May 23, 1972 F. W. HELD 3,664,668

RACKETBALL OR TENNIS RACKET HAVING A TUBULAR METAL FRAME

Filed April 3, 1970 2 Sheets-Sheet 1

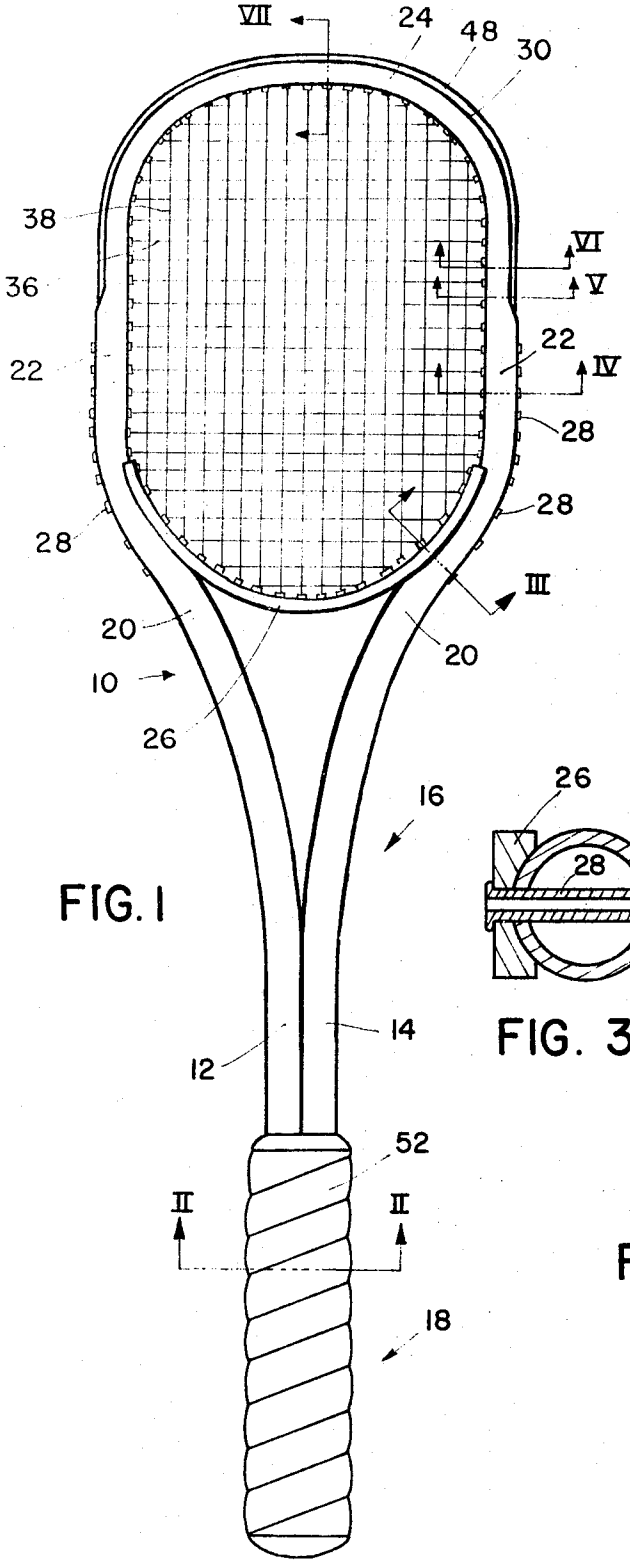


FIG. 1

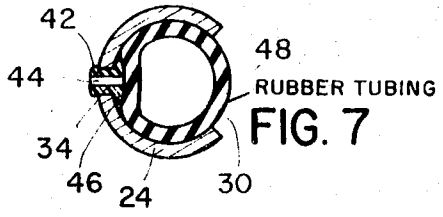


FIG. 7

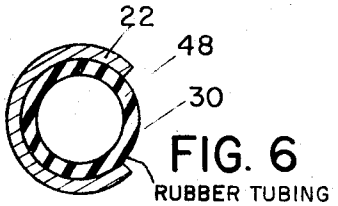


FIG. 6

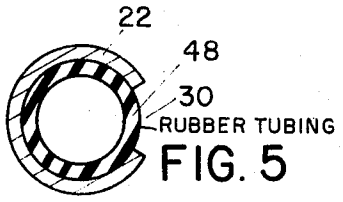


FIG. 5

FIG. 3

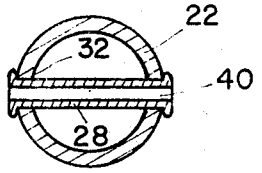


FIG. 4

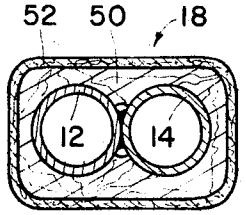


FIG. 2

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May 23, 1972 F. W. HELD 3,664,668

RACKETBALL OR TENNIS RACKET HAVING A TUBULAR METAL FRAME

Filed April 3, 1970 2 Sheets-Sheet 2

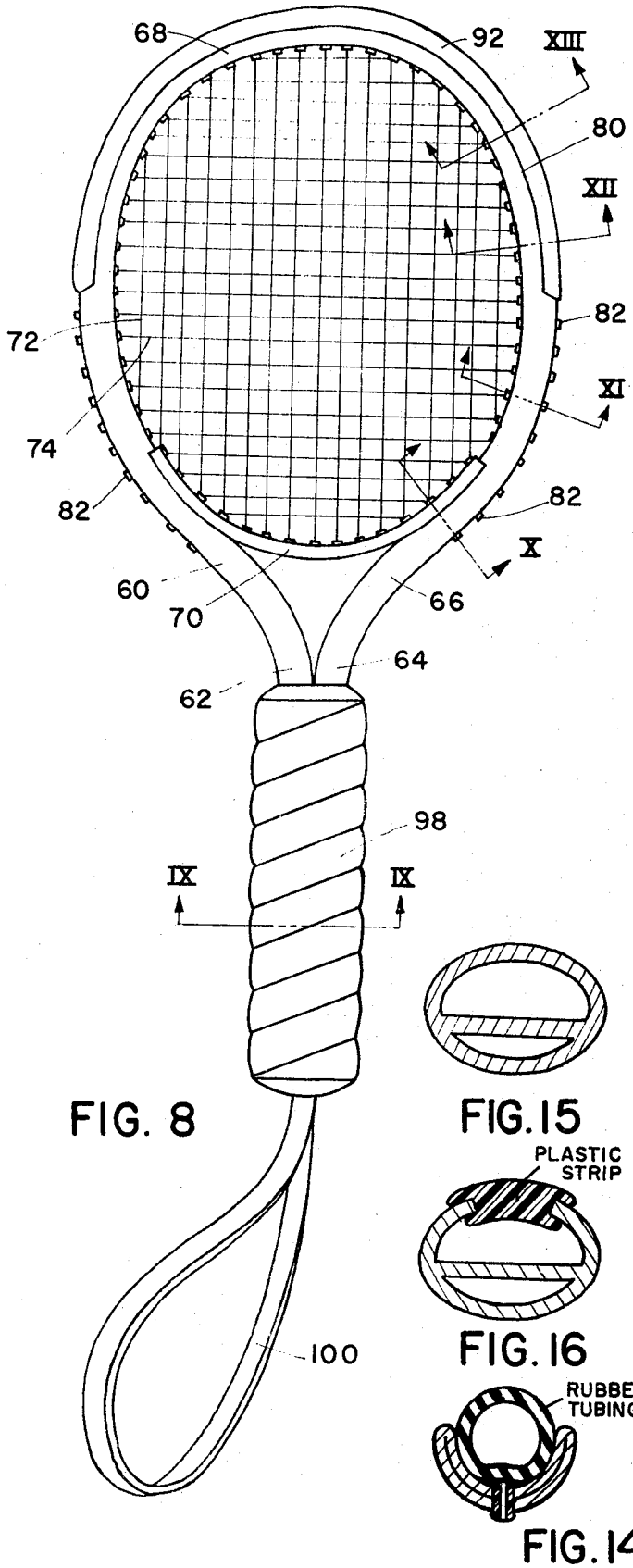


FIG. 8

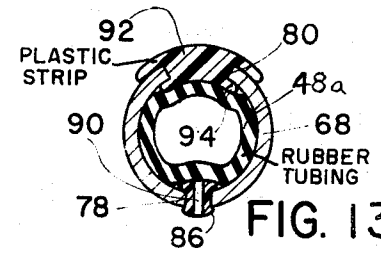


FIG. 13

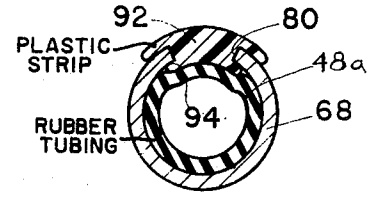


FIG. 12

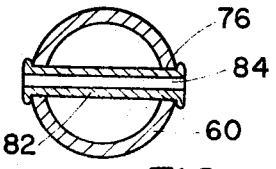


FIG. 11

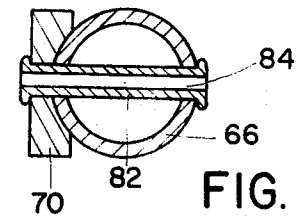


FIG. 10

FIG. 15

FIG. 16

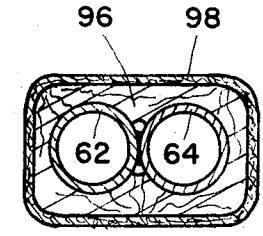


FIG. 9

FIG. 14

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RACKETBALL OR TENNIS RACKET HAVING A TUBULAR METAL FRAME

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Int. Cl. A63b 49/06, 49/12, 49/14
U.S. Cl. 273—73 C 11 Claims

ABSTRACT OF THE DISCLOSURE

Racquetball and tennis racquets having frames formed of a length of metal, preferably aluminum, tubing or extrusion, the end portions of which extend parallel to one another and are welded together to form the handle and shaft portions of the racquet and the intermediate portion of which forms the frame of the racquet. The frame is completed by a throat piece which spans the diverging portions of the tubing immediately above the shaft. A slot is provided in the tubing along the upper half of the racquet to alter the response frequency of the frame so that it coincides with that of the ball. Holes are provided in the tubing of the racquet and in the throat piece to receive the racquet strings. Hollow rivets or bushings may be provided in these holes to prevent cutting of the strings by the edges of the holes. A length of rubber or plastic may be positioned in the slot of the frame to add weight to the racquet and for protective purposes.

This invention relates to racquetball and tennis racquets and more particularly to such racquets whose frames are constructed of metal tubing.

While heretofore racquets have been constructed of metal tubing, such racquets have certain disadvantages when compared with conventional wood framed racquets. Among these disadvantages, is the fact that prior metal racquets do not have the same response characteristics as wood framed racquets. Thus, if a ball is struck off center, the metal-framed racquet has a "dead" feel.

It is the primary object of my invention to provide a metal-framed racquet which has desirable response characteristics and a "live" feel, regardless of whether the ball is hit on or off center. In accordance with the principles of the invention this is accomplished by providing a slot along a portion of the tubing forming the frame of the racquet which alters the frequency response of the racquet and, in a tennis racquet, by providing a novely shaped frame which further enhances the response characteristics of the racquet.

It is also an object of the present invention to provide a racquetball or tennis which is of durable construction. This is accomplished, in part, by utilizing the above-mentioned slot to position the portions of the strings running along the edge of the frame in a location where they are not likely to contact the playing court.

The above and other objects and advantages of my invention will become apparent upon consideration of the following specification and the accompanying drawings wherein there is shown a preferred embodiment of my invention.

In the drawing:

FIG. 1 is a plan view of an aluminum frame tennis racquet constructed in accordance with the principles of my invention;

FIGS. 2–7 are fragmentary sectional views taken along the lines II—II–VII—VII, respectively, of FIG. 1;

FIG. 8 is a plan view of an aluminum frame racquetball racquet constructed in accordance with the principles of my invention;

FIGS. 9–13 are fragmentary sectional views taken along the lines IX—IX–XIII—XIII, respectively, of FIG. 8;

FIG. 14 is a fragmentary sectional view taken through the upper portion of a racquet and showing an alternate method of forming the slot; and

FIGS. 15 and 16 are fragmentary sectional views taken through the unslotted and slotted portions of a racquet frame, respectively, and showing a further modification of the invention.

As will be seen from FIG. 1, the frame of the tennis racquet is formed of a length of aluminum tubing, designated generally by the reference numeral **10**. Preferably, the tubing is ½ inch outside diameter extruded aluminum tubing. The opposite ends **12** and **14** of the tubing length **10** extend in straight, contiguous relationship to one another, forming the lower shaft **16** and handle **18** portions of the racquet. These straight portions **12** and **14** are joined to each other, preferably by welding, along their contiguous lengths. Immediately above the lower shaft portion **16** the tube portions **12** and **14** diverge from one another, as indicated by the reference numeral **20**, and extend upwardly to form the sides **22** of the racquet. The uppermost portion **24** of the tubing **10** may be either round or substantially straight along the principal portion of its length and curves downwardly at each end to continue as the side portions **22** of the frame. The right and left halves of the frame are, of course, symmetric about the axis of the shaft portion **16**. The frame is completed by a throat piece **26** which is secured to the diverging portions **20** of the tubing **10**. As will be seen from FIG. 3, the throat piece **26** is formed of a length of aluminimum bar stock which is curved to the outline of the frame and tapered at its ends to fit against the tubing **20** and is secured by means of hollow rivets **28** passing through holes in the throat piece **26** and in the tubing **10**, or it could be welded into position.

A slot **30**, preferably 7/32 inch wide, is cut in the upper half of the side portions **22** of the frame and along the entire upper portion **24** of the frame, leaving a C-shaped cross-sectional portion forming the upper end of the frame. The slot preferably is aligned with the plane of the racquet and is on the outside edge of the tubing **10**. I have found that by providing the slot **30** along the upper portion of the racquet in the position shown and described, the response characteristics of the racquet are altered sufficiently so that the racquet has a "live" feel on impact with the ball, regardless of whether the ball is hit on or off center.

The side portions **22**, the upper portion **24**, and the throat piece **26** of the racquet are all provided with a plurality of spaced holes **32**, **34** for receiving the racquet strings **36** and **38**. Rivets **28** having hollow centers **40** are provided in the holes **32** in the unslotted portions of the tubing **10**. As described above, the rivets **28** also serve to secure the overlapped portions of the throat piece **26** to the diverging portions **20** of the tubing **10**. These rivets **28** also serve to protect the strings **36**, **38** from the sharp edges of the holes **32**. The holes **34** in the upper portion of the frame and in the throat piece **26** are provided with nylon bushing **42** which have holes **44** extending therethrough and enlarged head portions **46** retaining the bushings in place. These bushings serve to protect the strings **36** and **38** passing through the holes **34** in the same manner as the hollow rivets **28** protect the strings passing through the holes **32**.

It will be noted that the portions of the strings extending along the frame between adjacent holes in the upper portion **34** thereof lie at the bottom of the C-shaped tubing portion. Thus, these portions of the strings are protected from damage when the upper portion of the racquet frame **24** strikes the court surface. To further protect the

strings and the edges of the slot **30** in the tubing **10** there is provided a length of tubing **48**, preferably of rubber, which is received within the slot **30**. The tubing length also serves to absorb vibrations and to add weight to the frame.

The racquet is completed by the addition of a handle **18** which, as shown in FIG. 2, consists of a hollow sleeve-like member **50**, preferably of wood, surrounding and secured to the tube ends **12** and **14** and a covering **52** over the member **50** to provide a comfortable and non-slippery gripping surface. The covering **52** may be a spiral leather wrapping or a tubular rubber grip.

FIGS. 8–13 illustrate a racquetball racquet constructed in accordance with the principles of my invention. As in the tennis racquet described above, the racquetball racquet has a frame formed of a length of aluminum tubing **60** which has straight, parallel, and contiguous end portions **62** and **64** which are welded together to form the handle portion of the racquet. Immediately above the welded portions **62** and **64** the tubing **60** is bent into diverging portions **66** which continue upwardly and curve in an oval shape to form the upper portion **68** of the racquet frame. A throat piece **70** spans the diverging portions **66** and completes the oval configuration of the racquet. Vertical and horizontal strings **72** and **74**, respectively, are strung on the frame, the strings passing through holes **76** and **78** in the tube portions **55** and **68** and in the throat piece **70**. A slot **80** is provided along the outer edge of the frame in the upper half of the racquet. As in the previous embodiment, rivets **82** having hollow centers **84** are received within the holes **78** of the unslotted portions of the tubing **60** and these rivets serve to protect the strings **72** and **74**. The rivets **82** also serve to secure the throat piece **70** to the diverging portions **66**. Bushings **86** are provided in the holes **78** in the slotted portion of the frame **68** and in the throat piece **70**. These bushings have enlarged head portions **88** to retain them in place and holes **90** extending therethrough to receive the strings **72** and **74**. In order to protect the upper edges of the racquet frame and to protect the walls of the playing court from being nicked or gouged when struck by the racquet, there is provided a plastic cap piece **92**. This cap **92** may be a length of extruded plastic and preferably has grooves **94** along opposite sides so that the cap piece **92** may be snapped into the slot **80** in the upper portion **68** of the racquet frame. The cap **92** may be in addition to a resilient tube **48***a* which is tight or snug fitting inside the tube along the cut away or formed portion to add weight and absorb vibrations.

The welded together portions **62** and **64** of the tubing **60** are surrounded by a hollow wooden member **96**. A covering **98**, for example, a leather wrapping, is provided on the outer surface of the wooden member **96** and provides a non-slippery gripping surface for the racquet handle. A leather thong **100** is attached to the handle, extending from the lower end thereof.

It will be understood that changes may be made in and to the embodiments of my invention described above. The slot in the upper portion of the frame may extend along a greater or lesser portion of the frame. While the arrangement illustrated in which the slot extends along one half of the frame is preferred, the slot may extend along one-third to two-thirds of the frame. It should also be noted that the slot may be formed by collapsing a portion of the tubing, as shown in FIG. 14, rather than by cutting away the outer edge of the tubing. The tubing forming the frame may also be extruded to form an eliptical cross-section having an internal web as shown in FIG. 15 and FIG. 16. Other means than the hollow rivets and nylon bushings may be used to protect the strings as they pass through the holes in the frame. Also, if desired, the throat piece **30** may be secured to the diverging portions **28** of the frame by welding rather than by the use of hollow rivets. Further, the invention contemplates that the racquet frame comprises the essence of the invention and that a solid, or non-tubular handle could be used to still achieve the preferred objects of the invention.

As these and other changes may be made in the described embodiments of my invention reference should be had to the appended claims in determining the true scope of the invention.

As used in the following claims, the terms "inner periphery" and "outer periphery" refer, respectively, to the half cross section of the frame directed toward the center of the racquet and the half cross section directed away from the center of the racquet. For example, if the cross section shown in FIG. 7 were divided by the diameter which is perpendicular to the plane of the stringing, the left half cross section, when viewed as in FIG. 7, lies in the inner periphery of the frame while the right half cross section lies in the outer periphery.

What is claimed is:

1. A racquet having a head frame of generally elliptical configuration, a throat and a handle extending from the throat, the racquet being formed of a single length of metal tubing the end portions of which extend in parallel contiguous relation to form the handle, the portions of the tubing which form the handle, the throat, and the one-third to two-thirds of the head frame immediately adjacent the throat being hollow and having continuous inner and outer peripheries, one periphery of the tubing being discontinuous throughout the remainder of the head frame to provide a continuous slot therealong, holes being provided at spaced intervals in at least one of the continuous peripheries of the head frame, and the racquet including strings passing through the holes and extending within the confines of the head frame to define the hitting surface of the racquet.

2. The racquet according to claim **1** wherein the continuous slot extends along the outer periphery of the head frame so as to include substantially the entire portion of the curved end of the head frame opposite the handle.

3. The racquet according to claim **1** further including a length of resilient material received within the slotted portion of the tubing.

4. The racquet according to claim **1** wherein the tubing is one-half inch external diameter aluminum tubing and the slot is 7/32 inch wide.

5. The racquet according to claim **4** further including a length of rubber tubing having an external diameter substantially equal to the interior diameter of said metal tubing, said rubber tubing being received within said slot in snug tight fitting relation.

6. A racquet, comprising:

a shaft;

a frame having a pair of first sections extending from one end of the shaft and diverging from one another and a second section joining the first sections to form a substantially elliptical racquet head, the shaft and frame consisting of a single length of hollow metal tubing, that portion of the tubing which forms the second section of the frame and which extends between points between one-third and two-thirds of the distance from the shaft to the end of the frame furtherest from the shaft having inner and outer peripheries, one of which is discontinuous throughout the second sections to provide a slot extending continuously along the section, the remainder of the tubing having continuous inner and outer peripheries;

a throat piece secured at its opposite ends to opposite sides of the frame adjacent the shaft, the frame and the throat piece being provided with a plurality of holes along the lengths thereof;

strings passing through the holes and extending within the confines of the frame and the throat piece; and

a grip surrounding and secured to the end of the shaft remote from the frame.

7. The racquet according to claim **6** further including a length of a resilient material received within said slotted portion of said frame.

8. The racquet according to claim 7 wherein said resilient material comprises a length of rubber tubing having an external diameter substantially equal to the interior diameter of said metal tubing.

9. The racquet according to claim 7 wherein the resilient material comprises an elongated extrusion having slots extending the length thereof and on opposite sides of the extrusion, the edges of the tubing along the cut away portion of the frame being received in the slots to retain the resilient material in place.

10. The racquet according to claim 9 further including a length of rubber tubing having an external diameter substantially equal to the interior diameter of said metal tubing, said rubber tubing being received within the slotted portion of said metal tubing and covered by said length of extrusion.

11. A racquet formed from a single piece of metal tubing formed so that the ends thereof lie in substantially parallel relation to form a handle and the center thereof is curved to a substantially elliptical shape to form a head with stringing woven therein;

a grip holding the ends of the tubing forming the handle together, and which racquet is characterized by said tubing forming said head being hollow with substantially continuous inner and outer peripheries along all but a portion thereof where one periphery is discontinuous to define a continuous slot in the head extending a distance of between one-third to two-thirds the circumference of the head, and with the midpoint of the slot being directly opposite the ends of the tubing forming the handle.

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R. J. APLEY, Assistant Examiner

U.S. Cl. X.R.

273—73 D, 73 H, 73 J, 75