

[54] **RACKET WITH RESILIENT SURFACE**
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 273/73 A-73 L, 76, 95 R, 96 R

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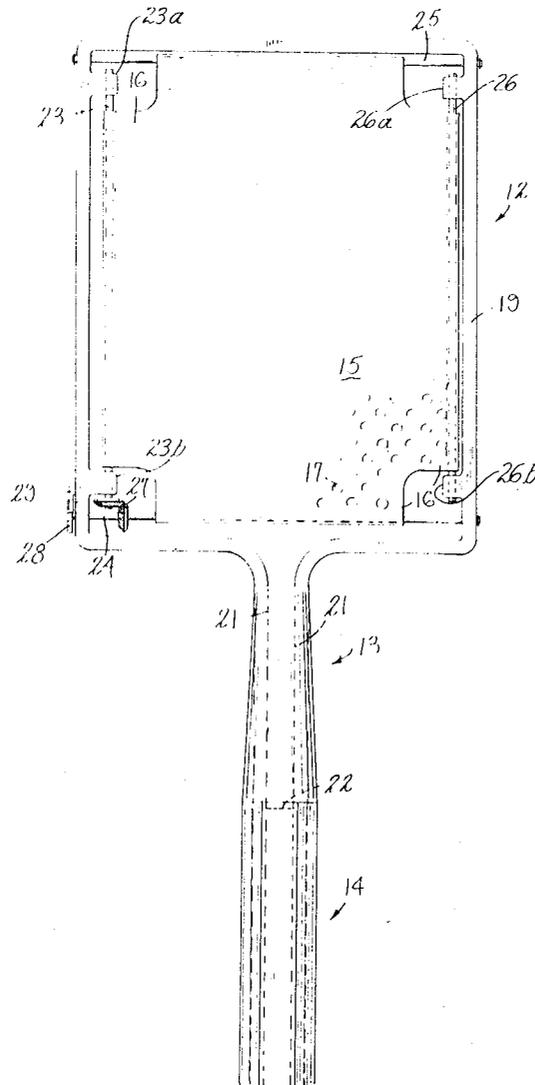
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 [57] **ABSTRACT**

A game racket, such as a tennis racket, in which the game ball contact surface is a resilient membrane such as plastic film. The membrane is tensioned in several directions at once by spindles on the edge of the racket head, the spindles being connected by bevel gears and rotated by a ratchet wheel and pawl.

6 Claims, 3 Drawing Figures



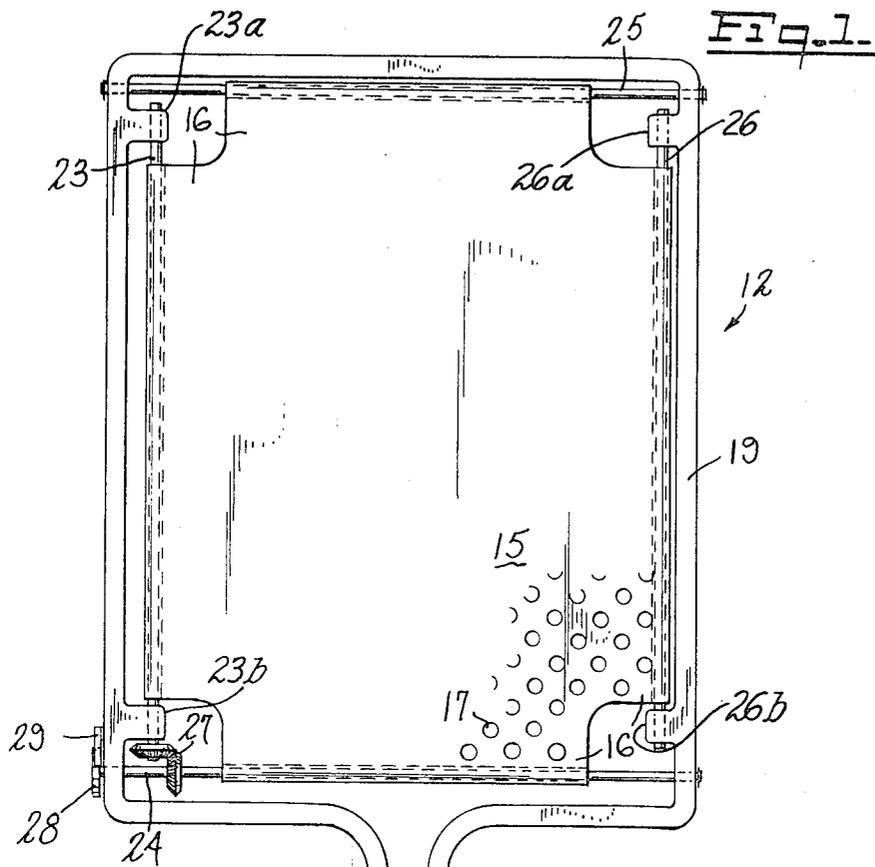


Fig. 1.

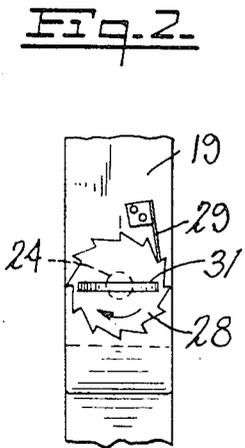


Fig. 2.

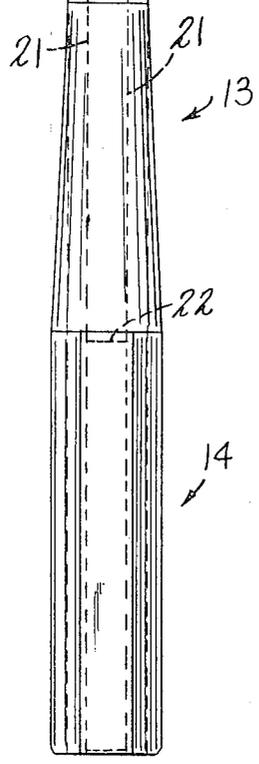
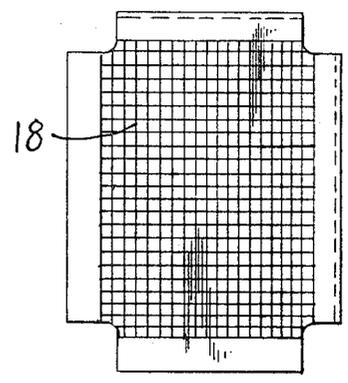


Fig. 3.



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RACKET WITH RESILIENT SURFACE

BACKGROUND OF THE INVENTION

This invention relates to an improved game racket such as a tennis racket or the like, and more particularly to a racket wherein the game ball contact surface of the racket is a resilient membrane.

While game rackets such as tennis rackets have been designed in which the game ball contact surface is a resilient membrane rather than strings or rigid surfaces, such rackets have not found acceptance for a variety of reasons, including complexity of construction, particularly as to means for tensioning the membrane. The lack of acceptance has resulted despite the fact that rackets using membranes in place of strings, particularly when the membranes are formed from plastic materials, provide greater resistance to deterioration by moisture and other atmospheric conditions, and the membranes are generally easier to affix to the racket. The latter is especially significant since the stringing of a conventional tennis racket normally is a tedious job and requires considerable skill.

Perhaps one of the major reasons for lack of acceptance of membrane rackets is that the tension imparted to the membrane has not been uniform in all directions, with the result that wrinkles are formed in the surface of the membrane after a period of time and the resiliency is not uniform over the membrane. Control over the game ball therefore is proportionately lost.

OBJECTS AND SUMMARY

Accordingly, an object of the invention is to provide a racket employing a membrane which may be tensioned in several directions simultaneously.

Still another object of the invention is to provide a racket in which tensioning means are incorporated directly therein so that the tension of the membrane may be modified and controlled conveniently and at any time.

Still another object is to provide a new and improved racket employing a membrane and tensioning mechanism therefor, which racket is simple and economical to manufacture, and wherein greater game ball control is attained.

These and other objects, features and advantages of the invention will become apparent from the specification which follows.

In summary outline, the racket of the invention includes as part of the frame a closed loop which is substantially covered with a resilient membrane. Tensioning means are incorporated into the frame of the racket for multidirectionally stretching and maintaining substantially uniform tension in the membrane, preferably by means of a plurality of rods which are rotatably mounted on edges of the loop. The rotatable rods are adapted to draw edges of the membrane in several directions simultaneously, this being accomplished by gears connecting the rods and a mechanism for rotating and locking the rods when the desired tension has been attained. The edges of the membrane which are not drawn by the rotatably rods may be anchored to the loop, as by other rods fixedly positioned on the loop, and any number of pairs of such rotatable rods and fixed rods may be employed, with suitable gearing therebetween. Wind resistance to the membrane may be reduced by the provision of openings in the mem-

brane, and improved ball control may be attained by embossing the surface of the membrane.

The invention accordingly comprises the features of construction, combinations of elements and arrangements of parts which will be exemplified in the constructions hereinafter set forth and the scope of the invention will be indicated in the claims.

DETAILED DESCRIPTION

For a fuller understanding of the nature and objects of the invention, reference is made to the following description taken in conjunction with the accompanying drawing in which:

FIG. 1 is a partially diagrammatic, plan view of a racket of the invention;

FIG. 2 is a somewhat enlarged side view of a portion of the tensioning means of the racket, shown to the left of FIG. 1; and

FIG. 3 is a partly diagrammatic, plan view of another embodiment of resilient membrane useful with the racket of the invention, somewhat reduced in size with respect to the membrane of the racket in FIG. 1.

With reference to FIGS. 1 and 2, there is shown a racket of the invention in the form of a tennis racket having a head portion 12, a throat portion 13, and a handle 14. The major portions of the frame of the racket thus are head portion 12 and throat portion 13, and the former is defined by a closed loop, here shown generally rectangular in shape. The game ball surface or face of the racket is a resilient membrane 15 having a plurality of edge extensions or ears 16 on the perimeter thereof. The membrane 15 may be formed of any suitable shaped sheet or film of foamed or cellular rubber, such as polyurethane and the like. A membrane of about 1-10 mils thickness, preferably about 5 mils thickness, is useful. The surface of the membrane may be provided with a plurality of apertures 17 in order to lower wind resistance to the membrane, and the surface of the membrane may be embossed (with or without the apertures 17), in a cross-hatched manner 18 or otherwise, as shown in FIG. 3, for improved frictional contact with a game ball.

Any suitable material may be used for the frame 19 of the racket, such as aluminum, metal alloys of various types, wood piles, or plastic, including combinations of the foregoing. One very suitable plastic material for the frame is a polycarbonate plastic sold by General Electric Company under the trademark "Lexan." This is a lightweight, strong plastic material which, in the form of three-eighths inch strips about forty inches long, may be shaped by heating into any desired loop shape. The material used for the head portion of the frame may be continuous and have extensions 21 forming portions of the throat and handle of the racket, as shown. A spacer block 22 may be inserted between the extensions 21 and this composite may then be wrapped or taped in a known manner to form the handle of the racket. The throat 13 of the racket also may be structured and covered in any desired manner in accordance with principles well known in the art.

Tensioning means are provided in the form of rotatable rods 23 and 24 which operate as spindles for drawing adjacent edges of the membrane 15. Although the ears 16 of the membrane rods are shown as rolled on the rods 23 and 24, it will be evident that the tensioning may also be accomplished by other means, such as by a plurality of wires or threads along the edges or ears

16 of the membrane which are wound on the rods 23 and 24. The opposing ears 16 of the membrane are anchored to the frame 19 in any suitable manner, such as by rigidly mounted rods 25 and 26. One convenient means for mounting rods 23 and 26 on frame 19 is a pair of tabs 23a and 23b for rotatably holding the ends of rod 23, and a second pair of tabs 26a and 26b for fixedly holding the ends of rod 26. Rods 23 and 26, however, may be mounted directly in frame 19, if desired.

The rods 23 and 24 are simultaneously rotated by means of a pair of meshing bevel gears 27, and the drive means for the rotation may be the combination of a ratchet wheel 28 and a pawl 29, as shown in detail in FIG. 2. A slot 31 may be provided in ratchet wheel 28 for insertion of a turnkey such as a coin, or a turnkey may be mounted integral with the ratchet wheel 28. The slot arrangement for a turnkey is preferred since it avoids projections from the edge of the frame 19 which add to the weight of the racket and which might cause injury.

In tensioning the membrane 15 of the racket, a coin or other turnkey is inserted in the slot 31 and the rod 24 is rotated to provide the desired lateral and longitudinal tension in the membrane 15, by virtue of the windup of the ears 16 of the membrane on the rods 23 and 24. The pawl 29 prevents reverse rotation of the ratchet wheel 28 once the desired tension has been attained, but the pawl may be disengaged from the ratchet wheel, with simultaneous disengagement of the bevel gears 27, for relaxation of the tension in the membrane, if desired.

While the racket of the invention is shown in the drawing as rectangular, it will be evident that the principles of the invention are applicable to a racket wherein the head has more than four sides, by providing the requisite gearing between adjacent rotatable rods. Also, more than one ratchet wheel and pawl arrangement may be employed, particularly in the case of the racket having more than four sides, for example, a racket in which the number of sides imparts an overall oval configuration to the racket. In this instance, however, it will be evident that multiple gears operated by a single drive means would make the multidirectional tensioning more difficult and complex, and therefore plural ratchet wheel and pawl arrangements would be desirable. It will be evident that the ears 16 may be anchored to the frame 19 in a manner other than by the rods 25 and 26. For example, the ears may be anchored by rivoting them directly to the frame, by the use of prongs, or by the use of a rod and a wire to form a nip for the membrane therebetween.

The racket of the invention thus provides the uniform multidirectional tensioning required for good resiliency and game ball control in cooperation with simplicity of

attachment of the membrane to the frame, and durability of the membrane. Moreover, the invention provides a convenient, "built-in," mechanism for tensioning of the membrane at any time, and the racket may be formed of readily available and economical materials.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It will also be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

What is claimed is:

1. In a racket, the combination of:

a frame having a handle, said frame including a closed loop;

a resilient membrane substantially filling the area within said loop;

tensioning means for multidirectionally stretching and maintaining substantially uniform tension in said membrane, wherein said tensioning means includes a plurality of rods rotatably mounted on edges of said loop, said rods being adapted to draw edges of said membrane;

gears connecting said rods for simultaneous rotation thereof; and

means for rotating and locking said rods when a predetermined tension on said membrane has been attained.

2. A racket as in claim 1 wherein said tensioning means further includes a plurality of other rods fixedly mounted on edges of said loop opposite said rotatable rods, said other rods being adapted to anchor other edges of said membrane.

3. A racket as in claim 2 including a pair each of said rotatable rods and said fixed rods.

4. A racket as in claim 1 wherein said tensioning means further includes a ratchet wheel and pawl, said ratchet wheel having a slot therein for insertion of a turnkey.

5. A racket as in claim 1 wherein said membrane is a plastic film having a plurality of openings there-through for lowering of wind resistance to said film.

6. A racket as in claim 1 wherein said membrane is a plastic film having an embossed surface for increased frictional contact with a game ball.

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