Improved racket and method of manufacturing same.

(57) Improved racket of the type which consists of a frame, a shaft, a transverse connection or heart, strings which are stretched in the frame into a network, and a handle, whereby the shaft and the frame consist of at least one bent hollow profile, with the characteristic that in the hollow profile reinforcement elements are placed at the level of the transverse connection or heart of the racket whereby these reinforcement elements locally fill up the above-mentioned profile.

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IMPROVED RACKET AND METHOD OF MANUFACTURING SAME

This invention concerns an improved racket for playing tennis, squash and the like.

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It is known that such rackets consist of a frame on which the strings are fitted and a shaft which is provided with handle. The crossing of frame and shaft is consolidated with a transverse connection called the "heart".

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One knows rackets in which the above-mentioned heart and shaft are made of wood. With more recent techniques one also has rackets for which these parts are made of synthetic material and/or metal.

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All these constructions however have the disadvantage that they are quite vulnerable at the heart, such that they break regularly, mainly at squash, where due to faulty strokes the racket often hits the wall, the floor or the opponent's racket. This vulnerability is caused by the fact that around the heart a considerable number of holes have to be provided for the strings to be attached, and also to allow the passage of screws and the like to fix the heart.

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An obvious possibility to solve this problem is to

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construct the frame with a stronger profile. However one then suffers from the disadvantage that the racket becomes quite heavy. This in turn is an enormous problem for the manufacturing of squash rackets, in which case the preferred maximum weight is 230 to 235 grams.

In order to solve the above-mentioned problems, this invention provides an improved racket which is stronger around the heart than the known manufacturing techniques, and at the same time is hardly heavier than with the common techniques.

For this purpose, the invention consists of an improved racket of the type which consists of a frame, a shaft, a transverse connection or heart, strings which are stretched in the frame such that they form a network, whereby the shaft and the frame consist of at least one bent hollow profile, which has the characteristic that in the hollow profile reinforcement elements are present next to the transverse connection or heart of the racket, whereby the reinforcement elements locally fill up the hollow profile.

The invention is also concerned with a method of constructing such an improved racket.

In order to illustrate the characteristics of the invention, in what follows, as a non-restrictive example, a preferred design is described, with reference to the following drawings:

figure 1 gives a view in perspective of the improved racket;

figure 2 shows a section according to line II-II in figure 1; figures 3 to 6 illustrate schematically and step by step the method of manufacturing the racket according the invention,

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and more specifically to fit the above-mentioned reinforcement elements.

As shown in figure 1 the invention concerns a racket
5 of the type which consists of a frame 1; a shaft 2; a transverse connection or heart 3; string 4 which are fitted on the frame 1 to form a network 5 and a handle 6; whereby the shaft 2 and the frame 1 mainly consist of at least one hollow profile, which preferably consists of a light metal such as
10 aluminium. The transverse connection or heart 3 is at its extremities connected to the frame 1 by means of screws 7 and rivets 8. The connection 3 itself preferably consists of synthetic material.

15 Therefore the invention concerns a racket which is provided with internal reinforcement elements 10 which are only introduced locally in the frame 1 close the connection or heart 3 so that they hardly increase the weight of the racket.

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These reinforcement elements 10 may be of arbitrary nature, but preferably consist of a number of wooden and/or synthetic layers, as shown in the section in figure 2.

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Such a layered structure gives the advantage that, according to the chosen material and the thickness of the layers, it is relatively easy to give the racket a desired weight.

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In this way each reinforcement element 10 from the inside to the outside consists of the combination of four layers, of which the first layer 11 consists of ashwood, the second layer 12 consists of bamboo, the third layer 13 consists of a fibre plastic and the fourth layer 14 consists of
35 a light preferably exotic type of wood.

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The ashwood gives the reinforcement element 10 a certain hardness. The bamboo is mainly used because of its flexibility. The greatest strength of the reinforcement elements 10 however is provided by the third layer 13. This layer is preferably reinforced with glass fibre or graphite fibre, or it consists entirely of glass fibre.

The fourth layer 14 serves as a filler and gives the advantage that, because of the light type of wood that is used, the total weight of the reinforcement elements 10 is limited.

Naturally various other combinations are possible. E.g. the layer structure may be used in reverse order in the frame 1, such that the above-mentioned first layer of ashwood is situated at the outside. The directions of the wood fibres of the wooden layers are preferably parallel to the longitudinal direction of the hollow profile of which the frame 1 is made. In the most basic design the reinforcement elements 10 consist exclusively of one material. In this case a compound of epoxy and graphite is preferred. It is also clear that the reinforcement elements 10 can be of arbitrary length. Preferably they extend over a reasonable distance above and below the heart 3, in order to prevent the fixing of screws 7 and the rivets 8 which would cause cracks. There is a variant which provides for the combination of the reinforcement elements 10 with a filler which is put into the remaining part of the hollow profile 1 of the frame and the shaft 2. This filler for example may consist of a self hardening foam plastic which is inserted into the profile. This means that loose particles such as wood chips from boring the holes 9 and from the reinforcement elements 10, cannot move up and down in the hollow profile, such that an undesired rattling noise is avoided.

In figures 3 to 6 a method of introducing the reinforcement elements 10 in the same frame 1 is shown step by step. The reinforcement elements 10 are driven into the as yet unbent hollow profile of which the frame 1 is made, up to a certain place, by means of plungers. After this, as is indicated in figure 6, the profile is bent to form the above-mentioned frame 1 and shaft 2. The bending may be done in an arbitrary way, and is for example done by means of press rollers which press the profile against a mould 17.

The further construction of the racket, in other words fixing the heart 3, the network 5 and handle 6, is done according to known methods.

The present invention is in no way limited to the design described as an example and illustrated in the attached drawings, but such improved racket as well as the above-mentioned reinforcement element can be manufactured in various forms and sizes without exceeding the scope of the invention.

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WHAT IS CLAIMED

1. Improved racket of the type that consists of a frame (1), a shaft (2); a transverse connection or heart (3);
5 strings (4) which are stretched between the frame (1) to a network (5) and a handle (6); whereby the shaft (2) and the frame (1) consist of at least one bent hollow profile; with the characteristics that in the hollow profile reinforcement elements are placed at the level of the transverse connection
10 or heart (3) of the racket; whereby these reinforcement elements (10) locally fill up the above-mentioned hollow profile.

2. Improved racket according to claim 1 with the characteristic that the reinforcement elements (10) consist
15 of several layers of material.

3. Improved racket according to claim 2 with the characteristic that the reinforcement elements (10) contain
20 at least one layer of ashwood.

4. Improved racket according to claim 2 with the characteristic that the reinforcement elements (10) contain
at least one layer of bamboo.

5. Improved racket according to claim 2 with the characteristic that the reinforcement elements (10) contain
25 at least one layer of synthetic material:

6. Improved racket according to claim 2 with the
30 characteristic that the reinforcement elements (10) contain at least one layer of light exotic wood.

7. Improved racket according to claim 2 with the characteristic that the reinforcement elements (10) consist
35 of four layers, respectively ashwood (11); bamboo (12); syn-

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thetic material (13) and ordinary wood (14).

8. Improved racket according to claims 5 or 8 with the characteristic that the synthetic layer is reinforced
5 with glass fibre or the like.

9. Improved racket according to claims 5 or 8 with the characteristic that the synthetic layer is reinforced with graphite fibre.

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10. Improved racket according to claims 7 or 8 with the characteristic that the reinforcement elements (10) are placed such that the above-mentioned first layer (11) is directed to the inside, or in other words is situated along the
15 heart (3) of the racket.

11. Improved racket according to claim 1 with the characteristic that the reinforcement elements (10) consist of a compound of epoxy and graphite.

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12. Improved racket according to one of the previous claims with the characteristic that the remainders of the hollow profile of which the frame (1) and the shaft (2) consist are filled with a filler.

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13. Improved racket according to claim 12, with the characteristic that the filler consists of foam plastic.

14. Method of manufacturing a racket as described
30 above, with the characteristic that the above-mentioned reinforcement elements are placed in position by pushing these into the hollow profile from which the frame (1) and the shaft (2) are constructed, before the profile is bent to its final shape.

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15. Method according to claim 14 with the characteristic that the reinforcement elements (10) are placed into the above-mentioned hollow profile by means of plungers (15).

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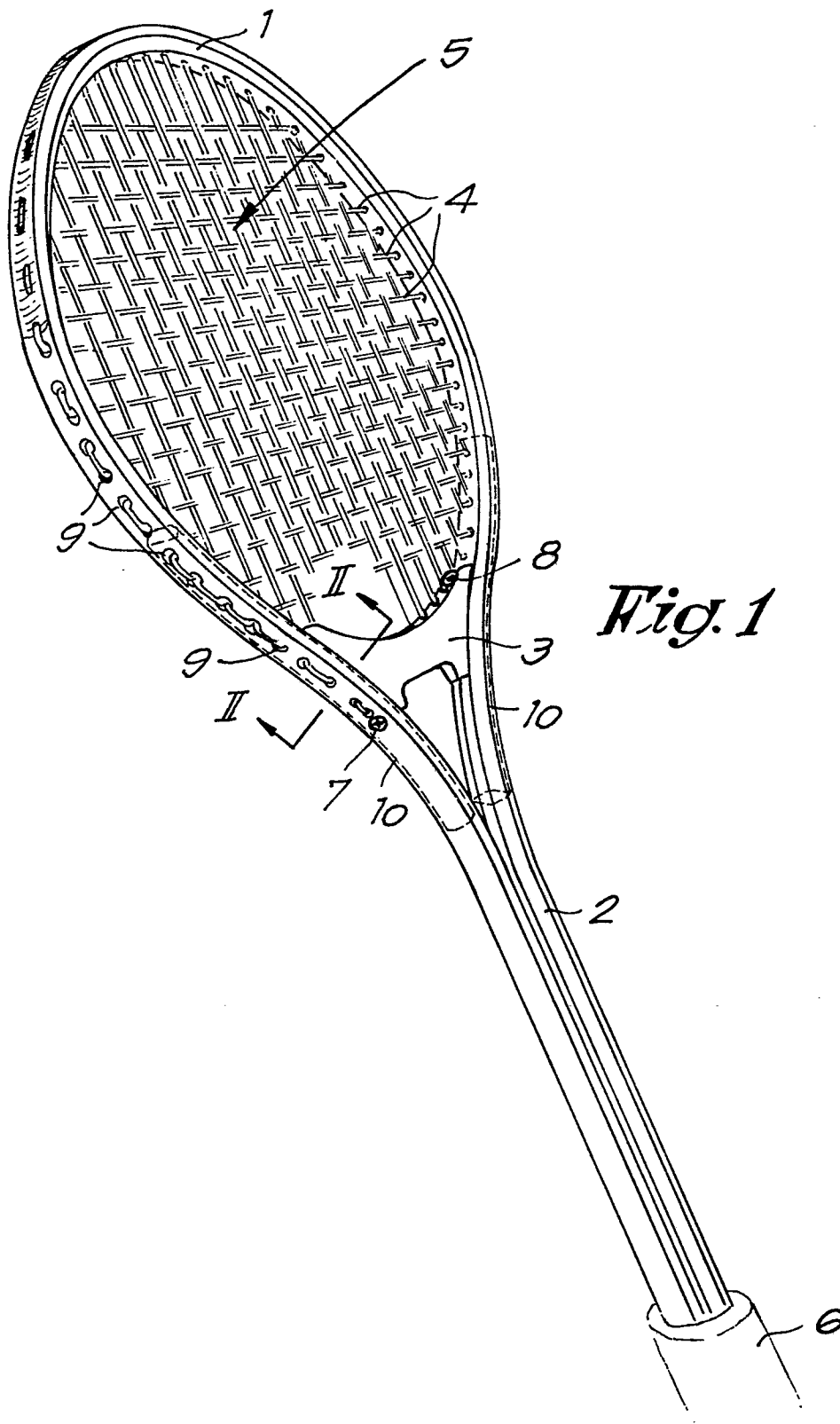
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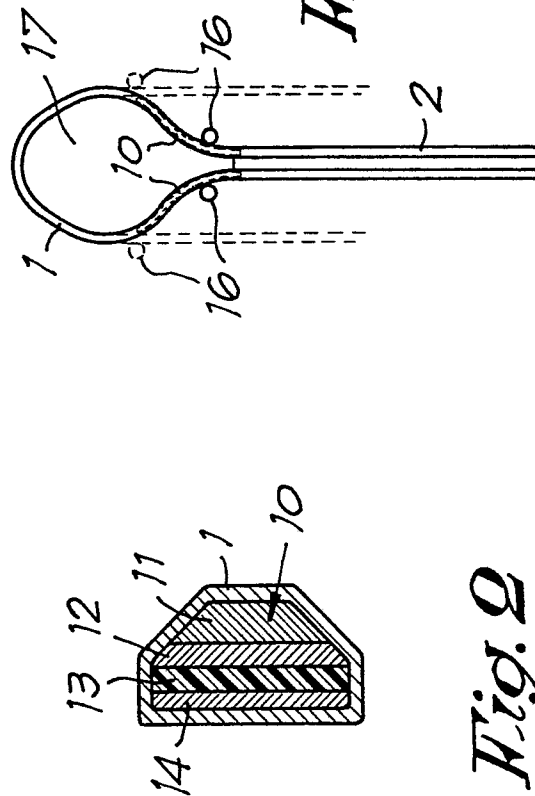
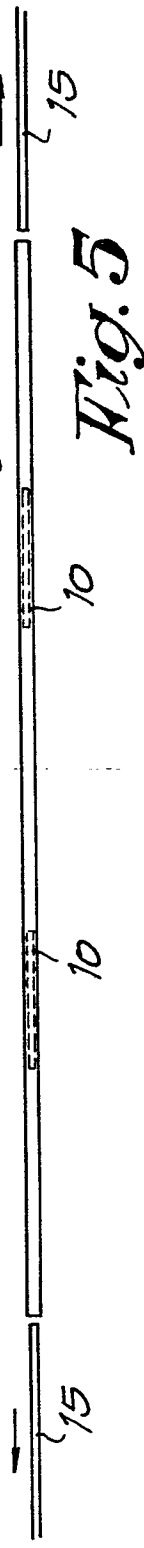


Fig. 6