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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Badminton racket.**

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EP 0 544 248 B1

Description

Field Of The Invention

This invention relates to badminton rackets, and, more particularly, to a badminton racket which is lighter than prior badminton rackets and which has a balance point or center of gravity closer to the head end of the racket than to the handle end.

Description Of The Prior Art

Badminton rackets conventionally have a length of about 660,4 mm (26 inches) and a weight of about 100 grams. The balance point or center of gravity of those rackets lies closer to the handle end of the racket than the head end. Accordingly, the prior badminton rackets are "head light." They typically include lead or other weight in the handle to increase the weight of the racket and to produce the "head lights" characteristic.

Representative competitive badminton rackets have the following physical properties:

Weight (Grams)	Length mm (Inches)	Balance mm (Inches)	lend (oz. in.^{2}) kgcm^2
95 to 115	659,9 to 666,2 (25.98 to 26.23)	288,0 to 320,0 (11.34 to 12.60	129,3 to 151,1 (707 to 826)

"Balance" is the distance of the balance point or center of gravity from the handle end of the racket. "lend" is the moment of inertia about an axis at the end of the handle which extends perpendicularly to the handle and is a measure of the ability of the racket to resist rotation about the axis.

Frolow Reissue U.S. Patent No. 31,419 describes a tennis racket which weighs less than conventional tennis rackets. Weight, removed from the handle end and added to the head end, makes the racket "head heavy," i.e., the balance point or center of gravity lies closer to the head end of the racket than the handle end. Frolow does not describe a badminton racket, which is distinctly different than a tennis racket in shape, weight, and other physical characteristics.

Strauch et al. U.S. Patent No. 5,062,634 describes a "head heavy" squash racket. The racket is light and has a balance point or center of gravity closer to the head than the handle. Strauch et al. do not describe a badminton racket which has distinctly different physical characteristics than a squash racket.

In EP 0 456 407 A1 a badminton racket is described with a frame having a head, a shaft and a Y-joint at the connection between the head and the shaft, said racket improving transmission of stress from the head to the shaft resulting in an increased length of the center longitudinal strings. This increased length improves power. Nothing is mentioned regarding the exact position of the center of gravity of the racket.

It is the object of the present invention to provide a badminton racket with improved performance which is easier to handle by a player.

This object is achieved by a badminton racket with the features according to claim 1.

Further embodiments are defined in the dependent claims 2 to 5.

SUMMARY OF THE INVENTION

The invention provides a badminton racket which is significantly lighter than prior badminton rackets and which is "head heavy." The weight of the racket is within the range of about 75 to 85 grams, and preferably within the range of about 80 to 85 grams. The length of the racket is about 660,4 mm (26 inches), and the balance point or center of gravity is about 340,4 mm to 386,1 mm (13.4 to 15.2 inches) from the handle end. The moment of inertia about an axis at the end of the handle is within the range of about 128,0 kgcm^2 to 142,7 kgcm^2 (700 to 780 oz. in.^{2}), and preferably within the range of about 133,5 kgcm^2 to 139,9 kgcm^2 (730 to 765 oz. in.^{2}), and the center of percussion is about 475,0 mm to 520,7 mm (18.7 to 20.5 inches) from the handle end of the racket.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of this invention one should now refer to the embodiment illustrated in greater detail in the accompanying drawings and described below by way of an example of the invention. In the drawings:

FIG. 1 is a plan view of a badminton racket frame formed in accordance with the invention;
FIG. 2 is a side elevational view of the racket frame;
FIG. 3 is a sectional view taken along the line 3-3 of FIG. 1.;
FIG. 4 is a sectional view taken along the line 4-4 of FIG. 1;
FIG. 5 is a sectional view taken along the line 5-5 of FIG. 1;
FIG. 6 is a sectional view taken along the line 6-6 of FIG. 1;
FIG. 7 is a sectional view taken along the line 7-7 of FIG. 1;
FIG. 8 is a sectional view taken along the line 8-8 of FIG. 1;
FIG. 9 is a sectional view taken along the line 9-9 of FIG. 1;
FIG. 10 is a sectional view taken along the line 10-10 of FIG. 1;
FIG. 11 is a sectional view taken along the line 11-11 of FIG. 1;
FIG. 12 in a sectional view taken along the line 12-12 of FIG. 1;
FIG. 13 is a sectional view taken along the line 13-13 of FIG. 1; and
FIG. 14 is a sectional view taken along the line 14-14 of FIG. 1.

While the following disclosure describes the invention in connection with one embodiment, one should understand that the invention is not limited to this embodiment. Furthermore, one should understand that the drawings are not to scale and that graphic symbols, diagrammatic representations, and fragmentary views, in part, illustrate the embodiment. In certain instances, the disclosure may not include details which are not necessary for an understanding of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS AND EMBODIMENTS

Referring to FIGS. 1 and 2, the numeral 20 designates a badminton racket of the present invention. This racket has a frame 21 which includes a hoop-shaped head portion 22 at one end, a generally T-shaped throat portion 23, and an elongated shaft portion 24 at the other, opposite end. The shaft portion terminates in a handle portion 25.

The head portion supports conventional string 26 with longitudinal and transverse portions which provide a conventional strung surface. The outer surface of the head portion 22 has a groove 27 (See FIGS. 3 and 4) to accommodate the cross-over portions of the strings; and drilled openings 28 in the head portion 22, through which the string extends, help define a pattern for the string.

The racket has a conventional butt cap 29 mounted on the butt end 30 of the handle portion 25. It also includes a flexible strip of leather or synthetic material 31 (See FIG. 14) spirally wound around the handle portion to provide a hand grip. Finally, it includes a bumper guard 32 which lies in the groove 27 and includes eyelets sized to fit into the openings 28. The guard 32 is a nylon member, or a member made out of any other suitable material. The racket string 26 extends through its eyelets and secures it in place (See FIGS. 1-3).

Preferably, the frame comprises molded graphite fibers and resin, although other materials may also form the frame, e.g., aluminum, graphite reinforced aluminum, polymers, fiber reinforced metals, etc. The frame's shape and cross section make it lighter than conventional badminton racket frames and head heavy.

The particular racket illustrated in FIGS. 1 and 2 has a weight within the range of about 75 to 85 grams, and preferably within the range of about 80 to 85 grams. The overall length L of the racket is 660,4 mm (26 inches), and the balance point or center of gravity is 340,4 mm to 386,1 mm (13.4 to 15.2 inches) from the butt end 30 of the racket. The end moment of inertia of the racket about an axis G-G is from 128,0 $kgcm^2$ to 142,7 $kgcm^2$ (700 to 780 oz. $in.^2$), and preferably from 133,5 $kgcm^2$ to 139,9 $kgcm^2$ (730 to 765 oz. $in.^2$). The axis G-G extends perpendicularly to the handle portion 25 at the butt end 30. The moment of inertia about an axis Y-Y, lying perpendicularly of the axis G-G along the center of the racket and extending through the center of gravity, is from 1,65 $kgcm^2$ to 2,19 $kgcm^2$ (9 to 12 oz. $in.^2$). The moment of inertia about an axis X-X, extending through the balance point or center of gravity and lying parallel to the axis G-G is from 29,3 $kgcm^2$ to 40,2 $kgcm^2$ (160 to 220 oz. $in.^2$).

The center of percussion of a racket is the point at which a ball striking a freely suspended racket will cause the racket to rotate about the axis G-G without moving the axis G-G. Prior badminton rackets generally have a center of percussion less than 470,9 mm (18.54 inches) from an axis at the butt end 30. The racket illustrated in FIGS. 1 and 2 has its center of percussion at 480,1 mm (18.90 inches) from the butt end 30 when measuring the center of percussion with respect to the axis G-G at the butt end. When measuring the center of percussion with respect to an axis which lies parallel to the axis G-G but 76,2 mm (3 inches) from the butt end 30, the center of percussion is 442,0 mm (17.4 inches) from that axis toward the head end 33.

The following parameters further define the configuration of the racket of the present invention which includes a generally oval head. The longitudinal dimension A of the strung surface, which is the inside dimension of the head portion, is 236,7 mm (9.32 inches). This dimension may be within the range of 236,2 mm to 279,4 mm (9.3 to 11.0 inches). The transverse dimension B of the strung surface is 183,9 mm (7.24 inches). This dimension may be within the range of 177,8 mm to 218,4 mm (7.0 to 8.6 inches). The length D of the handle portion 25 is 5.16 inches.

FIGS. 3-14 illustrate the height H and width W of the cross section of the frame at Sections 3-3 through 12-12, respectively. The height and width of the cross sections vary along the length of the frame as shown in FIG. 2. The height H and width W of the cross sections of one example of the racket appear below in Table I.

TABLE I

Cross Section	Height		Width	
	mm	(inch)	(inch)	mm
3-3	11,00	(0.433)	(0.195)	4,95
4-4	12,55	(0.494)	(0.235)	5,97
5-5	13,77	(0.542)	(0.268)	6,81
6-6	14,00	(0.551)	-	-
7-7	12,34	(0.486)	(0.414)	10,52
8-8	8,00	(0.315) (Diameter)	-	-
9-9	10,01	(0.394) (Diameter)	-	-
10-10	12,80	(0.504)	(0.512)	13,00
11-11	23,01	(0.906)	(0.925)	23,50
12-12	21,01	(0.827)	(0.846)	21,49

The height and width of sections 13-13 and 14-14 varies based on the size handle of the racket. The height of the frame at these sections varies between 21,01 mm to 26,49 mm (0.827 to 1.043 inches) and the width varies between 23,01 mm to 25,4 mm (0.906 to 1.000 inches). As shown in FIGS. 3-12, the racket frame is hollow.

One forms the racket of the present invention using conventional fabrication methods. They include forming the frame by laying graphite fibers and resin around an elongated inflatable bladder, arranging the bladder in the shape of the frame, curing the resin under heat and pressure, and deflating the bladder and removing it to provide a hollow frame. Subsequent steps include the assembly of the frame and the guard and handle components and the stringing of the racket.

While the above description and the drawings illustrate one embodiment, one should understand, of course, that the invention is not limited to this embodiment. Those skilled in the art to which the invention pertains may make modifications and other embodiments employing the principles of this invention particularly upon considering the foregoing teachings. For example, rather than having the bumper guard described above, the badminton racket of the present invention may include a frame with a thicker portion at the head end 33 to increase the weight on the head side of the racket and help provide the "head heavy" feature.

The applicant, therefore, by the appended claims, intends to cover any modifications and other embodiments as incorporate those features which constitute the essential features of this invention.

Claims

1. A badminton racket with a frame having a head portion (22) for supporting a strung surface, a handle portion (25) for holding by a player, a shaft portion (24) connected to the handle portion (25) and to the head portion (22) and a weight within the range of about 75 to about 85 grams, characterized in that:
said racket has a center of gravity located closer to the head end (33) of the racket than the handle end (30) of the racket, said center of gravity being positioned about 340.4 mm (13.4 inches) to about 386.1 mm (15.2 inches) from the handle end (30) of said racket.

2. The badminton racket of claim 1 wherein the center of percussion measured from the handle end (30) is about 475 mm to 520.7 mm (18.7 to 20.5 inches) from the handle end.

3. The badminton racket of claim 1 wherein a moment of inertia about an axis at the handle end (30) which extends perpendicular to the handle is about 128,0 kgcm^2 to about 142,7 kgcm^2 (700 to about 780 oz. in.^{2}).

4. The badminton racket of claim 1 wherein the head portion (22) has a longitudinal dimension parallel to the shaft portion (24) of less than 279.4 mm (11 inches) and a transverse dimension perpendicular to the shaft portion (24) of less than 218.4 mm (8.6 inches).

5. The badminton racket of claim 1 wherein the length of the racket is about 660 mm (26 inches).

Patentansprüche

1. Badmintonschläger mit einem Rahmen, der einen Kopfabschnitt (22) zum Tragen einer besaiteten Fläche, einen Griffabschnitt (25), der von einem Spieler gehalten werden kann, einen Schaftabschnitt (24), der mit dem Griffabschnitt (25) und dem Kopfabschnitt (22) verbunden ist und ein Gewicht innerhalb eines Bereichs von ungefähr 75 g bis ungefähr 85 g besitzt,
dadurch gekennzeichnet, daß:
der Schläger einen Schwerpunkt besitzt, der sich näher am Kopfende (33) des Schlägers als am Griffende (30) des Schlägers befindet, wobei sich der Schwerpunkt ungefähr 340,4 mm (13,4 Inch) bis ungefähr 386,1 mm (15,2 Inch) vom Griffende (30) des Schlägers entfernt befindet.

2. Badmintonschläger nach Anspruch 1, bei dem sich der Schlagmittelpunkt gemessen vom Griffende (30) ungefähr 475 mm bis 520,7 mm (18,7 bis 20,5 Inch) vom Griffende entfernt befindet.

3. Badmintonschläger nach Anspruch 1, bei dem ein Trägheitsmoment um eine Achse am Griffende (30), welche sich rechtwinkelig zum Griff erstreckt, ungefähr 128,0 kgcm^2 bis ungefähr 142,7 kgcm^2 (700 bis ungefähr 780 oz. in.^{2}) beträgt.

4. Badmintonschläger nach Anspruch 1, bei dem der Kopfabschnitt (22) eine Längsabmessung parallel zum Schaftabschnitt (24) von weniger als 279,4 mm (11 Inch) und eine Querabmessung rechtwinkelig zum Schaftabschnitt (24) von weniger als 218,4 mm (8,6 Inch) besitzt.

5. Badmintonschläger nach Anspruch 1, bei dem die Länge des Schlägers ungefähr 660 mm (26 Inch) beträgt.

Revendications

1. Une raquette de badminton disposant d'un cadre doté d'une portion de tête (22) destinée à supporter une surface cordée, d'une portion de poignée (25) destinée à la tenue en main par un joueur, une portion de manche (24) rattachée à la portion de poignée (25) et à la portion de tête (22) et ayant un poids compris dans une marge. d'environ 75 à environ 85 grammes, caractérisée par les éléments suivants:
ladite raquette a un centre de gravité situé plus près de l'extrémité de tête (33) de la raquette que de l'extrémité de poignée (30) de la raquette, ledit centre de gravité étant situé à une distance d'environ 340,4 mm (13,4 pouces) à environ 386,1 mm (15,2 pouces) de l'extrémité de poignée (30) de ladite raquette.

2. La raquette de badminton de la revendication 1, dont le centre de percussion mesuré à partir de l'extrémité de poignée (30) se situe à une distance d'environ 475 mm à 520,7 mm (18,7 à 20,5 pouces) de l'extrémité de poignée.

3. La raquette de badminton de la revendication 1, dont un moment d'inertie autour d'un axe situé à l'extrémité de poignée (30) qui se prolonge perpendiculairement à la poignée est d'environ 128,0 kgcm^2 à 142,7 kgcm^2 (700 à 780 oz. in^2).

4. La raquette de badminton de la revendication 1, dont la portion de tête (22) a une dimension longitudinale, parallèle à la portion de manche (24), qui est inférieure à 279,4 mm (11 pouces) et une dimension transversale, perpendiculaire à la portion de manche (24), inférieure à 218,4 mm (8,6

pouces).

5. La raquette de badminton de la revendication 1, dont la longueur de la raquette est d'environ 660 mm (26 pouces).

Fig. 1

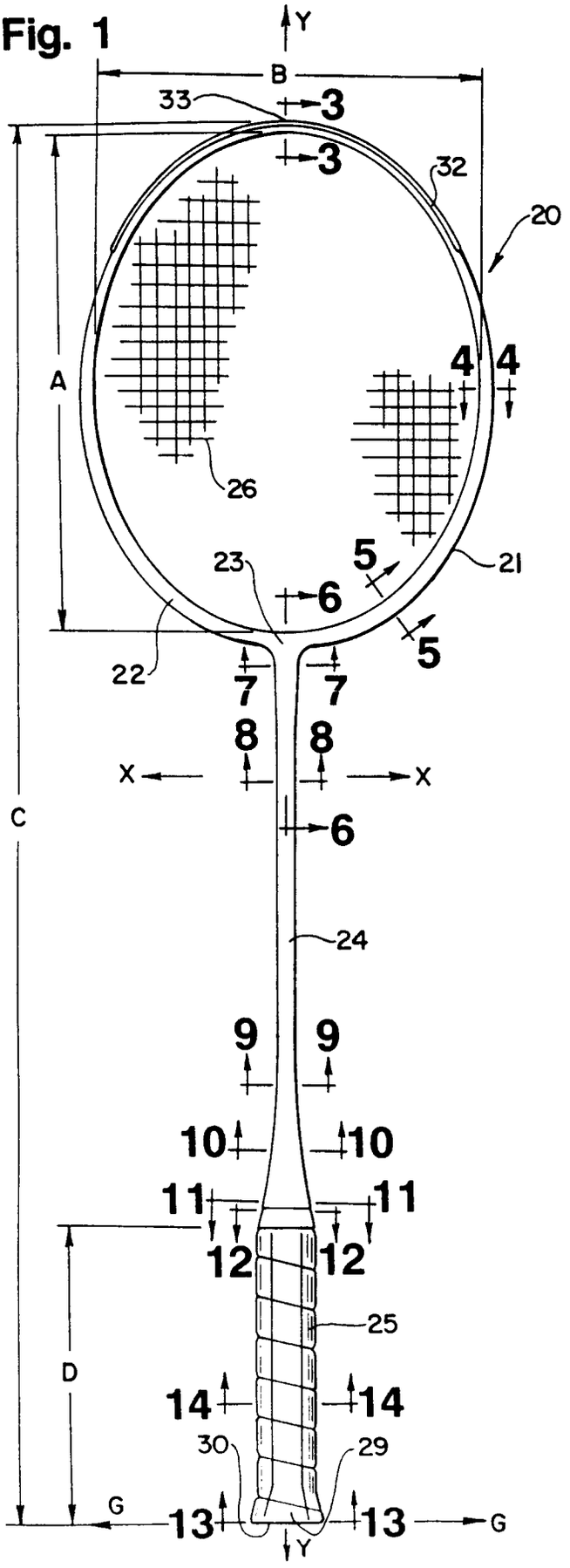
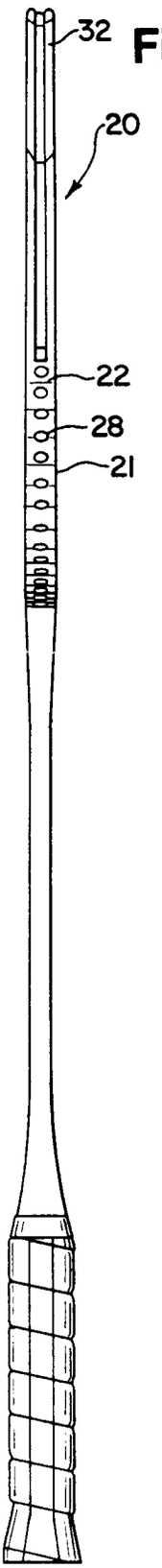

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13
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Y

Fig. 2


32
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21

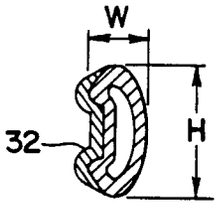


Fig. 3

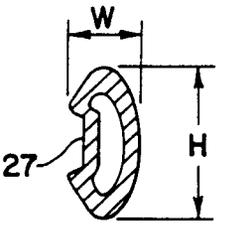


Fig. 4

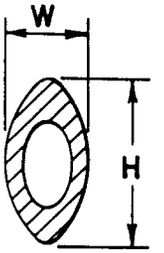


Fig. 5

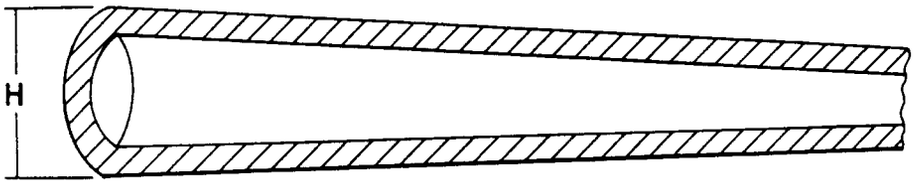


Fig. 6

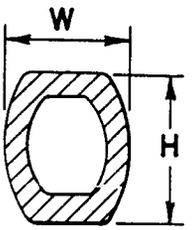


Fig. 7



Fig. 8

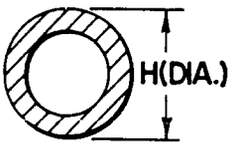


Fig. 9

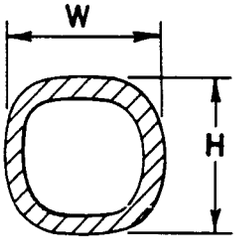


Fig. 10

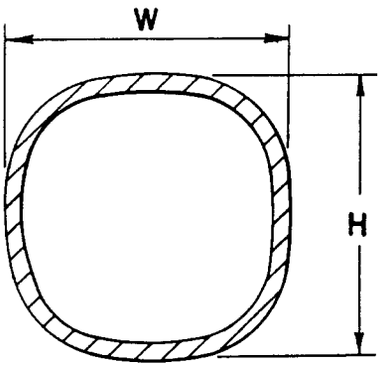


Fig. 12

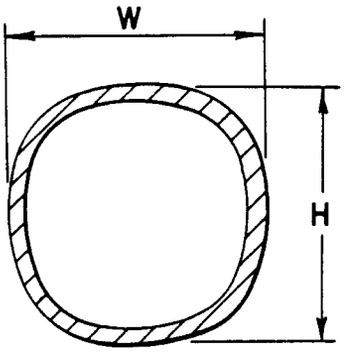


Fig. 11

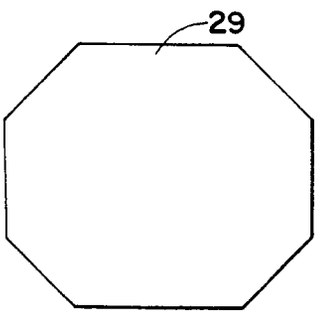


Fig. 13

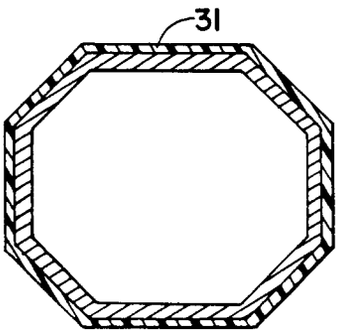


Fig. 14