# United States Patent

**Finkle et al.**

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## [54] TENNIS RACKET FOR DEVELOPING TENNIS SWING


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[51] **Int. Cl.** .....**A63b 69/38**

[58] **Field of Search**.....273/29 A, 29 R, 77 R, 73 R, 273/80.3, 193 B, 193 R, 80 B, 186 R, 186 A



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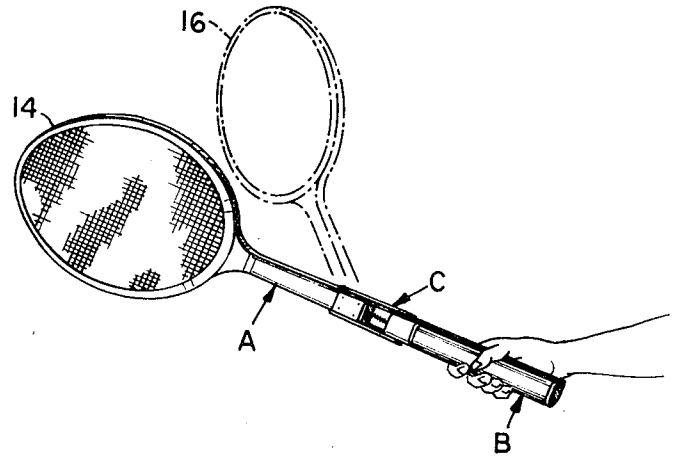
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[57] **ABSTRACT**

A tennis racket is provided with a hinge intermediate the handle and racket head for providing hinged movement of the racket in the plane of the racket head. The hinge is preferably provided with a bias which tends to maintain the racket handle and head in a normal linear relation. When the racket is used to swing and hit the tennis ball so that the centrifugal momentum of the racket head propels the ball, the bias of the spring is not overcome and the racket handle and the head through the hinge are maintained in a normal linear relation. However, when the racket is used to push the tennis ball so that the racket head and handle is used as a lever to propel the ball, the bias of the spring is overcome and the racket handle and head fold at the hinge out of normal relation.


**5 Claims, 5 Drawing Figures**



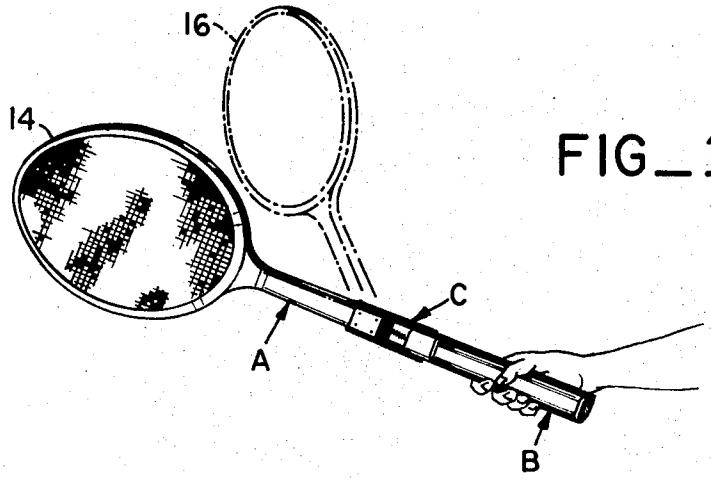
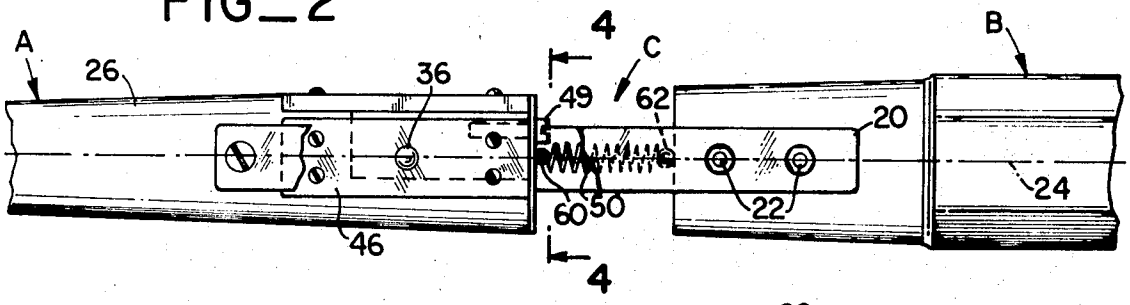



FIG_1

FIG_2



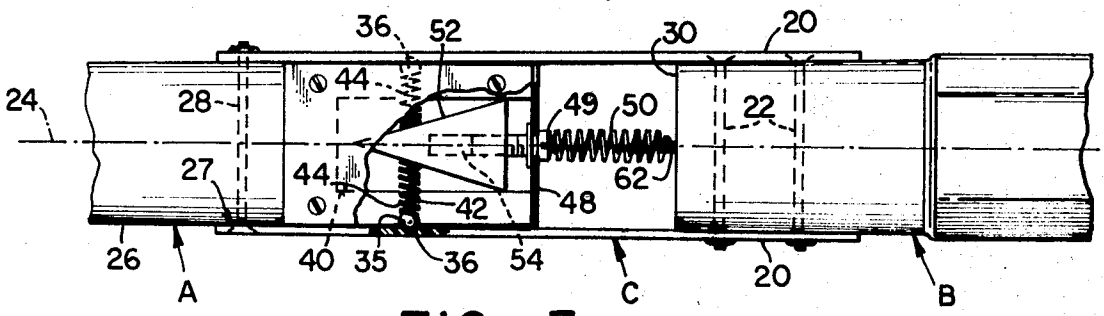




FIG_3

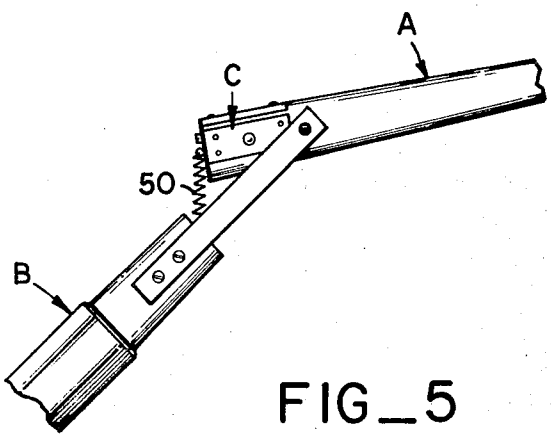



FIG_5

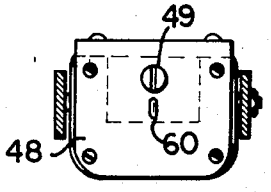



FIG_4

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# TENNIS RACKET FOR DEVELOPING TENNIS SWING

This invention relates to tennis rackets and, more particularly, to a tennis racket which is used to instruct the student of tennis in developing a forehand and backhand swinging stroke.

The accepted swing of a tennis racket is a motion wherein the momentum of the head of the tennis racket is used to propel the tennis ball. Instructors in the art of playing tennis go to great lengths to impart to their students the kinesthetic or muscular sense which must be developed in using the racket as a centrifugal implement to impact a tennis ball. Unfortunately, this kinesthetic or muscular sense is personal to the student. In many cases, verbal stimuli or visual imitation of an instructor are very inefficient. The student in trying to swing at a tennis ball inadvertently continues the undesirable habit of pushing at the tennis ball. The result is a tennis stroke which uses large amounts of energy, is physically tiring to the player, and developes an erratic stroke in which the direction of the tennis ball is hard to control.

It is a principal object of this invention to provide a tennis racket which furnishes the student with a physically detectable and visually apparent indication of incorrect tennis racket swing. Accordingly, the tennis racket intermediate the head and handle is provided with a hinge that pivots the head relative to the handle about an axis which is substantially parallel to the plane of the racket strings. The hinge is preferably provided with a bias preventing initial movement of the head relative to the handle. When the racket is correctly used in a swinging action stroke where the momentum of the racket head propels the ball, the bias of the hinge maintains the head relative to the handle in normal linear relation. When the racket is incorrectly used in a pushed and levered action stroke, the bias of the hinge is overcome and folding of the head relative to the handle out of normal linear relation occurs.

An advantage of this invention is that the student can both feel and observe immediately the effect of an incorrect tennis swing.

Yet another advantage of this invention is that the kinesthetic or muscular sense necessary to develop the correct tennis racket swing is automatically imparted to the student; the instructor can correct his student's tennis game with a minimum of verbal stimuli and visual imitation techniques.

Yet another advantage of this invention is that the presence of an instructor is often wholly unnecessary in the development of a correct tennis swing.

Yet another object of this invention is to provide for the complete lock of the hinge intermediate the handle and head.

An advantage of this complete lock is that the tennis racket can be used for all phases of a normal tennis game including the swinging stroke (common in other phases of the tennis game).

Yet another object of this invention is to provide a tennis racket which can be collapsed for storage and packaging in a relatively small area.

Still another object of this invention is to provide a restriction against complete hinge movement of the racket head relative to the racket handle.

An advantage of this restriction against complete hinge movement is that upon making an incorrect swing, the student of tennis can readily return the racket head to a correct linear relation relative to the racket handle.

Other objects, features and advantages of this invention will become more apparent after referring to the following specification and attached drawing in which:

FIG. 1 is a perspective view of the racket of this invention held in the hand of a student, the pivotal position of the racket head being illustrated in broken lines;

FIG. 2 is a side view of the hinge used in this invention;

FIG. 3 is a plan view of the hinge used in this invention;

FIG. 4 is a section taken along lines 4—4 of FIG. 2; and

FIG. 5 is a side view illustrating the restrained pivotal movement of the racket head relative to the racket handle.

With reference to FIG. 1, a tennis racket held in the hand of a student is illustrated. The racket includes a head A, and handle B and a hinge C positioned intermediate the racket head and handle. Hinge C provides for a pivotal movement of the racket head A relative to the handle B. This pivotal movement occurs along an axis which is normal to the axis of handle B and lies within the plane defined by strings 14 of racket head A.



Preferably, hinge C is provided with a bias. This bias resists initial hinge movement of the racket head A relative to handle B at hinge C. When the racket is used in a swinging tennis stroke , common to back court tennis play, the centrifugal force of the racket head will be used to propel the ball. No bending moment will be exerted at hinge C. When, in a swinging tennis stroke, the racket is incorrectly used, the player will invariably push the racket head A toward the oncoming ball. Such a pushing stroke will cause a bending moment to be applied at hinge C, the bias of the hinge will be overcome, and the racket head will fold to the position shown in the broken lines 16 in FIG. 1.

Referring to FIGS. 2 and 3, the construction of hinge C is illustrated. Hinge C includes two spaced apart and generally parallel bars 20. At their point of attachment to handle B, bars 20 are bolted to either side of the handle B by nut and bolts 22. The bars are aligned parallel to the central axis 24 of the tennis racket.

Bars 20 as bolted on either side of handle B are maintained in spaced apart relation. This spaced apart relation permits racket head A at shaft 26 to fit snugly between bars 20.

Racket head A at shaft 26 is placed intermediate bars 20. Typically, shaft 26 extends towards handle B between bars 20 approximately two-thirds of the distance between the ends of bars 20 and the end 30 of racket handle B. As will become more fully apparent, this position of racket head shaft 26 between bars 20 enables the bias mechanism of the hinge to be accommodated as well as to provide for the insertion of a coil spring 50 which restrains the movement of the racket head A relative to the handle B when breaking of the hinge C occurs.

Racket head A and bars 20 are severally cross bored at an aperture 27 at the end of bars 20 remote from handle B. The cross boring occurs within the plane defined by the strings of racket 14. Typically, the bore is at right angles to the axis 24 of the tennis racket. It will thus be seen that racket head A will pivot relative to handle B along an axis which lies within the plane of racket string 14 and is normal to the axis of the handle B.

In the construction of the racket according to this invention, it is preferred to provide hinge C with a bias which initially restrains breaking of the tennis racket at hinge C. This bias is provided by indentation 35 and spring loaded pawls 36 in bars 20 and racket head shaft 26 respectively.

Semi-spherical indentations 35 are located on the inside of bars 20. These indentations face toward racket head shaft 26 and are typically within the plane of the strings 14 of racket head A. The indentations are semi-spherical and shaped to receive spring loaded pawls 36 on handle A.

Racket head shaft 26 extending beyond bore 27 and towards handle B defines an aperture 40 which opens to and toward handle B. Shaft 26 of racket head A is cross-bored normally to axis 24 of the racket, at bore 42. Bore 42 is positioned to correspond with spherical indentations 35 on each of the bars 20.

Bores 42 have placed interior thereof pawls 36, here illustrated as being spherical in shape. Pawls 36 are in turn urged outwardly and towards bars 20 by compressively loaded coil springs 44. Typically, spheres 36 are restrained to a position where they are maintained interior of the bore 42 by plates 46 fastened to the sides of shaft 26. Plates 46 are in turn bored overlying the pawls 36 with an aperture which permits only partial protrusion of the pawl 36 from the bore 42 at aperture 47.

It has been found desirable to provide for outward adjustment of the force urging pawls 36 with relation to the spherical concavities 35 on the inside of bars 30. Such an adjustment permits the degree of bias of the hinge to be conveniently al-

tered when the racket is used by different players. This adjustment is effected through the combination of plate **48**, set screw **49** and wedge **52**.

Referring to FIG. **3**, it will be observed that the end of racket head shaft **26** is provided with a plate **48** which is secured over the end of the aperture. Bolt **49** is fastened through an aperture in plate **48** so as to permit rotation of the bolt relative to the plate without threaded movement of the bolt with respect to the plate.

Bolt **49** as extending beyond plate **48** and interiorly of the aperture **40** is threaded. This bolt engages a female threaded aperture **54** interior of wedge **52**. As is apparent, by the rotation of bolt **49**, wedge **52** can be moved into and out of the aperture **40** defined in shaft **26** of racket head A.

Wedge **52** is of triangular section as viewed in FIG. **3**. This wedge by the expedient of being advanced into aperture **40** compresses springs **44** causing the pawls **36** to be urged outwardly with increasing force. Upon being retracted from aperture **40** wedge **52** relaxes the tension on springs **44** causing the pawls **36** to be urged outwardly with a decreasing force.

Operation of the hinge is believed apparent. Typically, bolt **49** is rotated until springs **44** and pawls **36** are biased outwardly and towards bar **20** with a desired and predetermined force. When this force is experimentally determined, hinge C will break only when racket head A exceeds a predetermined bending moment with respect to racket handle B. If hinge C breaks too easily, correction of the condition may be effected by rotating bolt **49** and causing wedge **52** to move inwardly of aperture **40** towards racket head A. Conversely, if hinge C does not break readily enough, bolt **49** can be rotated to partially extract wedge **52** outwardly of aperture **40** and away from racket head A.

It is to be understood that a student of tennis may wish to use the apparatus of this invention as a normal tennis racket. Accordingly, hinge C may be locked to provide absolute rigidity. Such rigidity can be achieved by moving wedge **52** interiorly of aperture **40** so as to fully compress the coils of spring **44** into contact with one another. Alternately, a sleeve could be placed over hinge C so as to prevent any relative movement of racket head A relative to handle B. Likewise, pins and the like could be inserted through the hinge to effect the lock thereof.

When the apparatus of this invention is used by a student in learning a swinging stroke common to the back court game of tennis, complete breaking of the racket at hinge C may be undesired. Complete interruption of a tennis game to return the racket to a linear or straight disposition may not be desired. Accordingly, it has been found desirable to restrain complete breaking of the racket by tension spring **50**.

Plate **48** on the axis **24** of the racket includes an eye **60**. Eye **60** overlies aperture **40** interior of racket head shaft **26** and is exposed outwardly and towards handle B. Likewise, handle B includes an eye **62**. Eye **62** is exposed outwardly and from handle B at end **30** and extends towards racket head A. Coil spring **50** is hooked to eye **60** on racket head A and eye **62** on racket handle B.

Operation of spring **50** is believed apparent. Referring to FIG. **5**, when hinge C breaks, spring **50** will come under tension. When the spring comes under tension, complete hinge movement of racket head A relative to handle B will be restrained. Moreover, the racket head A will be biased to return to its normal linear disposition relative to handle B. By mastering an easily learned flipping motion of the racket opposite to the direction in which the breaking of hinge C has occured, a student of tennis can rapidly overcome the bias on pawl **36** and return the racket to its normal and linear disposition. Such a return may be made rapidly and between successive volleys in a game of tennis.

It will be realized that alternate devices preventing and restraining complete breaking of the hinge C can be used in the practice of this invention in substitution for spring **50**. Such restraining devices could include a chain cord or the like. While spring **50** here illustrated is elastic and under tension, it will be understood that this is not required. Likewise, other modifications may be made without departing from the spirit of this invention.

What is claimed is:

**1**. A tennis racket comprising: a racket head having strings supported in a plane; a straight racket handle; a hinge intermediate said racket head and handle for connecting said head and handle, said hinge permitting free pivotal motion of said head relative to said handle about an axis which is substantially parallel to the plane of the strings of said racket head and transverse of a longitudinal axis along said straight racket handle; means for restraining initial movement only of said hinge to maintain said strings of said racket head supported in said plane including said straight racket handle and said means permitting substantially uninhibited pivotal movement of said head relative to said handle as a result of said handle being swung with a pushed and levered action stroke upon hitting a ball at said hinge when said head and strings supported in said plane move out of parallel relation with said handle.

**2**. The invention of claim **1** and wherein said axis of said hinge is normal to said linear handle.

**3**. The invention of claim **1** and wherein said hinge includes means removed from said hinge for restraining movement of said racket head relative to said racket handle to less than the full pivotal motion provided by said hinge.

**4**. In a tennis racket including a racket head having strings placed in a plane on said head and a linear handle connected to said racket head, the improvement comprising: a hinge positioned intermediate said handle and said head, said hinge permitting pivotal movement of said head relative to said handle about an axis which is parallel to the plane of said strings on said racket head and transverse of a longitudinal axis along said linear racket handle; means for restraining initial movement only of said hinge to maintain said racket head and string placed in a plane in the same plane as said handle and said means permitting substantially uninhibited pivotal movement of said head relative to said handle when said head and strings in a plane are not in the same plane as said handle as a result of said racket being swung with a pushed and levered action stroke upon hitting a ball.

**5**. The invention of claim **4** and wherein said hinge axis is substantially normal to the axis of said handle.

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