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GAME RACKET CONSTRUCTION

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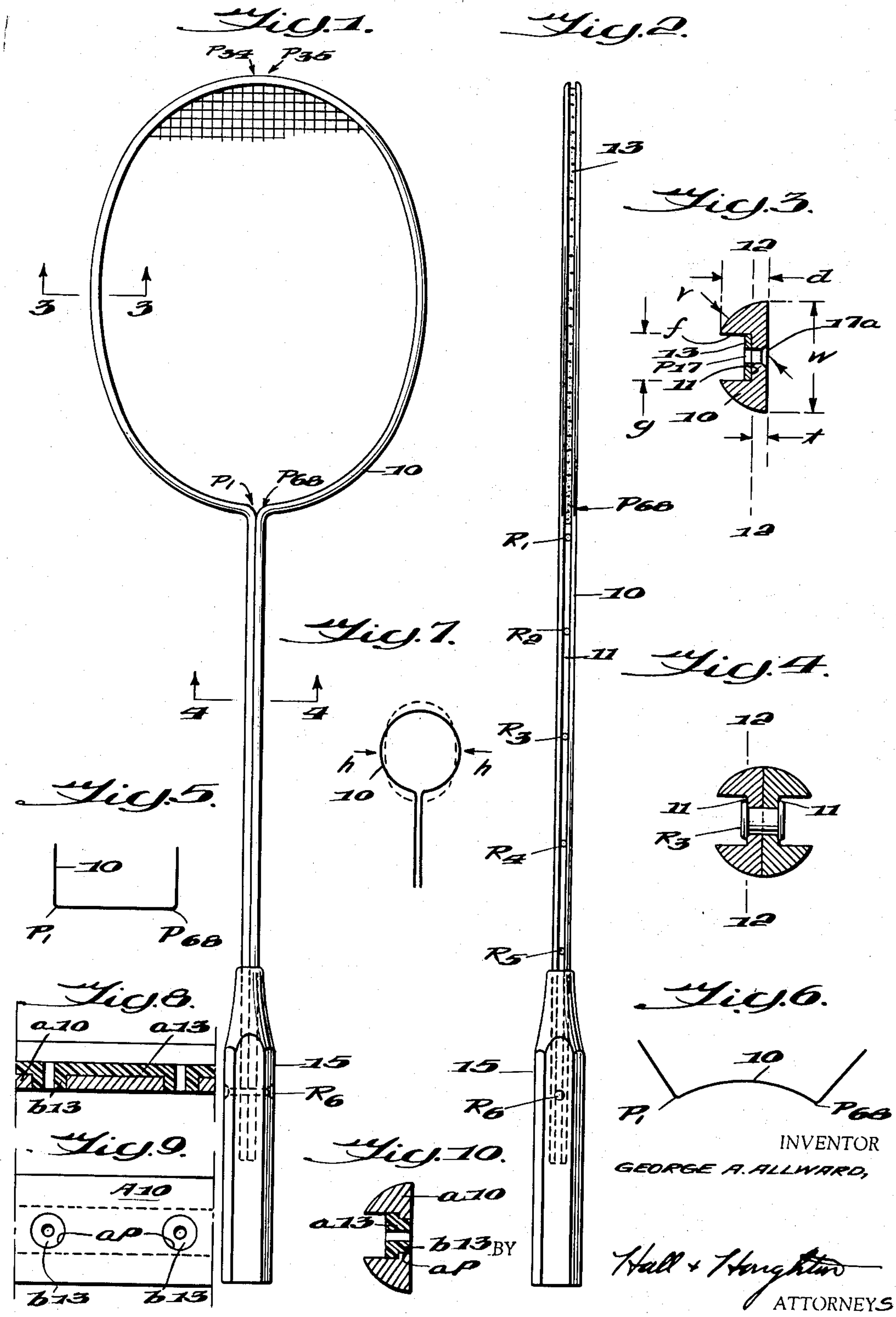

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GAME RACKET CONSTRUCTION

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This invention relates to game racket structures and aims to provide an improved racket frame construction, particularly but not exclusively a light, strong, resilient, warp-proof badminton racket.

The invention resides in the novel features of construction hereinafter described and as more particularly pointed out in the appended claims.

In the accompanying drawings of an illustrative embodiment of the invention

Fig. 1 is a front elevation of a racket according to the invention.

Fig. 2 is a side elevation thereof.

Fig. 3 is a cross section through the head of the frame taken on the line 3—3, Fig. 1, looking in the direction of the arrows.

Fig. 4 is a cross section through the shaft of the racket frame taken on the line 4—4, Fig. 1, looking in the direction of the arrows.

Figs. 5, 6 and 7 are diagrams illustrative of the preferred method of manufacture.

Figs. 8, 9 and 10 are a longitudinal cross section, a plan view and a transverse cross section of a modified construction of the channel lining arrangement.

Referring to Figs. 1–4, the racket frame of the present invention is formed from a single, continuous, solid, extruded channel **10** of light metal, preferably aluminum or an aluminum alloy. For a standard sized badminton racket the extruded channel or bar **10** may have a length of about 4½ feet. This channel, in accordance with this invention has a special cross section, best shown in Figs. 3 and 4. In this cross section the neutral plane of bending lies substantially at the level of the inner bottom **11** of the channel groove, as indicated by the center lines **12—12** in Figs. 3 and 4. Thus when the channel is bent, as shown in Fig. 1, the region of the bottom wall **11** undergoes substantially no elongation or foreshortening. As indicated in Fig. 3, for the standard badminton racket, the preferred dimensions of the channel strip are: overall width w about 3/8 inch, overall depth d about 3/16 inch, width of channel or groove g about 1/8 inch, thickness of base web t about 1/16 inch, the flanges f having straight parallel inner walls and outer walls lying on the arc of a circle of radius r except for slight rounding of the four parallel external edges of the extruded strip. Similar proportions, designed to present the inner surface of the base web approximately at the neutral plane and to present a smooth rounded exterior, may be employed on a somewhat larger scale for tennis racket construction and the like. Summarizing these features of the cross section without reference to specific dimensions, it will be seen that the flat web has two flanges extending from it in the same direction, and defining a rectangular groove therewith of a width approximately one-third the overall width of the channel, the two flanges being rounded from the base of the web to the open edge of the rectangular groove. Also, that in the preferred embodiment the groove has a depth about twice the thickness of the web adjacent to it, the flanges being rounded on arcs having

radii approximately equal to half the overall width of the web. As also shown in Fig. 3, in the preferred embodiment the arcs are swung about the median line of the flat side of the web as a center, and the channel has its neutral plane **12—12** approximately at the level of the inside bottom of the groove.

Still referring to the standard size badminton racket example, the central 27½ inches of the four-and-one-half foot channel has adhesively secured therein a liner strip **13**, preferably of soft leather about 1/16 of an inch thick; and the central 26½ inches of the so lined channel is then perforated through the channel web and strip with holes **P1** etc., properly spaced to provide for stringing of the racket. In the embodiment shown 68 stringing perforations are employed, the holes **P1** and **P68** being placed approximately centrally of the throat bends, as shown in Fig. 1, which throat bends are effected with an external radius of about 1/4 inch, as hereinafter more fully described. Each of the perforations **P1—P68**, at its inner end viewed in Fig. 1 is countersunk slightly, the countersink in the case of drilled perforation **P17** being indicated at **17*a*** in Fig. 3. Still referring to the illustrative embodiment of a standard badminton racket, the perforations P34 and **P35** at the tip of the racket head are spaced about 3/16 inch respectively from the center line of the racket, and the curvature at the throat bends **P1—P68** also spaces the holes P1 and **P68** about 3/8 inch apart. Thus the spacing of the holes in each quadrant of the racket may be a duplicate of that in each other quadrant when a symmetrical head is employed, as in a standard badminton racket, that in the illustrative embodiment having seventeen holes to a quadrant preferably being as follows, measuring the distances **P1—P2**, P1—P3, etc. up to **P1—P17**, with **P17** spaced about 3/8 of an inch from **P18**: 3/8 inch, 3/4 plus, 1 3/16, 1 5/8, 2 3/32, 2 19/32, 3, 3 7/16, 3 25/32, 4 5/32, 4 9/16, 4 29/32, 5 1/4, 5 5/8 minus, 5 31/32, 6 5/16.

As will be observed from the foregoing dimensions, the soft liner strip extends approximately a half inch beyond the ends of the row of stringing holes, **P1** to **P68** in the illustrative embodiment, and thus extends inside the channel around the throat bends when the frame is shaped.

As will be apparent from Fig. 2, the frame is also provided, when shaped, with a plurality of rivets **R1—R5** set into the reentrant portions of the handle forming parts of the channels. The channels, before bending, are preferably formed with holes to receive at least one of these rivets, preferably holes for the rivet **R2**, which may lie about 2½ inches from the first and last stringing holes **P1** and **P68** respectively. The holes for the rivets R1 and R3 to **R6** may be preformed or formed after the bending of the frame, as desired.

The channel strip having been supplied with the liner, and the stringing perforations having been formed and countersunk, the frame blank is ready for bending. This bending operation is facilitated by the particular cross section of the channel, and the sequence of bending steps now to be described is particularly advantageous.

Referring to Fig. 5, in the first step of bending the lined straight frame blank has its handle forming end portions bent at right angles over a curved surface of a radius of approximately one quarter inch, with the bends positioned relative to the 1st and last stringing openings **P1, P68**, as above described, as illustrated in diagrammatic form.

During this sharp bending a slight flattening and inward flow of the tips of the flanges f occurs in effect narrowing the mouth of the channel groove g and aiding in preventing the ends of the liner **13** from curling out of the groove if their adhesive securement should ultimately become detached.

When the two end sections of the channel have been bent at right angles to the central section thereof, as indicated in Fig. 5, the central section is sprung backwardly as in Fig. 6 either with or without the aid of a mandrel and this springing is continued until the throat portions and handle portions are brought into contact with each other as shown in solid lines in Fig. 7. The handle members are then secured together in any suitable manner. When this securement is effected by riveting, at least two rivets, as R2 and R1, and preferably all of rivets R1—R5 are then inserted. Following the securement of the handle members together the frame is flattened to an oval shape as shown in dotted lines in Fig. 7 by pressure on the sides of the head in the regions *h*—*h*. In general all stringing and rivet holes are pre-drilled or punched, and for a standard badminton racket the ovalizing is conducted to produce an oval having 7¾" by 9¾" outside dimensions as illustrated in Fig. 1, i. e. a major to minor axis ratio of about 39 to 31.

Due to the special shape of the channel member the bending of the extruded section does not materially alter the linear dimensions of the bottom face **11** of the groove *g* or tend to stretch the liner out of hole-to-hole alignment with the perforations P1—P68, and because of this advantage stringing of the formed racket is facilitated and separation of the liner from the channel member is avoided. Furthermore, as the liner turns the corners at the sharp throat bends under compression, and is seated in the channel at an area where its flanges are bent inwardly somewhat over the liner, all tendency of the liner to loosen and creep during the forming of the racket head is avoided.

Following the springing of the head into the shape shown in solid lines in Fig. 7 the handle member **15** is slipped over the ends of the shaft portions and secured thereto, as by one or more rivets R6 passing therethrough in the form shown. The hole to receive the rivet R6 is preferably drilled clear through the handle **15** and the facing channel members after the latter have been driven tightly into the handle **15**.

In the form of Figs. 1–4, above described, the stringing holes are pre-drilled or punched and countersunk, and a liner preferably of leather is used, to protect against string cutting. In the modified form of Figs. 8–10, the leather strip **13** (Figs. 2 and 3) is replaced by a molded plastic strip *a***13** having stringing sleeves *b***13** integral therewith and disposed to provide the proper string spacing for the shape of the racket head as above exemplified in connection with the stringing holes P1—P68. The frame *a***10** is provided with enlarged stringing sleeve receiving perforations or holes *a*P, preferably formed by a gang punch, and the sleeves *b***13** preferably terminate flush with the inner surface of the frame *a***10**, as shown. By the liner molding and gang punching procedure, the assembly of the parts is expedited, and the sleeve lining of the stringing apertures affords complete protection against string cutting. As before, the ends of the liner at and beyond the end holes (P1 and P68 in Fig. 1) are placed under compression by the throat bends and thus held against lifting.

While there have been described herein what are at present considered preferred embodiments of the invention, it will be obvious to those skilled in the art that many modifications and changes may be made therein without departing from the essence of the invention. It is therefore to be understood that the exemplary embodiments are illustrative and not restrictive of the invention, the scope of which is defined in the appended claims, and that all modifications that come within the meaning and range of equivalency of the claims are included therein.

I claim:

1. A game racket frame comprising a single channel member having a flat web and a pair of flanges extending from one side of said web and forming therewith a channel extending along said member, the external surfaces of said flanges being curved, said member having an approximately semi-circular cross-section except for said channel and being solid within the confines of its surface, said member having a pair of straight end portions with their webs contiguous and an outwardly bowed central portion the extremities of which extend outwardly from and form sharp bends with the adjacent straight end portions, said straight end portions forming a shaft having an approximately circular cross-sectional contour except for said channel.

2. The frame of claim 1, further including a plurality of rivets passing through the contiguous webs of said straight portions and securing the latter together.

3. The frame of claim 1, further including a handle grip surrounding and fixed to the free extremities of said straight end portions.

4. The game racket frame of claim 1, wherein said channel is a rectangular groove of a width approximately one-third the overall width of the channel member and of a depth approximately twice the thickness of the web of said member.

5. The game racket frame of claim 4, wherein said channel member has its neutral plane for bending approximately at the level of the inside bottom of the groove.

6. A game racket frame comprising a single channel member having a flat web and a pair of flanges extending from one side of said web and forming therewith a channel extending along said member, the external surfaces of said flanges being curved, said member having an approximately semi-circular cross-section except for said channel, said member having a pair of straight end portions with their webs contiguous and an outwardly bowed central portion, the extremities of which extend outwardly from and form sharp bends with the adjacent straight end portions, said bowed portion being provided with a plurality of stringing holes through the web of said member, the first and last of said holes being located at said bends, respectively, a handle grip surrounding and affixed to the free extremities of said straight end portions, and a liner of soft material secured in said channel around said bowed portion and having openings therethrough aligned with said stringing holes, the tips of the flanges at said sharp bends being deformed inwardly to narrow the mouth of the channel thereat, said liner extending past said bends.

7. The frame of claim 1, said bends being contiguous and having a radius of curvature of the same order of magnitude as the radius of curvature of said flanges and being curved much more sharply than said bowed portion.

8. In a game racket construction, a single continuous channel member having a flat web and a pair of flanges extending from one side of said web and forming therewith a channel extending along said member, said member having an approximately semi-circular cross-sectional contour except for said channel and being solid within the confines of its surface, said member having a pair of straight end portions with their webs fixed in contact with each other to form a shaft having an approximately circular cross-sectional contour except for said channel, and having an outwardly bowed central portion the extremities of which extend outwardly from and form sharp bends with the adjacent straight end portions, said bends being contiguous and being curved much more sharply than said bowed portion, and a handle grip fixed to and surrounding the free extremities of said straight end portions.

9. In the construction of claim 8, said bowed portion being formed with a plurality of stringing holes, said straight end portions being held together by rivets through the webs thereof, and said handle grip being fixed to said straight end portions by a rivet through said handle grip and said webs.

10. In a game racket construction, a single channel member having a flat web and a pair of flanges extending

from one side of said web and forming therewith a channel extending along said member, the external surfaces of said flanges being curved, said member having an approximately semicircular cross-section except for said channel and being solid within the confines of its surface, said member having a pair of straight end portions with their webs contiguous and an outwardly bowed oval central portion the extremities of which extend outwardly from and form sharp bends with the adjacent straight end portions, the radius of curvature of the bends being such that the oval is substantially continuous, whereby the central strings may be secured directly to the channel member at the bends.

11. In the construction of claim 10, said bowed portion being provided with a plurality of stringing holes through the web of said member, the first and last of said holes being located at said bends, respectively.

References Cited in the file of this patent

UNITED STATES PATENTS

1,452,803	Harris	Apr. 24, 1923
1,588,139	Penny	June 8, 1926
1,621,746	Morten	Mar. 22, 1927
1,637,583	Norten	Aug. 2, 1927
1,921,616	Hall	Aug. 8, 1933
1,937,787	Robinson	Dec. 5, 1933
1,982,448	Nash	Nov. 27, 1934

FOREIGN PATENTS

252,480	Great Britain	June 3, 1926
522,222	Great Britain	June 12, 1940
122,823	Australia	Nov. 28, 1946