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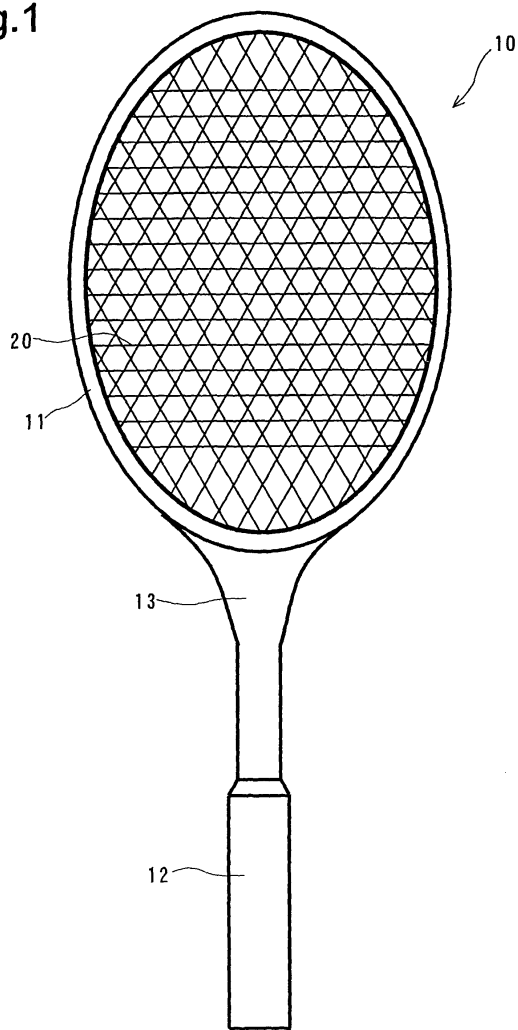
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(54) **Racket**

(57) A racket includes a frame portion and a string which is threaded through the frame portion to be interlaced so as to form a first set of parallel string paths, a second set of parallel string paths, and a third set of parallel string paths. The string is threaded through the frame portion via the first, second and third sets of parallel string paths so that the string forms an approximately planar racket face. The first, second and third sets of parallel string paths intersect each other by an angle of approximately 120 degrees.

**Fig.1**



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## Description

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

**[0001]** The present invention relates to a racket used for striking the ball in tennis, squash and similar games, or for striking a shuttlecock in badminton and similar games.

#### 2. Description of the Prior Art

**[0002]** The term "racket" that is a subject of the present invention is generally defined as a light-weight bat having a gut, nylon, or formerly, cord netting stretched in an oval open frame with a handle attached and is used for striking a ball in tennis, squash and similar games, or for striking a shuttlecock in badminton and similar games. The term "gut" is generally defined as a tough cord that is made from the intestines of certain animals (such as a sheep or a pig) and that which is used for strings of musical instruments, for sports rackets, or for sutures in closing wounds. The term "gut" with regard to the present invention refers to strings use for sports rackets in particular. Guts are generally classified into two different types: a natural gut made from the intestines of certain animals such as a sheep or a pig, and a synthetic resin gut such as a multi-filament gut, a mono-filament gut, a spin gut, or a composite gut including a hybrid gut.

**[0003]** The racket that is defined in the aforementioned manner is generally required to be superior in repulsive force, durability, flexibility, shock absorption and controllability of the hitting direction of the ball or the shuttlecock. These characteristics have formerly been determined by appropriately selecting the gut (string) and by adjusting the tension thereof, and/or by selecting the material of the frame and making adjustments to the strength thereof. Specifically, since the selection of a gut and adjustments to the tension thereof are important factors in obtaining a high repulsive force, various ideas have been applied to the material and to the diameter of the gut, and to the manner of plaiting and interlacing the gut (using a stringing machine) in conjunction with a determination of the strength of the frame which is determined so that the frame does not give in (collapse/cave in) due to the tension of the gut.

**[0004]** In conventional rackets, guts are stretched over the ball striking area of the racket both in the longitudinal direction of the racket and in a direction orthogonal thereto.

### SUMMARY OF THE INVENTION

**[0005]** The present invention provides a sports racket which is structurally designed to achieve a high repulsive force easily without making improvements to the

material of the gut or to the material of the frame of the racket.

**[0006]** To achieve the object mentioned above, according to an aspect of the present invention, a racket is provided, including a frame portion, and a string which is threaded through the frame portion to be interlaced so as to form a first set of parallel string paths, a second set of parallel string paths, and a third set of parallel string paths. The string is threaded through the frame portion via the first, second and third sets of parallel string paths so that the string forms an approximately planar racket face. The first, second and third sets of parallel string paths intersect each other by an angle of approximately 120 degrees.

**[0007]** It is desirable for the frame portion to have a plurality of string holes through which the string is threaded one after another.

**[0008]** The frame portion can include a main frame portion and a sub-frame portion. The sub-frame portion is fixed to the main frame portion after the string is threaded through the sub-frame portion.

**[0009]** It is desirable for the first set of parallel string paths to extend in a lateral direction of the racket.

**[0010]** In another embodiment, a racket is provided having a frame portion through which a string is threaded to form an approximately planar racket face. The string is threaded through the frame portion to be interlaced triaxially in a hexagonal shape.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0011]** The present invention will be described below in detail with reference to the accompanying drawings, in which:

Figure 1 is a front elevational view of a first embodiment of a racket according to the present invention; Figure 2 is an explanatory diagram showing an embodiment of a gut threading pattern for the racket shown in Figure 1;

Figure 3 is an explanatory diagram showing the directions of guts which are interlaced triaxially in a hexagonal shape for the racket according to the present invention; and

Figure 4 is an exploded front elevational view of a second embodiment of the racket according to the present invention.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0012]** Figures 1 through 3 show a first embodiment of a racket according to the present invention. As shown in Figure 1, the racket 10 is provided with an oval frame portion 11, a grip portion 12, and a neck portion 13 connecting the oval frame portion 11 with the grip portion 12. A string (gut) 20 is threaded through the frame portion 11 to form an approximately planar racket face. As

shown in Figure 3, the string 20 is threaded through the frame portion 11 to be interlaced triaxially in a hexagonal shape so as to form a first set of parallel string paths 20a, a second set of parallel string paths 20b and a third set of parallel string paths 20c. The first through third sets of parallel string paths 20a, 20b and 20c intersect each other by an angle of approximately 120 degrees (or 60 degrees) as shown in Figure 3. The first through third sets of parallel string paths 20a, 20b and 20c are determined so as not to all intersect each other at one common point. Namely, the first through third sets of parallel string paths 20a, 20b and 20c are determined so that the string 20 forms not only a plurality of regular triangles, but both a plurality of regular triangles and a plurality of regular hexagons if the thickness of the string 20 is ignored.

[0013] Figure 2 shows an embodiment of a string threading pattern of the string 20 that is threaded through the frame portion 11 to be interlaced triaxially in a hexagonal shape so as to form the first through third sets of parallel string paths 20a, 20b and 20c. String holes 11a are made at predetermined points on the frame portion 11 in advance. The string 20 is inserted into a specific string hole 11a, indicated by an arrow "in" shown in Figure 2, to be stretched (extended) across the frame portion 11 in a lateral direction to form the first set of parallel string paths 20a. Subsequently, the string 20 is stretched across the frame portion 11 in a first oblique direction (a direction from upper left to lower right or from lower right to upper left as viewed in Figure 1) to form the second set of parallel string paths 20b. Subsequently, the string 20 is stretched across the frame portion 11 in a second oblique direction (a direction from upper right to lower left or from lower left to upper right as viewed in Figure 1) to form the third set of parallel string paths 20c. Finally, the string 20 is drawn out of a specific string hole 11a indicated by an arrow "out" shown in Figure 2 to complete a stringing operation. The tension of the string 20 can be adjusted with a conventional stringing machine.

[0014] The repulsive force of the string 20, that is threaded through the frame portion 11 of the racket 10 to be interlaced triaxially in a hexagonal shape so as to form the first through third sets of parallel string paths 20a, 20b and 20c intersecting each other by an angle of approximately 120 degrees in the above described manner, can be more intensified than that of a conventional racket in which main strings and cross strings extend orthogonal to each other. In addition, the string 20 that is threaded through the frame portion 11 to be interlaced triaxially in a hexagonal shape so as to form the first through third sets of parallel string paths 20a, 20b and 20c intersecting each other by an angle of approximately 120 degrees has a quasi-isotropic structure to exhibit substantially no directivity within an elastic limit. Due to this characteristic, the string grid of the string 20 exhibits a substantially uniform repulsive force with little directivity when the ball or the shuttlecock strikes the

string grid from any direction.

[0015] Figure 4 shows a second embodiment of the racket according to the present invention. In Figure 4, elements and portions similar to those of the first embodiment of the racket 10 are designated by the same reference numerals. The racket 100 is provided with a main frame portion 11M and a sub-frame portion 11S which is fixed to the main frame portion 11M. The sub-frame portions 11S is provided with a plurality of string holes (not shown) corresponding to the string holes 11a of the racket 10 shown in Figure 1. The string 20 is threaded through the sub-frame portion 11S to be interlaced triaxially in a hexagonal shape so as to form the first through third sets of parallel string paths 20a, 20b and 20c intersecting each other by an angle of approximately 120 degrees, in the same manner as the first embodiment of the racket 10. After the string 20 has been threaded through the sub-frame portion 11S, the sub-frame portion 11S is fitted into the main frame portion 11M to be fixed thereto by a plurality of fixing devices 14 such as screws and nuts. This embodiment is effective especially for when all the ends of the stretched strings threaded through the sub-frame portion 11S are welded to the sub-frame portion 11S, or for when the string 20 is threaded through the sub-frame portion 11S that is provided independent of the main frame portion 11M.

[0016] In the above-described embodiments, the size of the hexagonal shape formed by the string 20, the tension thereof, and the type of string used (e.g., natural gut or a synthetic resin type, etc.), etc., are determined in accordance with required characteristics of the racket 10.

[0017] As can be understood from the foregoing, according to the present invention, a racket which exhibits a high repulsive force with an excellent controllability of the hitting direction of a ball or a shuttlecock is achieved by the above described string threading pattern of the string 20, which is threaded through the frame portion 11 or the sub-frame portion 11S to be interlaced triaxially in a hexagonal shape so as to form the first through third sets of parallel string paths 20a, 20b and 20c intersecting each other by an angle of approximately 120 degrees.

[0018] Obvious changes may be made in the specific embodiments of the present invention described herein, such modifications being within the spirit and scope of the invention claimed. It is indicated that all matter contained herein is illustrative and does not limit the scope of the present invention.

## Claims

1. A racket comprising:

a frame portion; and  
a string which is threaded through said frame

portion to be interlaced so as to form a first set of parallel string paths, a second set of parallel string paths, and a third set of parallel string paths;

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wherein said string is threaded through said frame portion via said first, second and third sets of parallel string paths so that said string forms an approximately planar racket face; and

wherein said first, second and third sets of parallel string paths intersect each other by an angle of approximately 120 degrees.

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2. The racket according to claim 1, wherein said frame portion has a plurality of string holes through which said string is threaded one after another.
3. The racket according to claim 1 or 2, wherein said frame portion comprises a main frame portion and a sub-frame portion; and  
wherein said sub-frame portion is fixed to said main frame portion after said string is threaded through said sub-frame portion.
4. The racket according to any of claims 1 to 3, wherein said first set of parallel string paths extend in a lateral direction of said racket.
5. A racket having a frame portion through which a string is threaded to form an approximately planar racket face;  
wherein said string is threaded through said frame portion to be interlaced triaxially in a hexagonal shape.

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Fig.1

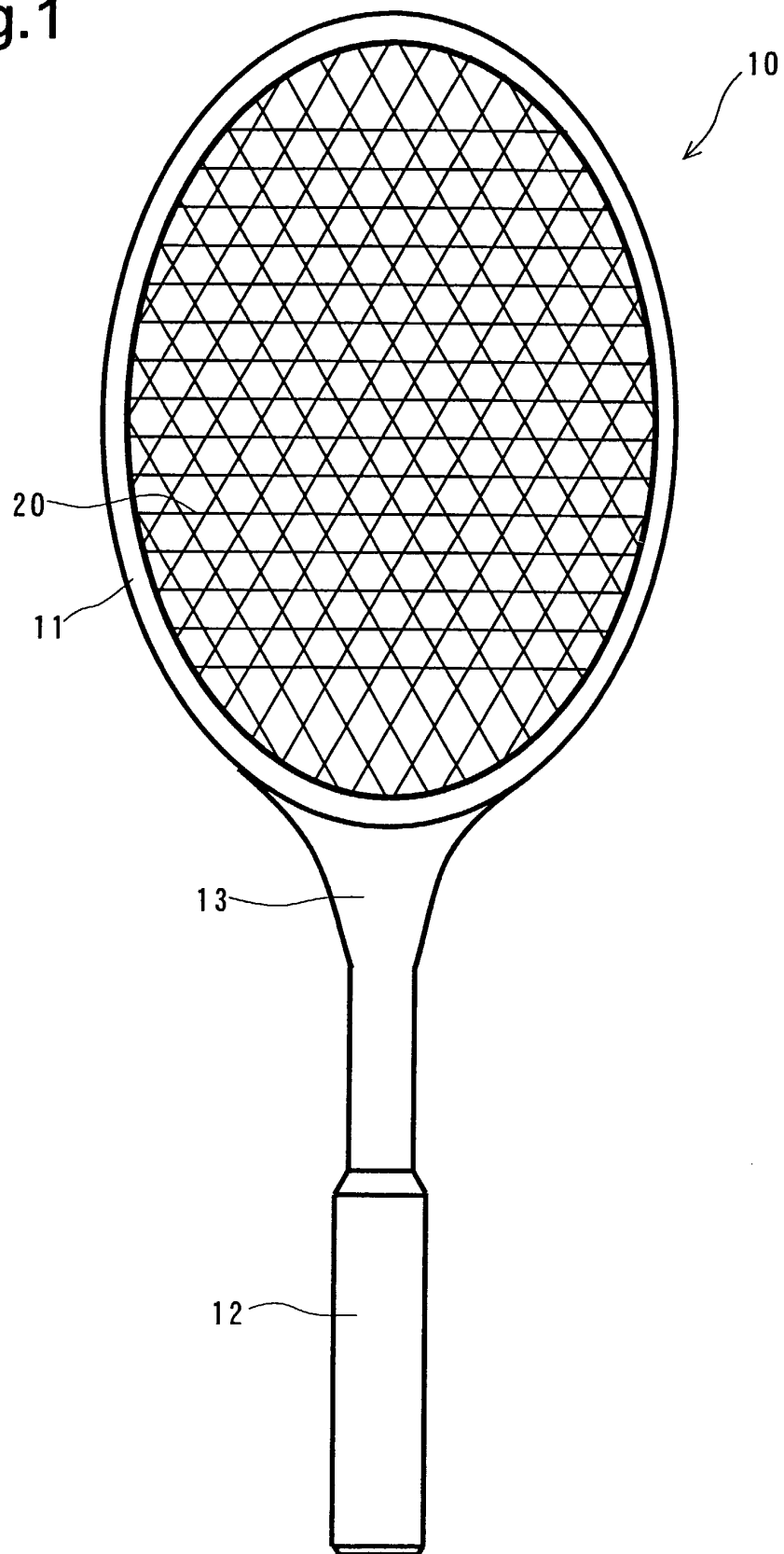


Fig.2

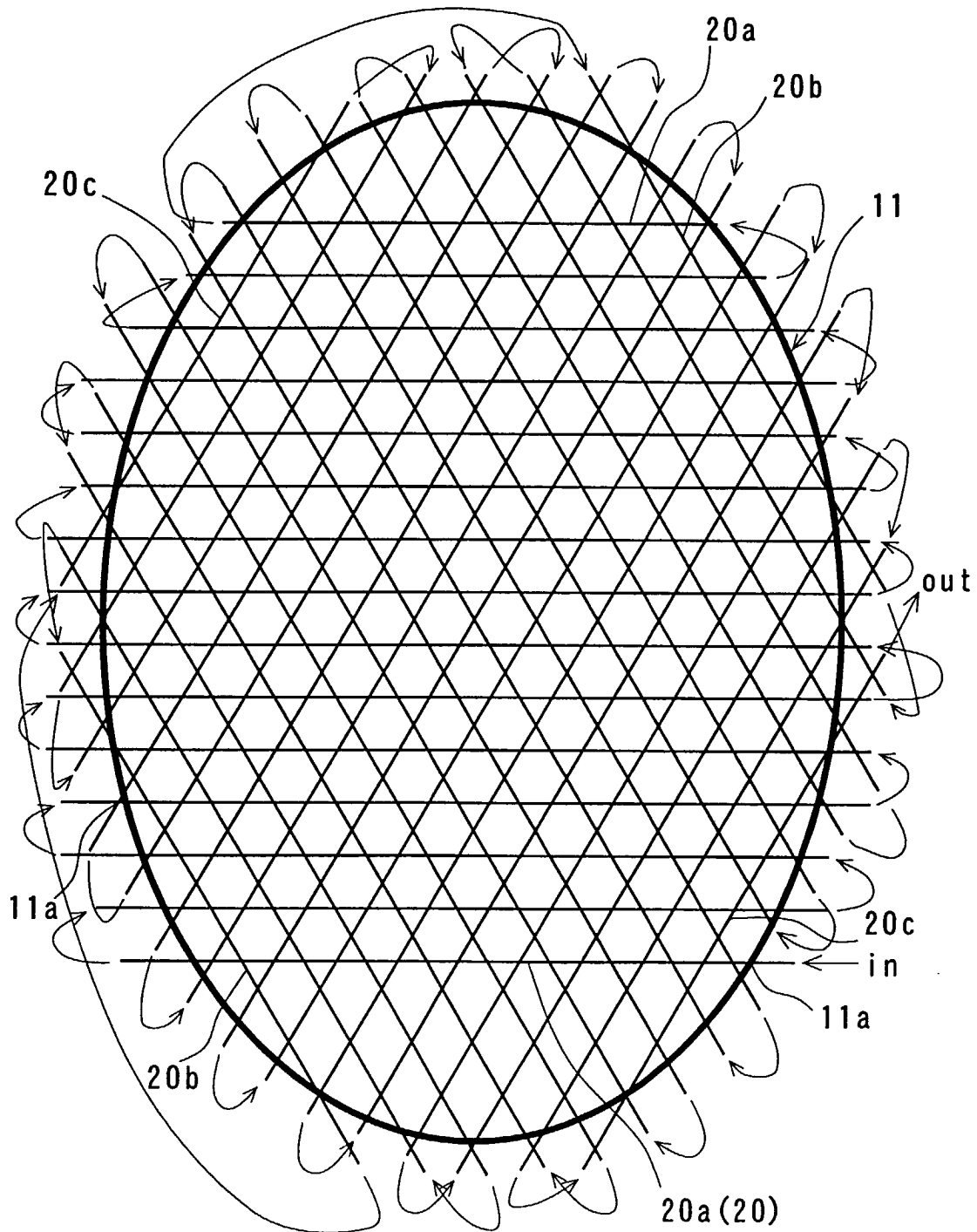


Fig.3

