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(54) **Sports racket.**

(57) A sports racket made from fibre-reinforced plastics material comprises a frame 14 in the form of a closed curve having a long axis YY' and a short axis XX' normal to each other and supporting a ball-striking mesh 20, a shaft 16 having one end coupled to the frame 14 at one end of the long axis, and a handle 18 provided on the other end of the shaft 16. The frame 14 is provided with corrugated elastic parts 30 disposed symmetrically at the ends of one of the axes and having corrugations which extend perpendicularly to the ball-striking mesh 20 so as to enhance its ball-controlling capability and to decrease its vibration upon hitting of a ball.

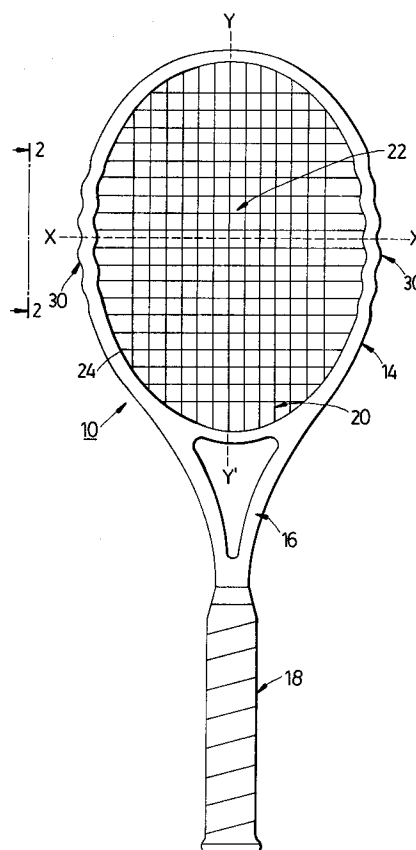


FIG 1

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BACKGROUND OF THE INVENTION

The present invention relates to a ball racket, and more particularly to a ball racket frame having netted strings with a great ball-striking force.

The conventional sports racket of the prior art comprises a circular frame with netted surface for hitting a ball. In fact, the structure of such circular frame extends in a uniform manner along the circular path. In other words, all segments of such circular frame are similar to one another in their cross sections. As a result, such circular frame is structurally defective in that it is not provided with a sound elasticity and that its ball-hitting force can not be effectively enhanced. In addition, such racket frame with a structural uniformity permits the shock wave to be transmitted without difficulty. That is to say that a ball player using such racket is vulnerable to an arm injury caused by the impact transmitted to the handle from the frame which has hit a ball.

SUMMARY OF THE INVENTION

It is therefore the primary objective of the present invention to provide a sports racket frame with a netted surface having a greater ball-striking force and a better ball-controlling capability.

It is another objective of the present invention to provide a sports racket frame with means capable of absorbing the shock.

In keeping with the principles of the present invention, the objectives of the present invention are accomplished by a sports racket, which is made from fiber reinforced plastic material and is composed of a circular frame, a shaft, and a handle. The circular frame is provided with a long axis and a short axis, which cross each other perpendicularly for netting the frame with strings to form a ball-striking netted surface. The shaft is coupled at one end thereof with one end of the long axis of the circular frame and is fastened at other end thereof with the handle. The circular frame is characterized in that it is provided with elastic segments located at both ends of the axis and symmetrical to each other. These elastic segments are corrugated and are disposed along the circular frame surface perpendicular to the ball-striking netted surface. As a result, the portion of frame corresponding to the sweet spot of the ball-striking netted surface is provided with a greater elasticity. Accordingly, the sweet spot of the ball-striking netted surface is provided with a greater strength to hit against a ball while the strings making up the sweet spot are provided with a greater room for expansion upon hitting a ball. In other words, such racket frame is provided with a greater ball penetration distance and therefore af-

fords an user thereof a better control of the ball.

The features and objectives of the present invention can be better understood by studying the following detailed description of the preferred embodiments, in conjunction with the drawings provided herewith.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a plan view of the preferred embodiment of the present invention.

FIG. 2 shows a sectional view of the portion taken along the line 2-2 as shown in FIG. 1.

FIG. 3 shows a schematic view of expansion of the strings upon hitting a ball.

FIG. 4 shows a plan view of another preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2, the tennis racket 10 embodied in the present invention is shown comprising a circular frame 14, a shaft 16, and a handle 18. The circular frame 14 is composed of strings 20 making up the ball-striking netted surface 22 and is made from several intertwined sheets of carbonaceous fiber fabric pre-impregnated in epoxy resin. In addition, the circular frame 14 comprises a plastic foamed material 12 embedded therein.

The circular frame 14 is, in fact, elliptical in shape and is provided with a short axis XX' and a long axis YY'. The present invention is characterized in that the frame 14 comprises the first corrugated elastic segments 30 located symmetrically at both ends of the short axis XX' and disposed along the frame surface 24 perpendicular to the ball-striking netted surface 22. The grooves and the ridges of the first corrugated elastic segments 30 located at both ends of the short axis XX' should be arranged in a corresponding manner so that they are subjected to pressure uniformly. The circular frame 14 comprises two sets of string holes parallel to the frame surface 24 for receiving therein the strings 20 to form the ball-striking netted surface 22. The portion of the string 20 passing through the string hole is protected by the string protective jacket 26.

The circular frame 14 is provided with a better and uniform elasticity by virtue of the fact that it comprises the first elastic segments 30 located at both ends of the short axis XX' thereof. In other words, the rebounding capability of the strings located at the first elastic segments 30 and the adjacent areas is greatly enhanced. As a result, the ball-striking netted surface 22 is provided with a greater striking force against the ball.

The striking force of the netted surface of a racket is derived mainly from the expansive strength of each of the netted strings making contact with the ball. In accordance with this principle, Timoshenko discloses on page 116 of his book entitled "VIBRATION PROBLEMS IN ENGINEERING" an equation as follows:

$$F = -T \frac{X}{L}$$

in which F stands for the force of the string exerting on the ball, L for the one-half length of the string, X for the ball penetration distance, and T for initial string tension. The equation is expressed in a negative value to indicate that the force of the string is exerting on the ball in a direction opposite to the traveling direction of the ball. If the initial string tension (T) and the length of string (L) remain constant, the force of the string exerting on the ball (F) is directly proportional to the ball penetration distance (X).

Now referring to FIG. 3, the string 40 arranged longitudinally is shown making contact with the ball 1. The ball penetration distance X_1 of the string 40 of the present invention is greater than the ball penetration distance X_0 of the string (indicated by dotted line) of the prior art racket. According to Timoshenko's equation described above, the striking force exerting on the ball by the netted surface of the present invention will increase in a direct proportion to an increase in the ball penetration distance. This is possible because the circular frame 14 of the present invention is provided with the first elastic segments 30, as described previously. In addition, as the expansion of the string 40 increases, the dwelling time of the ball 1 on the string 40 lasts longer accordingly. As a result, the sports racket frame of the present invention affords a better control of the ball.

Now referring to FIG. 4 showing another preferred embodiment of the present invention, the tennis racket 50 made from the fiber reinforced plastic material is shown comprising a circular frame 52, a shaft 54, and a handle 56.

The circular frame 52 is composed of first elastic segments 60 located at both ends of the short axis XX' thereof and of second elastic segments 70 located at both ends of the long axis YY' thereof. Both first and second elastic segments 60 and 70 are corrugated along the frame surface 59 perpendicular to the sweet spot 58. Accordingly, such tennis racket frame 50 is provided with means to achieve the intended objectives described above.

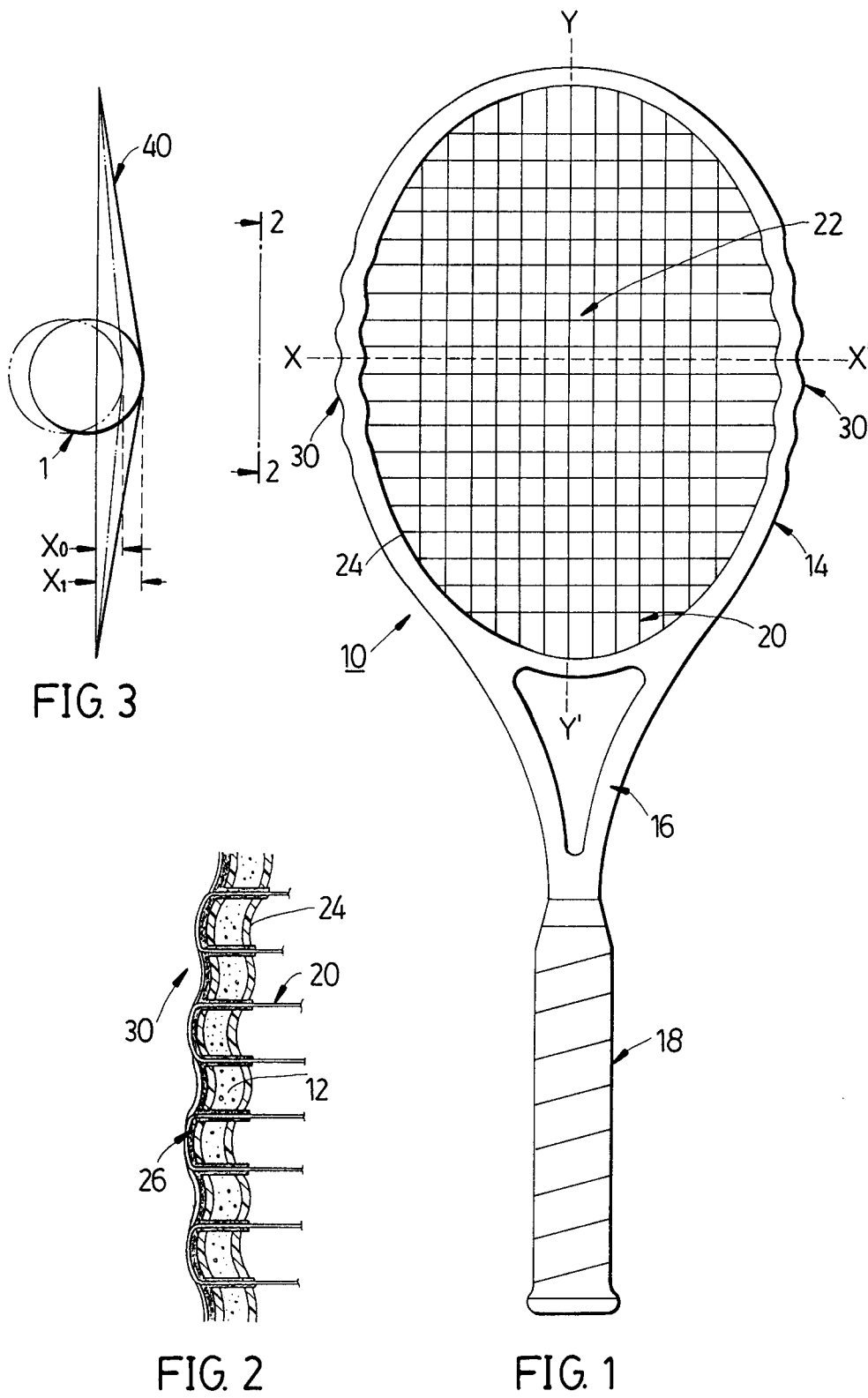
Both preferred embodiments described above are capable of mitigating effectively the transmission of shock wave to the handle from the head frame so as to minimize the risk of an arm injury to

the player using such rackets.

The embodiments of the present invention described above are to be considered in all respects as merely illustrative of principles of the present invention. Accordingly, the present invention is to be limited only by the scope of the hereinafter appended claims.

Claims

1. A sports racket made from fibre-reinforced plastics material and comprising a frame (14) in the form of a closed curve having a long axis (YY') and a short axis (XX') normal to each other and supporting a ball-striking mesh (20), a shaft (16) having one end coupled to said frame (14) at one end of said long axis, and a handle (18) provided on the other end of said shaft (16), characterised in that said frame (14) is provided with corrugated elastic parts (30; 60, 70) disposed symmetrically at the ends of one of said axes and having corrugations which extend perpendicularly to said ball-striking mesh (20).
2. A sports racket according to claim 1, characterised in that said frame (14) is provided with corrugated elastic parts (60, 70) disposed symmetrically at the ends of both of said axes and having corrugations which extend perpendicularly to said ball-striking mesh (20).



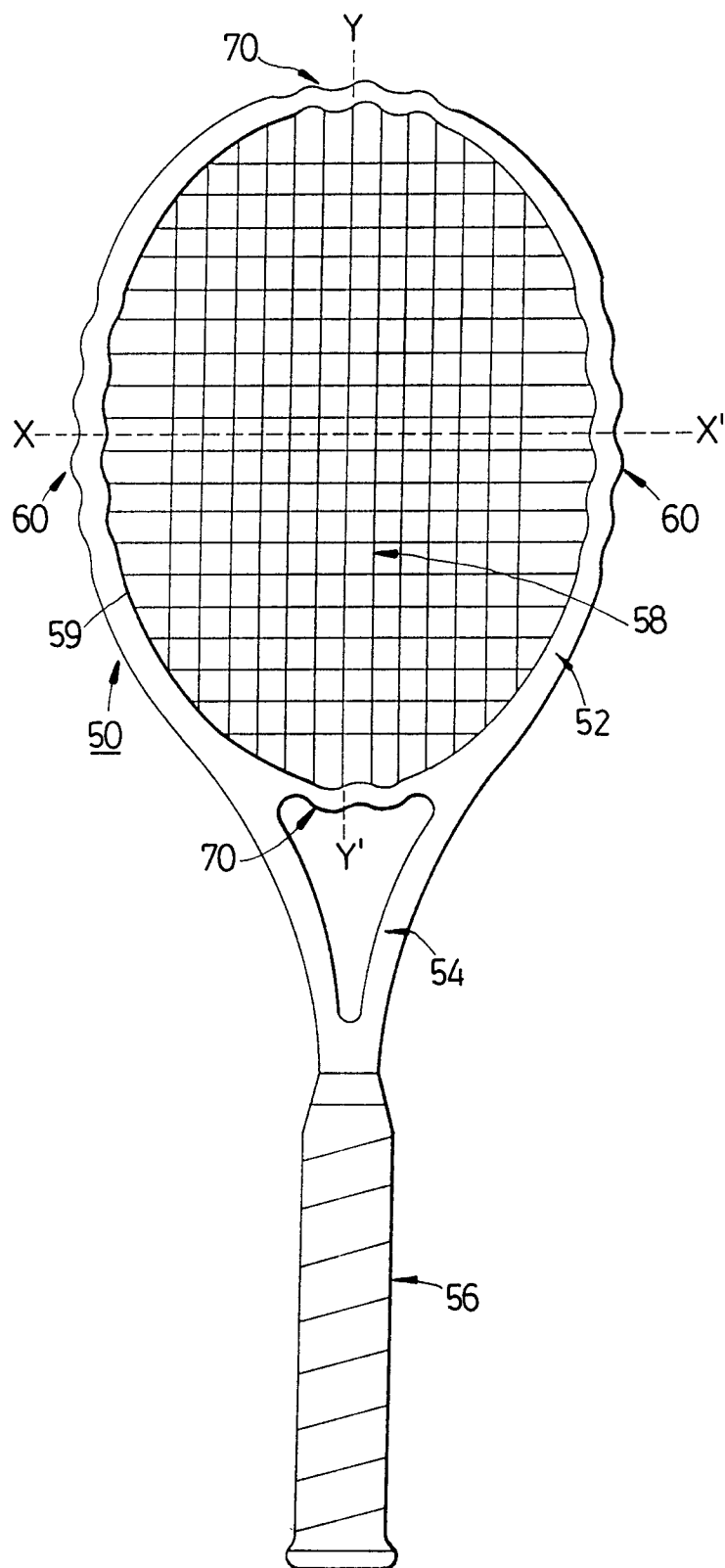


FIG. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 91 30 9820

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	GB-A-2 203 653 (LO KUN-NAN) * page 1, line 20 - page 2, line 3 * ---	1	A63B49/02
A	DE-C-3 700 072 (HON JIN-SAN) * column 2, line 20 - line 22 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A63B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26 MAY 1992	Examiner GERARD B.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			