# United States Patent [19]

**Berzatzy**

[11] **3,712,618**

[45] **Jan. 23, 1973**


## [54] TENNIS RACKET ATTACHMENT


[76] Inventor: **Paul G. Berzatzy,** 231 North Robinson Street, Schenectady, N.Y. 12304



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[21] Appl. No.: **103,769**

[52] **U.S. Cl.** ..... **273/75**

[51] **Int. Cl.** ..... **A63b 49/08**

[58] **Field of Search** ....273/67 R, 73 R, 73 J, 75, 166; 124/20 R; 416/63, 69–75



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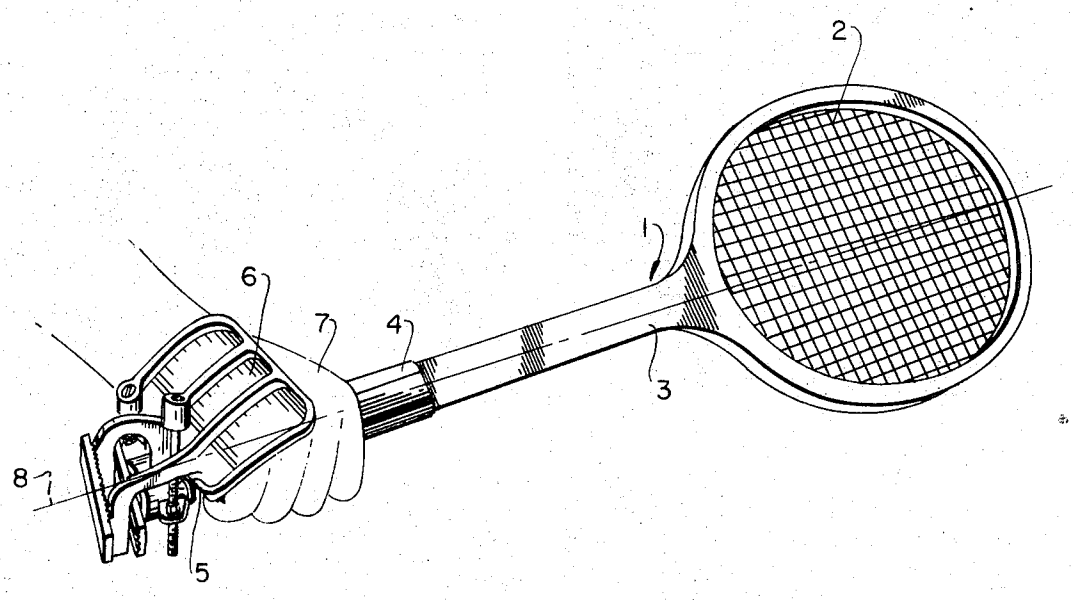
[57] **ABSTRACT**

A brace and locator to assist a tennis player in gripping a conventional tennis racket is provided with a surface engageable with the back of the gripping hand, which surface is universally adjustable and rigidly braced with respect to a mounting portion to be rigidly secured to a conventional tennis racket handle without engaging any portion of the normal handle grip. The surface is rotatably adjustable in three mutually perpendicular planes and translationally adjustable in two perpendicular directions that are each perpendicular to the longitudinal axis of the mounting portion, which longitudinal axis will coincide with the longitudinal axis of the racket handle when assembled. The specifically defined surface engages the player's hand, and means are provided to adjust this surface with respect to a conventional handle to fit any desired grip and hand size.


**34 Claims, 19 Drawing Figures**



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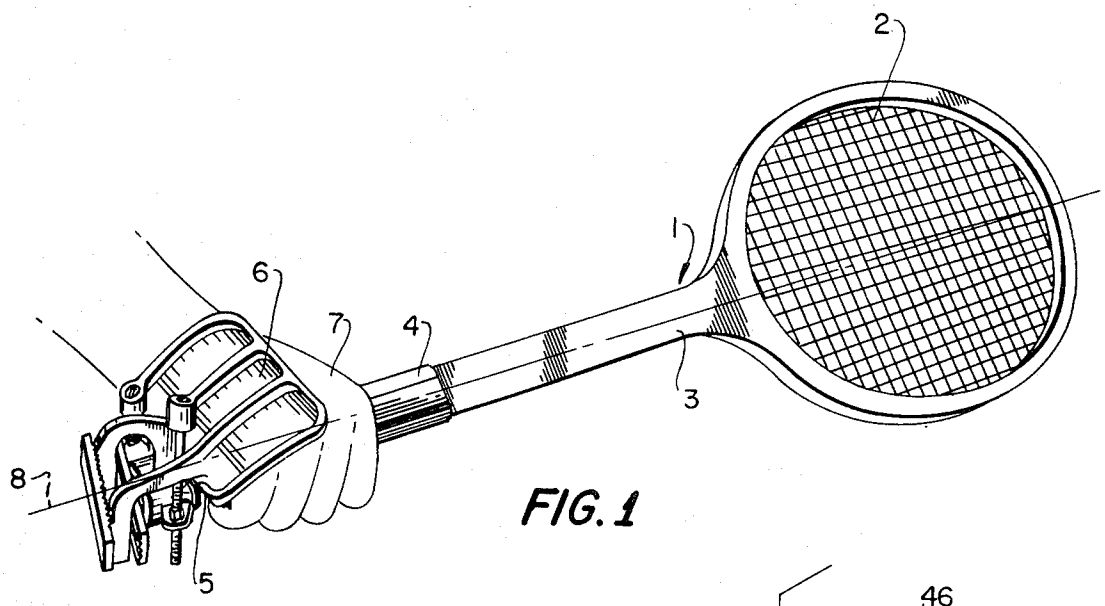


FIG. 1

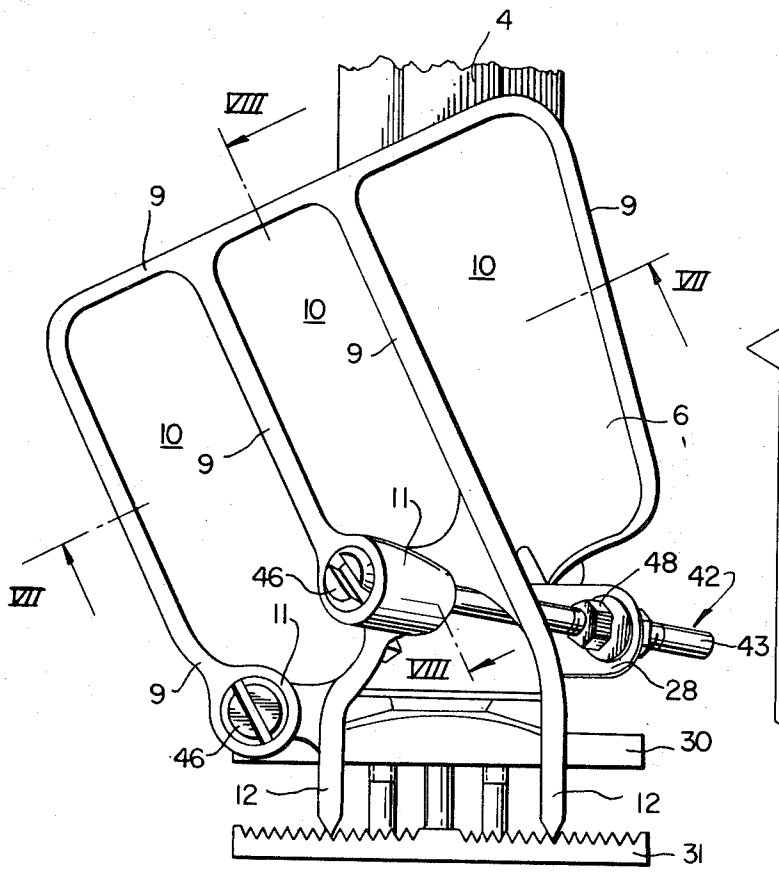


FIG. 2

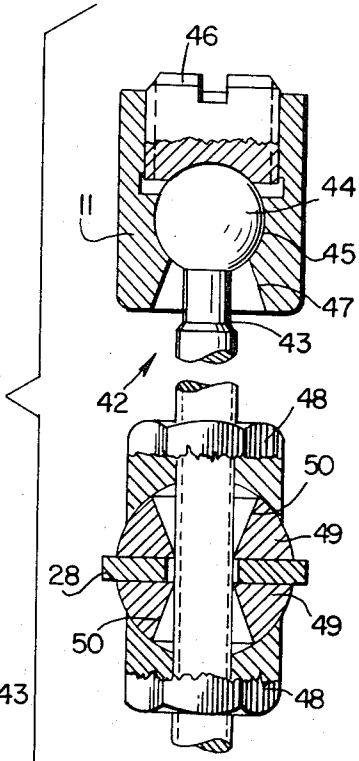


FIG. 5

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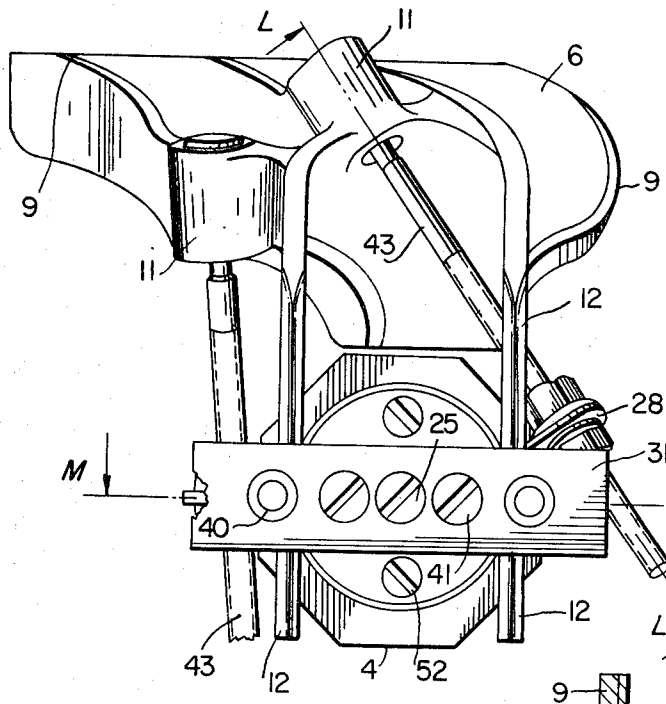


FIG. 3

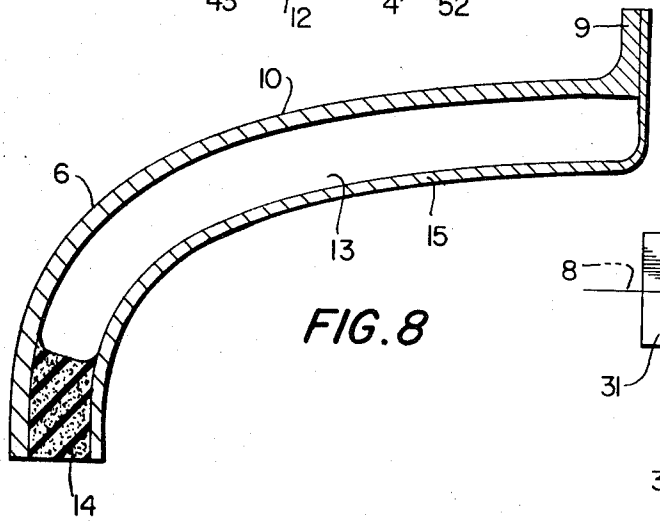


FIG. 8

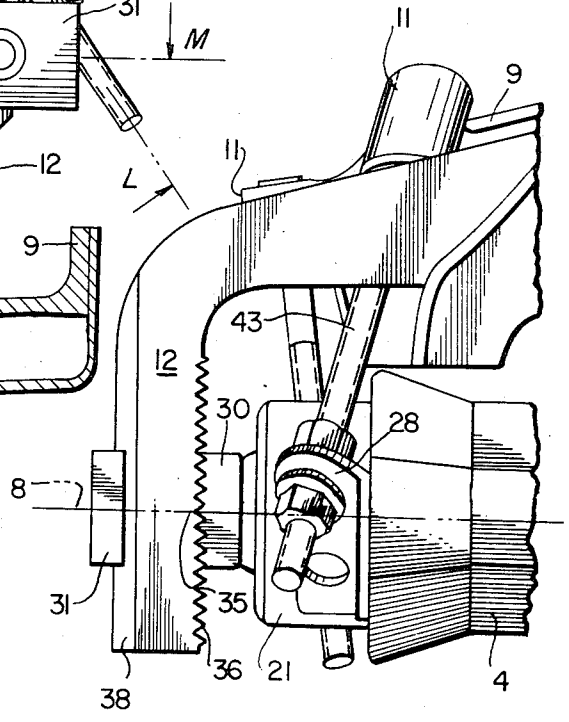


FIG. 4

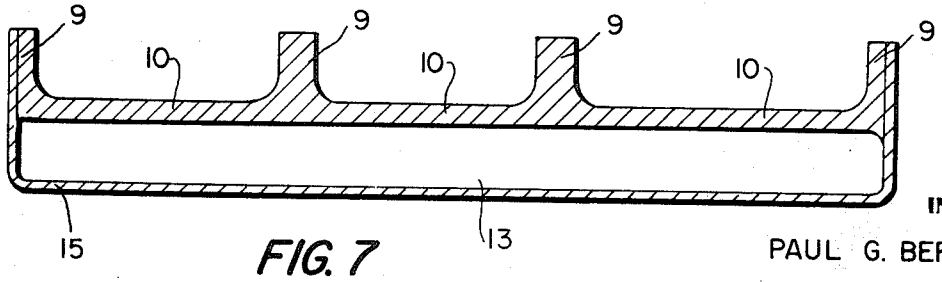


FIG. 7

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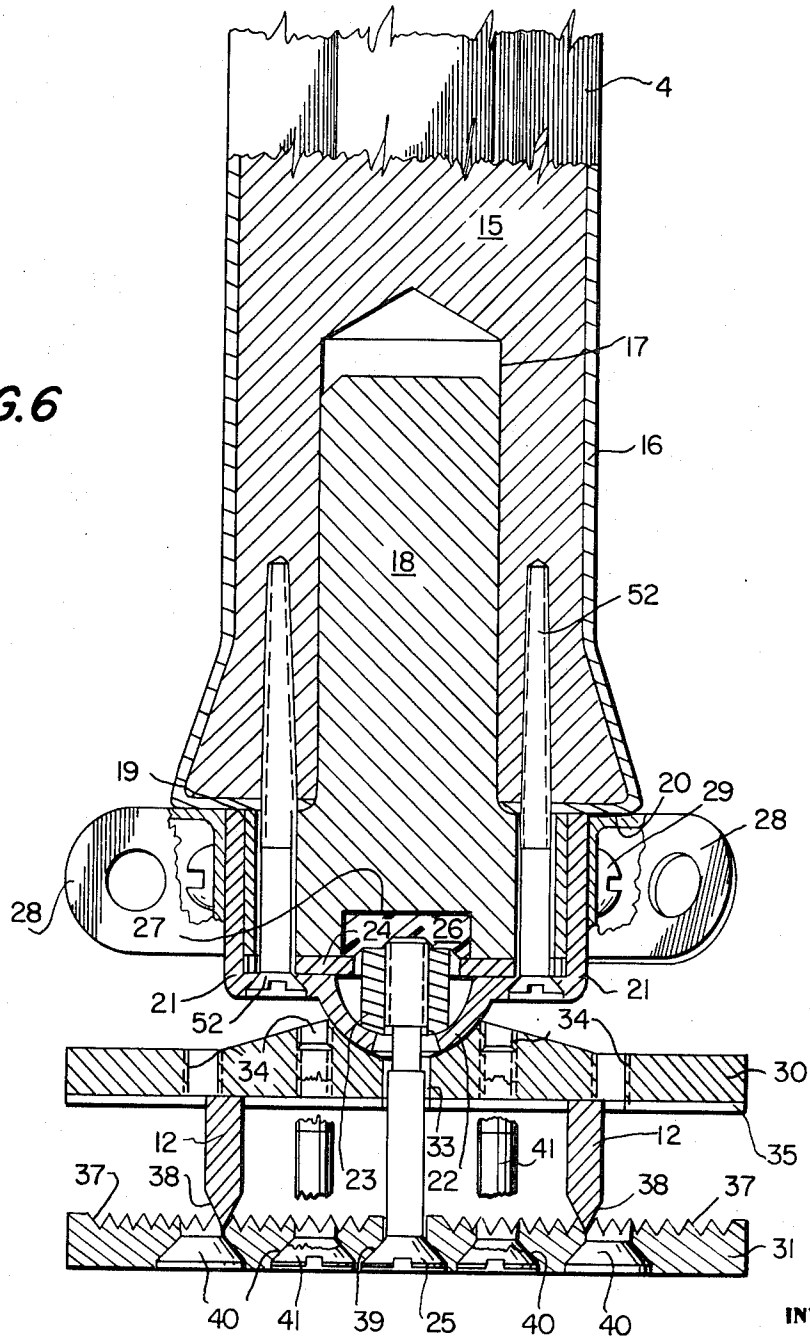
FIG. 6

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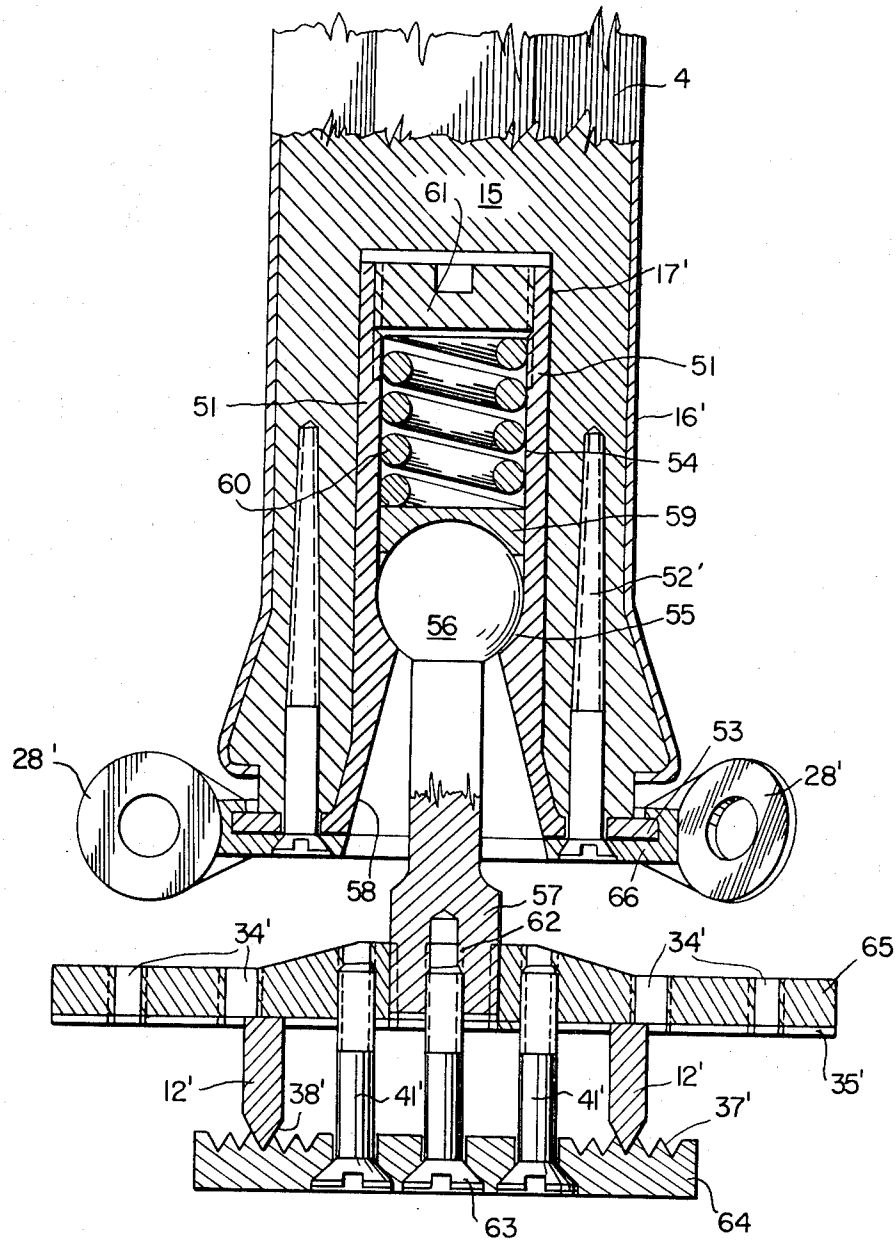


FIG. 9

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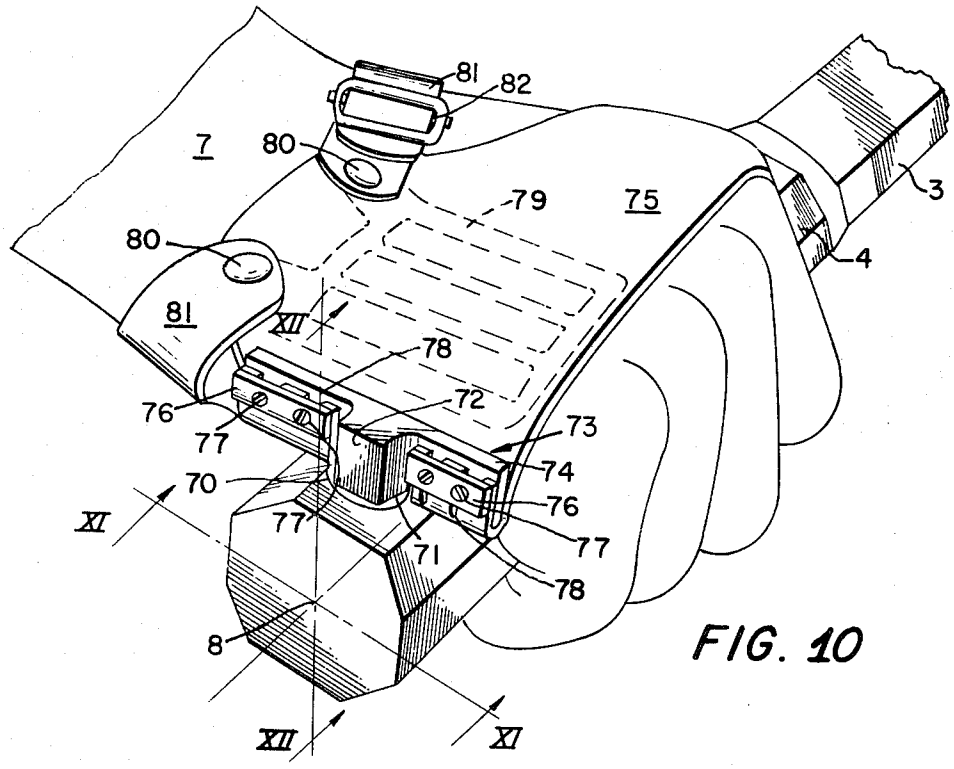


FIG. 10

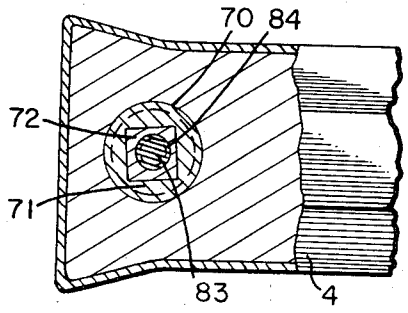


FIG. 11

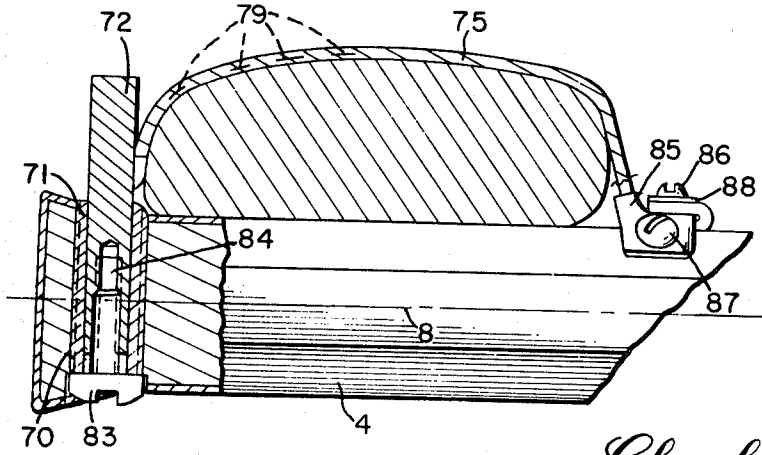


FIG. 12

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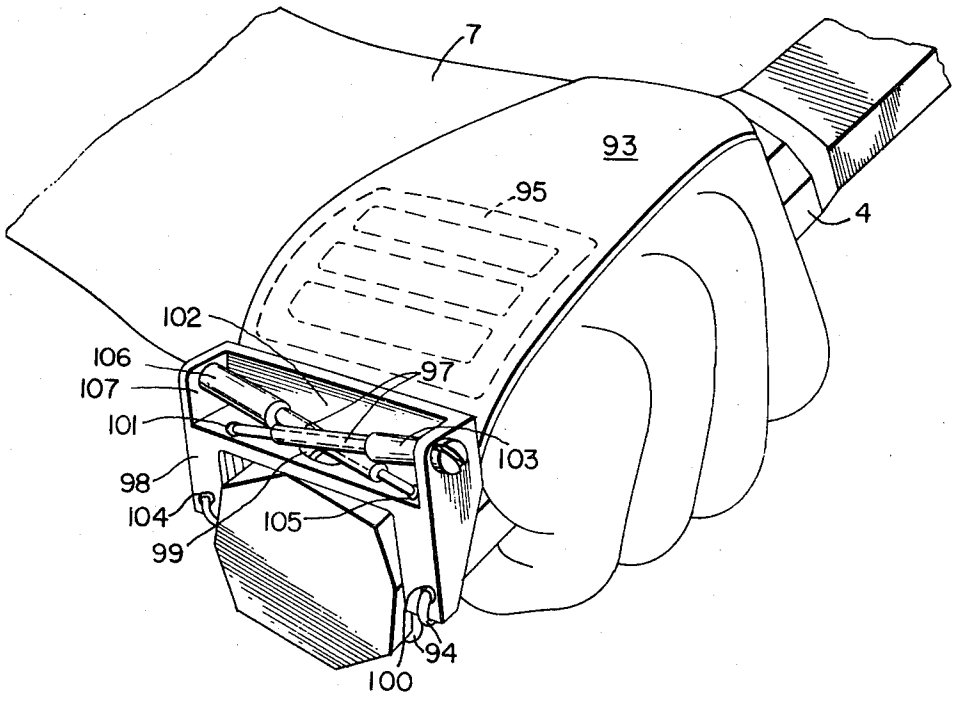


FIG. 13

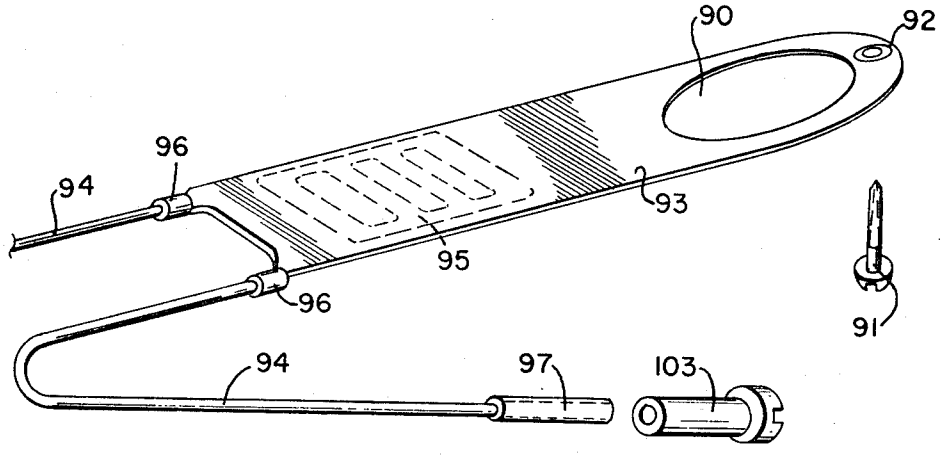


FIG. 14

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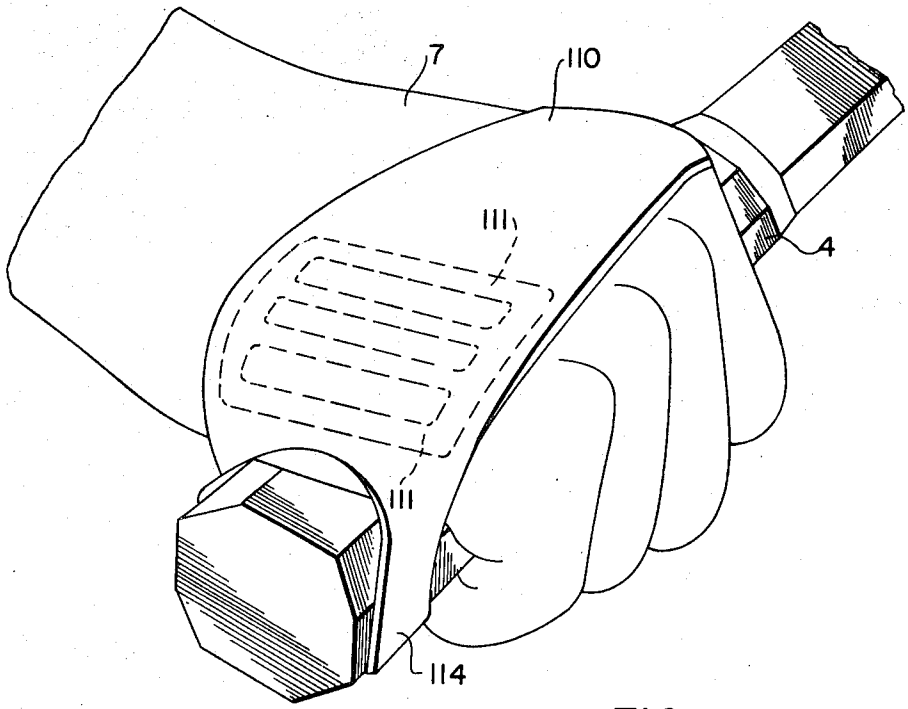
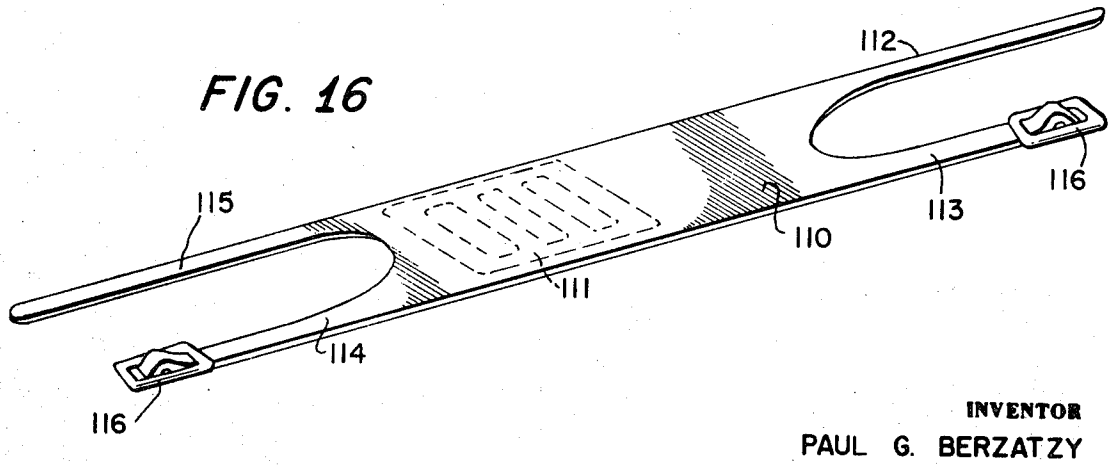



FIG. 15

FIG. 16

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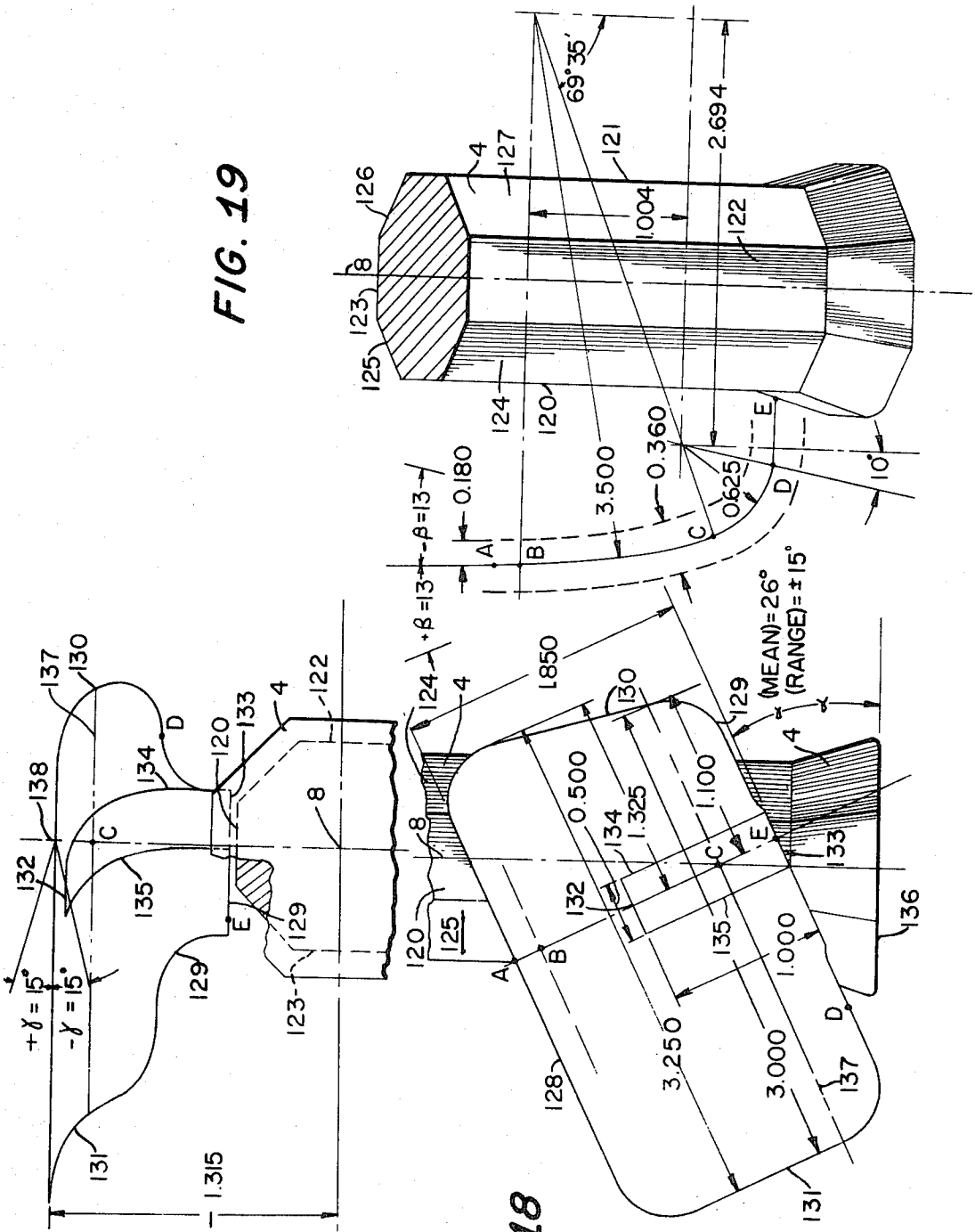


FIG. 19

FIG. 18

FIG. 17

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# TENNIS RACKET ATTACHMENT

## BACKGROUND OF THE INVENTION

In playing tennis, the player cannot be constantly checking his racket to assure that the position of his hand on the racket handle is proper during play. He must keep a very firm grip on the racket handle to counteract the considerable centrifugal forces of a fast stroke, for example, a serve or to counteract the torque resulting from the ball engaging the opposite end of the racket. This tight grip together with the shock of the ball striking the racket has been considered by many to be responsible for the common ailment known as a "-tennis elbow," which can be quite severe and has caused many players to reluctantly retire from the game. These problems have resulted in a need that has been only partially satisfied by the prior art, for example, applicant's own U.S. Pat. No. 3,203,697, issued Aug. 31, 1965.

It is quite usual to strike a ball with the racket head at a substantial radial distance from the longitudinal axis of the handle, which will produce a torque tending to rotate the handle within the player's grip. The conventional tennis racket handle is somewhat rounded, which shape when combined with a slippery grip resulting from perspiration will commonly result in relative rotation between the handle and player's hand under the influence of this torque. The above-mentioned Berzatzy patent only relies upon the frictional circular engagement of an expanding plug of small radius to counteract the torque that tends to cause the handle to rotate about its axis. With the rather lengthy lever arm of the support portion for the back of the player's hand of the Berzatzy patent, this frictional contact is insufficient to assure the prevention of rotation for a handle of normal rounded construction.

In the forehand stroke of tennis, the torque produced by the force of the ball striking the racket head and the moment arm from the striking point to the forefinger of the player's hand tends to rotate the racket about a generally vertically extending axis passing through the gripping forefinger to separate the end of the racket handle from the player's palm portion that is adjacent the little finger. This results in a tendency to weaken the stroke and can be counteracted only by a tight and strong grip upon the handle, which is impossible for some players and many times greatly contributes to the aforementioned "tennis elbow." While the brace of the Berzatzy patent, U.S. Pat. No. 3,203,697 does tend to counteract this torque on the forehand stroke, there is insufficient adjustability in the patented brace to comfortably accommodate the wide variety of players' hands and grip positions. With respect to grip positions, the conventional continental, eastern and western grips vary with respect to the rotation of the hand and racket about the longitudinal axis of the handle, and individual preferences will change the angle of the hand with respect to the longitudinal axis of the handle for any one of these conventional grips. That is, in analyzing the grips and hands of many different players, it has been found by the inventor that the back of the player's hand changes position with respect to the racket handle from player to player rotationally in three mutually perpendicular planes and translationally in three mutually perpendicular directions.



From the above, it is seen that there is a need for an attachment that can be installed and fastened to any conventionally shaped tennis racket handle and that will not slip in a circular direction within the hand, for an attachment that prevents the racket from flying out of the hand due to the centrifugal force resulting from a fast stroke, for an attachment that gives a definite reference surface for holding the racket always in the same position relative to the hand, and for an attachment that allows a more relaxed grip due to the additional support and thereby reducing the possibility of developing "tennis elbow."

The conventional tennis racket handle does not have a fixed reference for circular orientation or for the axial position of the racket relative to the hand, so that the player depends merely on the subjective feeling of the grip for holding the racket always in the same position. In addition, the forehand stroke is considered by many players to be basically unstable. This instability is generated by the limited load carrying capability of the hand in the forehand stroke condition, as partially explained above. The circumference of the cross-section of a conventional racket handle averages 4½ inches. With the fingers and the thumb wrapped around the handle, the grip around the outer portion of the hand is strong and stable since the forefinger and thumb together can overlap the whole circumference of the handle; however, the grip is weaker and therefore is unstable at the inner portion of the hand defined by the little finger, because the little finger alone cannot overlap the circumference of the handle. Consequently, the grip can loosen and open a gap between the palm and the handle at the inner region of the hand during a forehand stroke, which concentrates the reaction force of the axial moment on the little finger.

## SUMMARY OF THE INVENTION

It is an object of the present invention to overcome the above-mentioned difficulties by providing a light, support-type structure which can be attached to any conventionally-shaped tennis racket handle, which will comfortably fit to any proportionally normal adult hand by its proper geometry and by its properly controlled three dimensional adjustability, which after adjustment can be positively locked into its desired final position, and which has enough strength in load carrying capacity for giving additional support to the tennis racket.

The attachment will provide a support that gives a definite circular orientation to the racket relative to the hand, which carries all of the axial load due to the centrifugal force of the strokes, and which carries the load of the forehand stroke and eliminates the possibility of a gap between the palm and the conventionally shaped handle of a tennis racket.

One specific embodiment of the attachment is provided with a padded inner surface for conformingly engaging a substantial portion of the back of a player's hand. Support bars integral with the surface and clamping racks that may be rigidly secured to the racket handle have interengaging cross serrations for translatory adjustment of the surface in two mutually perpendicular directions, perpendicularly relative to the longitudinal axis of the attachment that will coincide with the longitudinal axis of the racket handle. For rotational

adjustment in three mutually perpendicular planes, the racks are universally mounted about a common point by means of a ball and socket joint and held in their rotated position by means of two bracing rods that may be adjusted in length between opposed universally mounted ends. The attachment is mounted on a conventional racket handle by means of a plug that telescopically engages in a blind central hole in the end of the racket and parallel screws. Thus, the attachment does not in any way engage or interfere with the gripping portion of the conventional tennis racket.

Another embodiment of the attachment according to the present invention is provided with a rigid surface to engage the rearward end of the player's hand to resist axial movements of the hand relative to the racket and provide a rigid angular orientation surface. This rigid surface is a part of a T-shaped plug that may be rigidly inserted into a hole drilled in the racket handle. The hole is drilled in the handle at the desired axial position and the T-shaped member is secured in the desired angular position. The remainder of the alignment surface is formed by a flexible semi-rigid body portion secured at its forward end by a screw, braced mid-way by a reinforcing plate and secured at its wrist side with a wrist encircling adjustable strap.

A further specific embodiment of the attachment according to the present invention is similar to the last-mentioned embodiment, without a wrist encircling strap. The forward portion of the flexible member forming the alignment surface is secured by encircling the racket handle so that it may be attached by a screw on the side of the handle opposite from the player's palm position. The rigid portion of the alignment surface is formed by a generally U-shaped supporting member that is axially and to some extent angularly fixed by means of a screw extending into the racket handle. The flexible portion of the surface is secured by cords wrapped around the lower portion of the handle and engaging the U-shaped member, with adjustment of the cords adjusting the angular position of the flexible surface and the angular position of the rigid alignment surface, about several axes.

The simplest version of the attachment of the present invention employs a flexible main body portion forming the alignment surface. Opposite ends of the main body portion are secured by means of buckle adjustable straps encircling the racket handle. In this manner, the angular positions and the axial position of the alignment surface will be determined by the adjustment of the straps and frictional contact between the straps and racket handle.

From the various embodiments, it is seen that the physical form of the present invention may take on various specific structural forms, which are advantageous in their own right. However, the basic structure is that of an alignment embracing surface that may be attached to a conventional tennis racket handle with means providing the necessary degrees of adjustability for conforming to any adult player's hand and to accommodate the desired grip of the player. Throughout the present disclosure, the term conventional tennis racket handle is defined as preferably having an octagonal surface configuration in cross section perpendicular to the longitudinal axis of the tennis racket, with the circumference of the handle surface as measured around the longitudinal axis in a plane perpendicular to the longitudinal axis being between 4 and 5 inches and most preferably being between 4¼ and 4⅞ inches, and with the sides of the octagonal being portions of flat hand engaging strips extending parallel to the longitudinal axis of symmetry of the racket and further in cross section being substantially equal in length with the smallest in length being no smaller than one-half the length of the side that is longest in length. The term conventional tennis racket handle as used hereinafter in the claims and specification is intended to apply to any and all widely used commercially available tennis racket handles of this same general and symmetrical configuration.

With this adjustability and positive bracing, the surface may be placed in the most advantageous position for conforming to the back of the hand of any tennis player regardless of his particular preferred grip, will provide a stable reference surface for accurately locating the hand with respect to the racket handle, and will positively resist movement of the hand relative to the racket handle.

## BRIEF DESCRIPTION OF THE DRAWING

Further objects, features and advantages of the present invention will become more clear from the following detailed description of the drawing wherein:

FIG. 1 is a perspective view of the attachment of the present invention mounted upon a conventional tennis racket being held by the hand of a player;

FIG. 2 is a top plan view of the attachment mounted on a tennis racket handle portion;

FIG. 3 is an end view of FIG. 2;

FIG. 4 if a side elevation view of FIG. 2;

FIG. 5 is a partial cross-sectional view of one of the adjustable and universally mounted bracing rods, taken along line L—L of FIG. 3;

FIG. 6 is a cross-sectional view taken along line M—M of FIG. 3;

FIG. 7 is a cross-sectional view of the surface forming portion taken along line VII—VII of FIG. 2;

FIG. 8 is a cross-sectional view through the surface forming portion taken along line VIII—VIII of FIG. 2;

FIG. 9 is a cross-sectional view, similar to FIG. 6, but of another embodiment of the present invention;

FIG. 10 is a perspective view of a further embodiment of the present invention, which is semi-rigid;

FIG. 11 is a cross-sectional view taken along line XI—XI;

FIG. 12 is a cross-sectional view taken along line XII—XII;

FIG. 13 is a perspective view of another embodiment of the attachment according to the present invention, which is semi-rigid;

FIG. 14 is a partial exploded view of the attachment shown in FIG. 13;

FIG. 15 is a perspective view of another embodiment of the attachment according to the present invention, which is the most flexible of the embodiments;

FIG. 16 is a perspective view of the attachment unassembled;

FIG. 17 is a partial end view of a conventional tennis racket handle showing the relationship of the involved portion or surface area of contact between the player's hand and the attachment according to all of the em-

bodiments of the present invention for a right-handed player, it being understood that the geometry would be a mirror image for a left-handed player;

FIG. 18 is a top plan view of the surface relationship of FIG. 17; and

FIG. 19 is a side view of the surface relationship shown in FIGS. 17 and 18.

## DETAILED DESCRIPTION OF THE DRAWING

The brace and locator attachment of the present invention is generally shown in FIG. 1 in assembled position with a conventional tennis racket 1, which has a head portion 2, a throat 3 and a handle gripping portion 4. In conventionally constructed tennis rackets, the gripping portion 4 is generally round or slightly elongated in one direction while usually having approximately eight flat surfaces around its periphery. The attachment 5 is mounted on the terminal end of the handle 4, in a manner to be described below, to provide a locator or reference and bracing surface portion 6 engaging with the back 7 of a tennis player's hand as he grips the handle gripping surface 4 with his particular style of holding the racket. To accommodate the various styles of holding a tennis racket, for example, the western, eastern or continental grip, the surface portion 6 is translationally adjustable in two mutually perpendicular directions, which are also perpendicular to the longitudinal axis 8 of the racket 1, and rotationally adjustable in the three mutually perpendicular planes.

Details of the attachment are more clearly shown in the top, end and side views of FIGS. 2, 3, and 4, wherein the racket has been partially shown together with only a partial showing of the surface in FIG. 4.

The surface forming portion 6 may be constructed of a cast lightweight metal, for example, magnesium or aluminum, although other materials are contemplated such as a molded synthetic resin. The attachment includes a plurality of reinforcing ribs 9, interconnecting thin webs 10, reinforced bored bosses 11 and two parallel depending support bars 12. The surface portion 6 is preferably constructed in one piece by molding or casting. To the contoured surface portion 6, which engages in the back 7 of the player's hand, there is attached padding to compensate for the variations in hand configurations between players, to insure comfortable engagement with the player's hand, and to increase the contacting surface for a firmer engagement. A bag 13 is completely filled with a pulverized or granular material, for example, fine beads of plastic or sand, and the bag 13 is bonded or otherwise secured to the inner contoured surface of the adjacent webs 10. After the granular material adjusts to compensate for variations in hand configurations, it will present a firm surface as an incompressable fluid. Towards the heel portion of the surface portion 6, there is bonded a foam rubber pad 14 for the same purposes as the bag 13. The foam pad 14 may be cut after adjustment when the excess portions are cut off; thus, the bag 13 will not be cut to release its contents. The bag 13 and the pad 14 are covered by a suitable layer of material 15 that may be leather, plastic, fabric or the like, which is bonded to the adjacent ribs 9 and the inner surfaces of the bag 13 and pad 14.

The means for mounting the surface portion 6 on the handle of the tennis racket 1 are most clearly shown in FIGS. 2–4 and 6. The gripping portion of the tennis racket handle 4, with reference to FIG. 6, includes an inner core 15 of wood or metal surrounded by a covering 16, which is usually wrapped strips of leather. A central bore 17 in the core 15 may exist in the conventional tennis racket for the purpose of holding weights or the like, or may be specifically bored to mount the attachment of the present invention.

The stationary portion of the attachment includes an adapter plug 18 that tightly telescopes within the bore 17 and has a flange portion 19 that overlaps the terminal end 20 of the handle 4. An adapter cup 21 engages over and covers the flange 19 of the plug 18 and has a plurality of peripherally arranged holes therein for receiving a corresponding plurality of wood screws 52, or the like, which wood screws tightly clamp the cup 21 and adapter plug 18 to the terminal end 20 of the racket handle 4 by means of their threaded engagement into the core 15, as shown.

The central portion of the adapter cup 21 is formed into a hemispherical socket 22 for receiving therein a correspondingly shaped nut 23 that forms with the socket 22 a ball and socket type joint. The nut 23 is held against rotation by a locking plate 24 which loosely but non-rotatably surrounds the hexagonal or other configurate head of the nut 23. The locking plate 24 is in turn held against rotation by being clamped between the plug 18 and adapter cup 21 by the screws 52 that pass therethrough. When the nut 23 is not threadably receiving the center screw 25, it is prevented from moving out of alignment with the central hole in the socket 22 by the pressure of a resilient foam or the like plug 26 that is carried within a correspondingly shaped recess 27 in the adapter plug 18. Apertured ears 28 are rigidly attached to the side walls of the adapter cup 21 by means of screws 29.

To adjustably mount the surface portion 6 for translation in two mutually perpendicular directions, two racks 30 and 31 are provided to clamp therebetween the depending support bars 12 partially under the influence of the clamping center screw 25.

The inner rack 30 is provided with a spherical portion that engages the outer surface of the socket 22, has a central hole 33 for loosely passing the center screw 25, has a plurality of threaded screw holes 34 and a plurality of fine-toothed serrations 35 that are parallel with the planar extent of FIG. 6. The serrations 35 are in engagement with correspondingly shaped serrations 36 on the support bars 12 for translational adjustment of the surface portion 6 perpendicular to the plane of FIG. 6.

The outer rack 31 is provided with a plurality of coarse serrations 37 that are parallel to each other and perpendicular to the plane of FIG. 6 for interengagement with the serrations 38 of the support bars 12 to provide for translational adjustment of the surface portion 6 in a direction perpendicular to the plane of FIG. 4. The outer rack 31 is also provided with an aperture 39 for receiving the head of the center screw 25 so that the center screw 25 may be tightened to clamp the racks 30, 31 and support bars 12 tightly to the adapter cap 21. Further screw apertures 40 are provided longitudinally aligned with the threaded holes 34 for the reception of a lesser number of screws 41, which screws 41 will tightly clamp the racks 30, 31 and sup-

port bars 12 together in their adjusted position. A greater number of apertures 40 are provided than the number of screws 41 so that the screw 41 may clamp the racks 30, 31 together regardless of the adjusted position of the support bars 12, which support bars 12 are shown in FIG. 6 in a particular adjusted position wherein they overlap a pair of holes 34, 40.

Due to the ball and socket connection provided by the nut 23 and socket portion 22 of the adpater cap 21 respectively, the surface portion 6 may be rotated universally about the center point of the ball and socket joint, that is, in three mutually perpendicular planes. With the racks 30, 31 tightly clamping therebetween the support bars 12 by means of the screws 41 and with the central screw 25 loosened, the now rigid assembly of the racks 30, 31 and surface portion 6 may be rotated about the ball and socket joint 23, 22 to a desired position. After rotation to the desired position, the screw 25 will be tightened to clamp the surface portion 6. To ensure that the surface portion 6 will not rotate further, bracing members are provided between the ears 28 and the surface portion 6.

The rigid brace members 42 extend between corresponding ones of the bored bosses 11 in the surface portion 6 and apertured ears 28 that are secured to the adapter cup 21 to prevent undesired rotation of the surface portion 6 about the ball and socket joint 23, 22. The brace members are universally mounted at their opposite ends to respective bosses 11 and ears 28, and provided with threaded means for adjusting their length between the universal mountings. Since the brace members are identical in structure, only one will be described in detail.

As shown in FIG. 5, a brace member 42 has a shaft 43 provided in one end with a spherical head 44 that is received within a spherically shaped socket 45 in the corresponding boss 11. The upper portion of the boss 11 is threaded to receive a set screw 46 that has a spherical aperture at its inner end to take up slack or clamp the head 44 within the socket 45. As seen, the shaft 43 passes through a flared opening 47 in the lower portion of the boss 11 so that the shaft 43 may be universally rotated within the limits of the flared opening 47 with respect to the boss 11 when the set screw 46 is unscrewed sufficiently to permit rotation.

The other end of the shaft 43 is threaded for longitudinal adjustment with respect to two nuts 48 which form a part of the second universal mounting, so that the distance between the universal mountings may be adjusted according to rotation of the nuts 48. The inner surfaces of the nuts 48 are spherically recessed to engage two correspondingly spherically shaped annular rings 49 that are mounted on opposite sides of the ear 28. By loosening the nuts 48, it is seen that the shaft 43 may be universally rotated with respect to the ear 28 within the limits of the flared openings 50 of the rings 49. Tightening of the nuts 48 will securely clamp the lower universal joint.

A modification of the universal mounting structure previously described with respect to FIG. 6, is shown in FIG. 9, wherein like reference numerals have been used for parts that are identical to previously described parts of the embodiment specifically shown in FIG. 6, but with primes added to indicate that they are a part of the modification. Therefore, reference is made above for description of these identical or similar parts.

In FIG. 9, the central bore 17' of the racket core 15 firmly receives the adapter plug 51, which is rigidly held in place by means of wood screws 52' that pass through holes in a flange portion 53 of the plug 51. A central bore 54 in the plug 51 terminates in a spherical socket 55 that receives the spherical head 56 of a mounting pin 57 for universal movement therebetween within the confines of the flared opening 58 of the plug 51. The spherical head 56 is spring loaded into engagement with the socket 55 by a recessed piston 59 biased longitudinally with coil compression spring 60 held in place within the bore 54 by threaded plug 61. Adjustment of the threaded plug 61 is made before the adapter plug 51 is inserted within the bore 17' of the racket. The opposite end of the mounting pin 57 is formed with a threaded bore 62 that receives a central screw 63, which passes through the outer rack 64. The ears 28' are in one piece with a spanning plate 66, that is secured rigidly to the terminal end of the racket handle by the screws 52'. The remaining structure to complete the attachment for the embodiment of FIG. 9 would be identical to that previously described above with respect to FIG. 5.

A further embodiment of the present invention is shown in FIGS. 10, 11 and 12. This embodiment has the same general purpose as the above-described embodiment, but is semi-flexibly supported with respect to the tennis racket handle, while providing some rigidity.

As particularly shown in FIGS. 10 and 11, the handle portion 4 of a conventional tennis racket is drilled at approximately right angles to the longitudinal center line 8 through the gripping surface. This drilled hole 70 receives a threaded light metallic sleeve 71, which is further secured to the tennis racket with epoxy or other adhesive in a permanent manner. The metallic sleeve 71 has a square hole extending through its entire length as shown in FIG. 12 to receive the depending leg 72 of a T-shaped support member 73. Before the epoxy sets, the player will grip the racket handle as shown in FIG. 10 to determine the angular relationship of the cross member 74 with respect to the longitudinal axis 8 of the racket; with the setting of the epoxy, this angular relationship will be fixed. Also, the desired position of the player's hand along the tennis racket handle determines the place at which the hole 70 is drilled so that the tennis racket attachment will be custom fit to a particular player's specifications.

A flexible but generally non-elastic strap 75 extends over the player's hand 7 and at one end is reversely bent around the cross member 74 to its terminal end where it is interposed between the cross member 74 and respectively clamping plates 76. Suitable screws 77 pass through holes in the clamping plates 76 and are threaded into the cross member 74 to tightly secure the rearward end of the strap 75 with respect to the T-shaped support member 73, there being slots 78 in the strap 75 to accommodate the screws 77.

As shown in FIG. 12, the opposite end of the strap 75 is rigidly secured to a sheet metal guide 85 that is fixedly secured to the conventional tennis racket handle 4 in the desired position by means of screws 86 and 87, with the interposition of a washer 88. The points at which the screws 86 and 87 enter the conventional tennis racket handle will be determined by the shape of the particular player's hand and his desired position with respect to the handle. It is understood that the racket

handle may be conventionally made of wood, metal or other material, with the only modification of the attachment being the type of screw that is used.

Buckling of the strap **75** is prevented by the thin and flexible metallic reinforcing plate **79** that is embedded in the plastic, leather or other material strap **75**. The reinforcing plate extends over to and reinforces the mounting area for rivets **80**, which in turn mount the opposite ends of a supplemental strap **81** that encircles the wrist portion of a player's hand. The strap **81** is subdivided by a conventional type of buckle **82** that is used to adjust the circumferential extent of the strap **81** to provide a secure and adjustable fit to a particular player's wrist.

The main strap **75** is tightly secured over the player's hand by adjusting the position of the leg **72** within the correspondingly shaped slot of the metallic sleeve **71**. This is accomplished by means of threading the screw **83** into and out of a threaded bore **84** within the terminal end of the leg **72**.

A further embodiment of the present invention is shown in FIG. **13**, wherein a more flexible surface portion is provided for gripping the back of the player's hand, with the attachment again being secured to a conventionally shaped tennis racket handle.

The attachment shown in FIG. **13** has a forward large, preferably circular, aperture **90** that initially is slipped over the rearward end of the tennis racket handle **4** and moved forward to allow sufficient space for the player to grip the handle **4** with his hand **7** according to his desired position. Thereafter, the attachment is moved rearwardly until it comfortably abuts the forward knuckle of the hand **7**. In this position, a screw **91**, shown in FIG. **14**, is passed upwardly, with respect to FIG. **13**, through a reinforced hole **92** to be tightly screwed into the handle **4** of its face substantially opposite from the player's forward knuckle, that is substantially opposite from the main body portion of the attachment as shown in FIG. **13**.

After the forward portion of the attachment has been secured as set forth above, the main body **93** of the attachment is firmly placed over the upper portion of the player's hand as shown in FIG. **13** so that the cords **94** may be wrapped beneath the rearward end of the tennis racket handle **4** for securing the rearward end of the attachment. The main body portion **93** in the attachment is preferably constructed of leather, flexible plastic, or the like that is flexible and will generally conform to the shape of the player's hand without stretching substantially. To prevent buckling of the main body portion **93**, a reinforcing plate **95** of spring steel, hard plastic or the like is secured to the main body portion **93**, for example by embedding in the plastic or laminating between layers of leather.

The cords **94** may be nylon rope, steel cables, leather thongs, or the like and are secured to the main body portion **93** at spaced points by reinforcing sleeves **96**. At the opposite ends of the cords **94**, there are respectively fixedly secured externally threaded mounting members **97**, which may be externally threaded tubes, telescoped with the ends of the cords **94**. Preferably, the cords **94** are threaded through the tubes **97** so that the terminal ends of the cords **94** may be knotted at a desired point to prevent withdrawal of the tubes **97**.

The rearward portion of the player's hand abuts against a mounting member **98** that is substantially U-shaped and secured to the top portion of the handle **4** by means of a screw **99** passing through a hole in the bight portion of the U-shaped member and thereafter into the tennis racket handle **4**.

As viewed in FIG. **13**, the right hand cord **94** passes downwardly between the player's hand and the mounting member **98** to where it passes through the hole **100** in the lower portion of the right hand leg of mounting member **98**. Thereafter, the right hand cord passes from right to left beneath the racket handle **4** and then upwardly along the left hand side of the handle **4** to where it passes through hole **101** in the mounting member **98** and then from left to right within a recess **102** and the mounting member **98** to where its mounting sleeve **97** is screwed into an internally threaded fastener **103** that passes through a hole in the right hand side wall of the cavity **102**. In a similar manner, the left hand cord **94** passes through hole **104**, beneath the handle **4**, upwardly along the right hand portion of the handle **4**, through hole **105**, and from right to left within cavity **102** to where its externally threaded sleeve **97** is screwed into the fastener **106** that passes from left to right through a correspondingly shaped hole in the left hand side wall **107** of the cavity **102**. With tightening of the screws **103**, **106**, the main body portion **93** will be firmly clamped to the back of the player's hand.

A further simplified version of the present invention is shown in FIGS. **15** and **16**. In this form of the invention, the main body portion **110** of the attachment is provided with a reinforcing plate **111**, which as described above may be of spring steel or the like and embedded in the plastic of the main body portion **110** or laminated between leather sheets of the main body portion **110**, or the like. Opposed ends of the main body portion **110** are provided with straps, **112**, **113**, **114**, **115**. The straps **113** and **114** are provided with conventional buckles **116**.

With the above structure, the straps **112** and **113** may be passed around corresponding sides of the tennis racket handle forward of the player's hand **7** to where the strap **112** is passed through the buckle **116** beneath the handle **4** for securing the forward portion of the attachment. In a like manner, the straps **114** and **115** are passed respectively along opposite sides of the handle **4** to where they are buckled beneath the handle **4** for securing the rearward portion of the attachment. As in the above embodiments, the attachment will be adjustably secured according to the desired grip of the player.

It is seen that although the above specifically set forth embodiments of FIGS. **1 – 16** are structurally different, they merely use different approaches toward the same basic objectives of the present invention, which are:

1. Additional support for a conventional tennis racket is provided by all of the above embodiments.

2. All of the above embodiments may be attached to a conventional tennis racket handle.

3. All of the above embodiments can be inexpensively mass produced, so that they will be available for the general public.

4. All of the above embodiments will comfortably fit to any adult tennis player's hand, when holding a conventional tennis racket in any desired position.

5. In all of the above embodiments, the vital area of the attachment which is in contact with the hand falls within the region to be described as the "involved portion of the hand."

6. Additional transverse support, additional rotational and orientation support, and additional axial support is provided for a conventional tennis racket handle.

The most rigid embodiment of the present invention as specifically shown in FIGS. **1 – 9** satisfies the above objectives and provides the above features to the greatest degree and therefore is the most preferred form of the present invention. However, the similarity in design concepts of all of the embodiments will be stressed in the following discussion.

As a part of the present invention, a considerable amount of data was collected concerning the size and shape of adult male and female hands, variations in preferred hand positioning on a tennis racket handle, and desired areas of contact for a surface to produce the desired results of the present invention. The area of contact and adjustability of the surface will be discussed with respect to FIGS. **17**, **18** and **19** as they apply specifically to the rigid attachment of FIGS. **1 – 9**, although the analysis will follow at least to a lesser extent for all of the embodiments of the present invention.

As shown, the tennis racket handle **4** is of conventional shape, that is provided with an upper hand engaging surface **120**, a lower hand engaging surface **121**, a right side surface **122**, a left side surface **123** and connecting surfaces **124**, **125**, **126** and **127**. The designation above is according to the position of the tennis racket handle when its longitudinal axis **8** is horizontal and the racket is gripped in the forehand grip with the player's palm facing downward.

In FIGS. **17** and **18**, the maximum required area of contact between the attachment and the player's hand will correspond to the inner surface of the attachment main body portion of the embodiments according to FIGS. **1 – 16** when they are engaging the player's hand. This area of surface is defined by the forward line **128**, the rearward line **129**, the right hand line **130**, and the left hand line **131**. This area of contact is specifically shown in its mean position of adjustment in FIGS. **17 – 19**, which corresponds to the average grip position.

As viewed in FIG. **17**, the height of the upper most portion of this maximum required area of contact as measured from the longitudinal axis **8** is approximately 1.815 inches with a range of plus or minus one-half inch according to the size of the player's hand. This upper most portion of the area will be substantially straight as seen in the end view of FIG. **17** and be parallel to the upper surface **120** of the handle with an adjustability of 15° rotation in either direction about an axis which is passing through of the upper most portion of the contact area parallel to the longitudinal axis **8**.

According to the adjustability provided by the present invention, the entire surface may be moved either to the right or left in the range of approximately 0 to 0.625 inches on each side as a function of the design. Normally, the reference point C on this surface will be within the plane passing through the longitudinal axis **8** and being perpendicular to the surface **120**. According to the adjustability of the present invention, this reference point C may be moved axially, with respect to the longitudinal axis **8** to accommodate various grips within the range of 2.5 and 0.25 inches as measured from the terminal end of the handle **136**.

Further adjustability according to the above embodiments is provided to rotate this maximum required surface generally about an axis perpendicular to the plane of FIG. **18** and intersecting the longitudinal axis **8**. This rotation will be approximately 15° to the right and 15° to the left from the illustrated position, which illustrated position is the mean position wherein line **128** forms an angle of 64° with the longitudinal axis **8** as seen in FIG. **18**.

Further adjustability provided by the embodiments of the present invention may be seen with respect to FIG. **19**, wherein the entire surface may be rotated about an axis perpendicular to the plane of FIG. **19**. This rotational adjustment would be approximately 13° in one direction and 13° in the other direction from the mean position illustrated wherein the right hand most portion of the surface from A to B represents a substantially straight line as viewed in FIG. **19**, which straight line is parallel to the longitudinal axis **8** of the racket handle.

As seen in FIG. **19**, the surface extends from point B to point C along the back of the player's hand with an average radius of 3.5 inches, from point C to 10° beyond point D along the typical radius of curvature of a player's hand of 0.625 inches and from this point 10° beyond D to point E to resist axial displacement of a player's hand with respect to the racket handle **4**;, the line from the point 10° beyond D to E is radial in the mean position. With the same center of curvature, FIG. **19** shows a range for this curved surface between the two dotted lines parallel to the average solid line and spaced respectively 0.180 inches; within this range the attachment is capable to conform to any surface configuration of any proportionally normal adult's hand. Thus, the radius of the curve from B to C would be within the range of 3,680 to 3.320 inches and the radius of the curve from C to D would be within the range of 0.805 to 0.445 inches. In the more flexible embodiments, the player's hand will assure that the contact surface conforms to the drawings. Thus, the tail portion of the contact surface of the flexibly-supported attachments is similar to the corresponding contact surface of the solidly-supported attachment because of the general convex configuration of the hand at its end position.

Point C is used in the drawing as a reference point and is the point of intersection between a transition line **137** and a radial plane **138**; the transition line **137** is the line of intersection between the curved surface with a mean radius of 3.500 inches from B to C and the curved surface with a mean radius of 0.625 inches, and the radial plane **138** would be the plane containing the axis **8** and being perpendicular to the transition line. Additional dimensions of this surface are shown in FIGS. **17–19** and further measurements may be taken from the drawing, which is to scale, and which scale forms a specifically disclosed portion of the present specification.

The minimum required area of contact between the player's hand and the surface portion of the embodiments according to the present invention, which area will also be considered as the inner surface of these embodiments as are shown in the FIGS. wherein the attachment is gripping the player's hand, is shown in FIGS. 17–19. This minimum required area is defined by forward line 132, rearward line 133, right hand line 134, and left hand line 135. This minimum required area of contact has the same adjustability about the three mutually perpendicular axes as does the maximum required area of contact previously described. As seen in FIGS. 17 and 18, the lines defining the minimum required area of contact are substantially parallel to the corresponding lines defining the maximum required area of contact. The dimensions of this minimum required area of contact are given in the drawing and specifically form a portion of the present disclosure, as well as the scale of the drawing. In the drawing, all dimensions are given in inches.

## OPERATION

The attachment of the present invention may be bought together with a tennis racket specifically designed for its mounting or may be bought separately and installed on a conventional tennis racket. The adapter plug 18, 51 is mounted within the central bore 17, 17′ of the racket handle along with the adapter cup and other rigid structure by means of the wood screws 52, 52′. Thereafter, the movable structure is loosely mounted, in any arbitrary adjusted position, as shown in the drawings. Angular adjustments are made about the ball and socket joint 23, 22 or 56 by loosening the brace members 42 and rotating the surface to a desired position. Before or after this angular adjustment, the support bars 12, 12′ would be adjusted perpendicular to the plane of FIG. 6 or FIG. 9 by changing the interengagement of the serrations 35, 36 or 35′ or 36′ and adjusted perpendicular to the plane of FIG. 4 by changing the interengagement of the serrations 37, 38, or 37′ or 38′. Since the angular adjustments would slightly alter the translational adjustments and vice versa, it may be desirable to repeat the adjusting steps one after another until the most comfortable and advantageous position of the surface with respect to the back of the player's hand is obtained.

Thereafter, the screws 41, 41′ would be tightly secured to clamp the depending support bars 12, 12′ between the racks 30, 31 and 64, 65, respectively. Securement of the angular adjustment would be made by appropriately adjusting the position of the lower universal joints 48–50 of the brace members 42 and thereafter locking the upper and lower universal joints of these brace members along with locking of the universal joint 22, 23 by tightening the center screw 25.

If the racket with the attachment is to be used by only one player, it will not thereafter be necessary to change the adjustment so that the unused portion of the shafts 43 that extend below the nut 48 may be cut off, and the player may cut off the unused portions of the racks 30, 31, 64, 65 that extend beyond the support bars 12, 12′ and screws 41, 41′. These cut off ends may thereafter be filed or otherwise rounded to prevent marring of the furniture or injury to the player.

With a properly adjusted attachment, it is seen that the padded inner surface of the device will firmly engage the back of the player's hand when he is gripping the racket in his particular desired position so that a locator surface will be provided to quickly assure the player that he is properly gripping the racket during play without necessitating looking at the racket. Further, the back of the hand adjacent the little finger will not lift from the racket handle due to the torque produced by the stroke and centered about the first knuckle. Further, it is seen that the surface, particularly the pad 14, will provide a firm brace for longitudinal movement of the hand with respect to the racket handle so that the racket handle will not fly out of the player's hand due to centrifugal forces caused by a fast stroke or serve. If the ball strikes the racket head 2 radially off center from the longitudinal axis 8, a torque will be produced about this axis 8 that will tend to rotate the handle relative to the hand of the player, which torque will be satisfactorily counteracted to prevent rotation by the engagement of the surface with the back of the player's hand and rigid bracing of the surface with respect to the handle of the racket.

The attachment of FIGS. 10 – 12, may be bought separate from a conventional tennis racket and assembled to the tennis racket handle with a minimum of modification.

The player will grip the racket handle 4 with his usual and preferred hand location. This grip will determine where the hole 70 should be drilled within the handle 4; that is, the axial location, as measured along the longitudinal axis will be determined for the hole 70 and the transverse location for the hole 70 will simultaneously be determined. As seen in FIG. 10, the hole 70 is slightly off set to the left in the transverse direction to the axis 8 for a particular player; it is to be understood that another player may prefer the hole 70 to be off set to the right from the axis 8. After the hole 70 is drilled, the plug 71 is threaded or otherwise preliminarily secured within the hole 70 for reception of the configured leg 72. At this point, the angular orientation of the cross member 74 is determined by the player's grip as the plug 71 is correspondingly rotated. This angular orientation is fixed by means of cement or the like, which was inserted along with the plug 71 and is now permitted to set.

After the plug 71 is fixed by setting of the cement, the leg 72 is assembled within the plug 71 and the screw 83 screwed part way into the leg 72. With the player's hand 7 assuming the normal grip on the handle 4, the strap 75 is brought tightly across the top of the player's hand and the screw 86 fastened within the handle 4 to fix the foward portion of the attachment. Thereafter, the screw 83 may be tightened to pull the strap tightly and firmly locate the player's hand with respect to the handle 4 in the desired position. Securement of the adjustable strap 81 will further assure proper bracing and alignment.

With the attachment of FIGS. 13 and 14, the assembly process is similar in that it is performed with a minimum of modification for a conventional tennis racket handle. The handle 4 is first passed through the hole 90 so that the main body portion 93 of the attachment may be brought over the top of the player's hand, which assumes its preferred position with respect

to the handle 4. In this position, the cords 94 are passed down respective sides of the handle 4 so that the mounting member 98 may be pressed tightly against the adjacent portion of the player's hand while clamping the adjacent portion of the main body portion 93 therebetween. This will axially with respect to the axis 8, transversely with respect to the axis 8, and angularly about the axis of the screw 99 locate the mounting member 98 with respect to the handle 4. In this desired position, the screw 99 is passed through the corresponding hole in the mounting member 98 and fastened to the handle 4 to secure the mounting member. Thereafter, the respective cords 94 are passed through their holes 100, 101 and 104, 105 so that their threaded ends 97 may be screwed into the fasteners 103, which fasteners 103 are turned to draw the main body portion 93 tightly across the player's hand and firmly affix the attachment.

The attachment of FIGS. 15 and 16 may be secured to a conventional tennis racket handle without any modification of the tennis racket. After the player's hand assumes its preferred position with respect to the handle 4, the main body portion 110 is placed across the back of the player's hand as shown in FIG. 15 so that the forward straps 112, 113 may be secured around the forward portion of the handle 4 and the rearward straps 114, 115 may be secured around the rearward portion of the handle 4, as shown. The buckles 116, will provide the necessary adjustment for tightly securing the attachment in position.

The principles of operation and areas of contact are more fully set forth with respect to FIGS. 17 – 19 for all of the embodiments of the present invention.

While the invention has been specifically described with respect to the preferred embodiments, which are advantageous in their own specific details, further modifications, embodiments and variations are contemplated according to the broader aspects of the present invention as defined by the spirit and scope of the following claims.

What is claimed is:

1. A hand positioner and brace for providing a reference surface generally for the back of a tennis player's hand as he grips a conventional tennis racket handle having a longitudinal axis, a gripping surface and terminal end, comprising: a surface portion adapted to the configuration of the back of an average tennis player's hand; means for adjustably mounting said surface portion on the terminal end of a conventional tennis racket handle spaced from and independently of the gripping surface to be adapted to any proportionally normal adult tennis player's hand in any desired gripping position; said mounting means including a first mounting portion having a reference axis generally to be aligned with the handle longitudinal axis when secured to the tennis racket handle and a second mounting portion rigidly secured with respect to said surface portion; said first and second mounting portions having interengaging parallel serrations extending generally perpendicular to said reference axis, and separate interengaging parallel serrations perpendicular to said first mentioned serrations and perpendicular to said reference axis; and means for providing a clamping force between said first and second mounting portions in the direction of said reference axis for tightly clamping said serrations together.

2. The device of claim 1, wherein said surface portion is of a one piece construction including two spaced and parallel support bars having said serrations respectively on opposite surfaces to constitute said second mounting portion; said first mounting portion including inner and outer racks having respectively thereon said serrations facing each other and in engagement with the corresponding serrations on said support bars; and said clamping means including a plurality of threaded members extending between said racks.

3. The device of claim 2, wherein said racks have at least twice as many threaded holes as the number of said threaded members for receiving therein said threaded members irrespective of the placing of said support bars between said racks.

4. The device of claim 2, said mounting means further includes a single bolt centrally extending through said racks for securing said first and second mounting portions to the terminal end of the handle.

5. A hand positioner and brace for providing a reference surface generally for the back of a tennis player's hand as he grips a conventional tennis racket handle, comprising: a surface portion adapted to the configuration of the back of an average tennis player's hand; means for adjustably mounting said surface portion on a conventional tennis racket handle spaced from and independently of the normal handle gripping surface, and including a first mounting portion to be rigidly carried by the handle; said mounting means further including means for adjusting said surface portion with respect to said first mounting portion rotationally in three mutually perpendicular planes; and means for rigidly clamping said surface portion in any of the angularly adjusted positions.

6. The device of claim 5, wherein said mounting means includes a ball and socket joint; and said clamping means including at least two rigid members movable relative to each other during angular adjustment of said surface portion in any of said planes and at least one of said rigid members having means for adjusting its effective length for securing said surface portion in any of the adjusted positions.

7. The device of claim 6, wherein at least one of said rigid members includes a rod having universal mounting means at both ends and means between its end for threadably adjusting the distance between said universal mounting means.

8. The device of claim 7, wherein said mounting means includes a ball and socket joint having a threaded bolt extending therethrough and a separate nut within the ball portion; said first portion including a plate surrounding said nut to prevent it from rotating and a resilient block axially biasing said nut.

9. The device of claim 8, wherein each of said rigid members include universal mounting means at opposite ends directly securing them between said surface portion and said first portion; said surface portion being of a one piece construction with two parallel depending support bars, each having a plurality of serrations on opposed surfaces, which serrations are perpendicular to each other and parallel with corresponding serrations on the other support bar; a first rack having serrations engaging the serrations on one face of each support bar for adjustable interengagement in one direction perpendicular to the respective serrations; a second rack having serrations adjustably engaging the

other serrations of said support bars for relative adjustment in a direction perpendicular to said first mentioned direction; said first rack and said first mounting portion having interengaging partially spherical surfaces for universal adjustment about the center of curvature; a threaded member extending through said first rack, second rack and first mounting portions, and being aligned with said center of curvature for clamping said second rack, support bars, first rack and first mounting portion rigidly together in their adjusted position; a plug adapted to be telescopically engaged within a correspondingly shaped blind hole in the terminal end of a tennis racket handle and having a diametrically enlarged outer flange for overlapping the end portion of the handle; and a plurality of wood screws extending through said first mounting portion and said flange for threaded engagement with the handle.

**10.** A hand positioner and brace for providing a reference surface generally for the back of a tennis player's hand as he grips a conventional tennis racket handle, comprising: a surface portion adapted to the configuration of the back of an average tennis player's hand; means for mounting the surface portion on a conventional tennis racket handle spaced from and independently of the normal handle gripping surface; said mounting means including a first mounting portion to be stationarily mounted on said surface portion, means for adjustably mounting said surface portion for rotation about an axis with respect to said first mounting portion, and at least two brace members supporting said surface portion in the rotationally adjusted position; and, means for mounting said brace members for relative movement with respect to each other and said first mounting portion during rotational adjustment of said surface portion.

**11.** The device of claim **10**, wherein at least one of said brace members is axially adjustable in length.

**12.** The device of claim **11**, wherein said one brace member has universal mounting means at each of its opposite ends and threaded means for adjusting its effective length between said universal mounting means.

**13.** The device of claim **10**, wherein at least one of said brace members has universal mounting means at each of its ends.

**14.** A tennis racket, comprising: a shaft defining a longitudinal axis, a ball engaging head secured at one axial end of said shaft; a hand engaging handle secured at the other axial end of said shaft in alignment with said longitudinal axis, said handle having a circumference in the range of 4 to 5 inches as measured in a plane perpendicular to the longitudinal axis and being substantially octagonal in cross-section perpendicular to the longitudinal axis; an attachment having a support surface overlying one side of said handle for engaging the back of a player's gripping hand as a hand positioner and brace; said attachment further having means for securely holding said support surface in position rotationally, axially and transversely with respect to said longitudinal axis to conform to any proportionally normal adult tennis player's hand in any desired gripping position; said surface being generally defined by a reference straight line moving generally parallel to itself across said entire surface so that in a first plane generally parallel to the longitudinal axis and generally perpendicular to said reference line the locus of a point on said line will extend rearwardly with respect to said handle first along a generally straight line, then inwardly toward said handle along a first radius, and then more sharply inwardly toward said handle along a second radius; said reference straight line lying in a second plane perpendicular to said first plane and generally parallel to said longitudinal axis, and forming an angle within the range of 41° to 11° with a projection of the longitudinal axis on said parallel plane; said straight line of the locus lying within the range of +13° to −13° with respect to being parallel to the longitudinal axis as seen in said first plane; and said reference line further forming an angle of 75° to 105° with respect to a line perpendicular to its mean position and passing through said longitudinal axis in a third plane perpendicular to said longitudinal axis.

**15.** The apparatus of claim **14**, wherein said holding means is adjustable to position said attachment on said handle in any operating position around said axis for 360° of rotation.

**16.** The apparatus of claim **14**, wherein said reference line extends a maximum distance within the range of 2.315 and 1.315 inches from said longitudinal axis.

**17.** The apparatus of claim **14**, wherein the projection of said locus in said second plane extends within the range of 1.850 to 1.000 inches.

**18.** The apparatus of claim **14**, wherein the maximum length of said reference line is within the range of 3.250 to 0.500 inches.

**19.** The apparatus of claim **14**, wherein said first radius is approximately 3.500 inches and said second radius is approximately 0.625 inches.

**20.** The apparatus of claim **19**, wherein the extremes for the range and any possible curvature within the range which falls within the curvatures for said locus is defined by two parallel loci, respectively 0.180 inches inward and outward of the mean locus having exactly said radii.

**21.** A tennis racket, comprising: a shaft defining a longitudinal axis, a ball engaging head secured at one axial end of said shaft; a hand engaging handle secured at the other axial end of said shaft in alignment with said longitudinal axis, said handle having a circumference in the range of 4 to 5 inches as measured in a plane perpendicular to the longitudinal axis and being substantially octagonal in cross-section perpendicular to the longitudinal axis; an attachment having a support surface overlying one side of said handle for engaging the back of a player's gripping hand as a hand positioner and brace; said attachment further having means for securely holding said support surface in position rotationally, axially and transversely with respect to said longitudinal axis to conform to any proportionally normal adult tennis player's hand in any desired gripping position; said attachment including a flexible sheet material main body having a forward portion and a rearward portion on the opposite side of said forward portion from said head, with respect to said handle; screw means securing the forward portion and extending into said handle; a rigid T-shaped support member having a depending leg portion secured against rotation within said handle and generally perpendicular to the longitudinal axis, a transverse portion having substan-

tially its entire transverse extent rigidly secured to the rearward portion of said flexible sheet material main body rearward portion; and said transverse portion extending generally perpendicular to said leg and at a desired angle with respect to said longitudinal axis.

22. The apparatus of claim 21, wherein said main body portion includes a transversely extending side piece; an adjustable length strap extending in a loop from said side piece for encircling the wrist of the wearer.

23. The apparatus of claim 22, including a reinforcing plate more rigid than said main body portion being secured throughout its extent to said main body portion; fastener means extending through opposite ends of said strap and through said main body portion and said reinforcing plate.

24. The apparatus of claim 21, including screw means for adjustably moving said T-shaped member parallel to the extent of its leg and generally perpendicular to the longitudinal axis for tightening said main body portion about a player's hand.

25. A tennis racket, comprising: a shaft defining a longitudinal axis, a ball engaging head secured at one axial end of said shaft; a hand engaging handle secured at the other axial end of said shaft in alignment with said longitudinal axis, said handle having a circumference in the range of 4 to 5 inches as measured in a plane perpendicular to the longitudinal axis and being substantially octagonal in cross-section perpendicular to the longitudinal axis; an attachment having a support surface overlying one side of said handle for engaging the back of a player's gripping hand as a hand positioner and brace; said attachment further having means for securely holding said support surface in position rotationally, axially and transversely with respect to said longitudinal axis to conform to any proportionally normal adult tennis player's hand in any desired gripping position; said attachment including a relatively flexible sheet main body portion having a forward end and a rearward end, with respect to said handle; means fixedly securing the forward end of said main body portion to said handle; a supporting member fixedly secured to the rearward end of said handle; two cord members extending from the rearward end of said main body portion oppositely around said handle and being secured adjustably at their terminal ends to said support member so as to generally each form loops extending tightly around said handle.

26. The apparatus of claim 25, wherein said support member is a generally U-shaped bracket having a threaded fastener extending into said handle and depending side legs respectively provided with holes receiving therethrough portions of said cord members.

27. The apparatus of claim 26, wherein said supporting member further includes second holes for said cord members; an internally threaded rotatable fastener extending through each of said second holes and a threaded sleeve secured to the terminal end of each of said cord members being telescopically threaded within respective rotatable fasteners.

28. A tennis racket, comprising: a shaft defining a longitudinal axis, a ball engaging head secured at one axial end of said shaft; a hand engaging handle secured at the other axial end of said shaft in alignment with said longitudinal axis, said handle having a circumference in the range of 4 to 5 inches as measured in a plane perpendicular to the longitudinal axis and being substantially octagonal in cross-section perpendicular to the longitudinal axis; an attachment having a support surface overlying one side of said handle for engaging the back of a player's gripping hand as a hand positioner and brace; said attachment further having means for securely holding said support surface in position rotationally, axially and transversely with respect to said longitudinal axis to conform to any proportionally normal adult tennis player's hand in any desired gripping position; said attachment including a relatively flexible sheet member having a forward portion and a rearward portion, with respect to said handle; an adjustable strap secured to the forward portion and extending in a loop around said handle; and an adjustable strap secured to the rearward portion and extending in a loop around said handle.

29. An attachment for a tennis racket having a shaft defining a longitudinal axis, a ball engaging head secured at one axial end of the shaft, a hand engaging handle secured at the other axial end of the shaft in alignment with the longitudinal axis, and the handle circumference in the range of 4–5 inches as measured in a plane perpendicular to the longitudinal axis and being substantially octagonal in cross section perpendicular to the longitudinal axis, the attachment having: a support surface overlying one side of the handle for engaging the back of a player's gripping hand as a hand positioner and brace; means for securely holding said support surface in position rotationally, axially and transversely with respect to said longitudinal axis to conform to any proportionally normal adult tennis player's hand in any desired gripping position; said surface being generally defined by a reference straight line moving generally parallel to itself across said entire surface so that in a first plane generally parallel to the longitudinal axis and generally perpendicular to said reference line the locus of a point on said line will extend rearwardly with respect to said handle first along a generally straight line, then inwardly toward said handle along a first radius, and then more sharply inwardly toward said handle along a second radius; said reference straight line lying in a second plane perpendicular to said first plane and generally parallel to said longitudinal axis, and forming an angle within the range of 41° to 11° with a projection of the longitudinal axis on said parallel plane; said straight line of the locus lying within the range of +13° to −13° with respect to being parallel to the longitudinal axis as seen in said first plane; and said reference line further forming an angle of 75° to 105° with respect to a line perpendicular to its mean position and passing through said longitudinal axis in a third plane perpendicular to said longitudinal axis.

30. The apparatus of claim 29, wherein said reference line extends a maximum distance within the range of 2.315 and 1.315 inches from said longitudinal axis.

31. The apparatus of claim 29, wherein the projection of said locus in said second plane extends within the range of 1.850 to 1.000 inches.

32. The apparatus of claim 29, wherein the maximum length of said reference line is within the range of 3.250 to 0.500 inches.

33. The apparatus of claim 29, wherein said first radius is approximately 3.500 inches and said second radius is approximately 0.625 inches.

34. The apparatus of claim 33, wherein the extremes for the range and any possible curvature within the range which falls within the curvatures for said locus is defined by two parallel loci, respectively 0.180 inches inward and outward of the mean locus having exactly said radii.

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