Aug. 31, 1937. H. W. ROBERTS ET AL 2,091,654

APPARATUS FOR STRINGING RACKETS

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Fig. 1

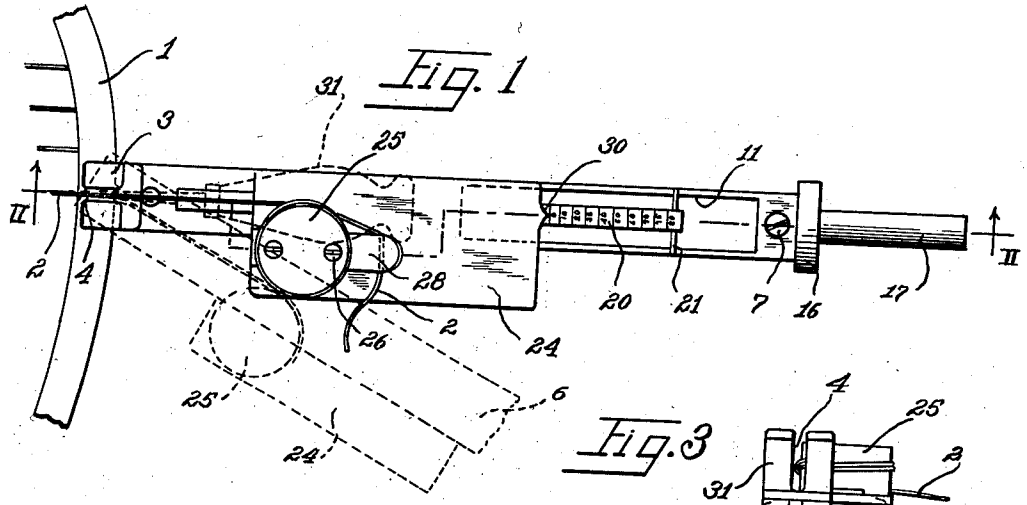


Fig. 3

Fig. 2

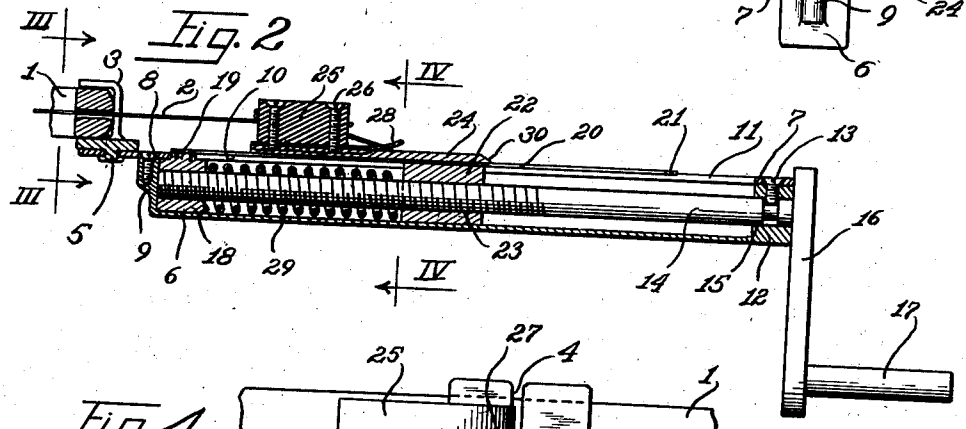
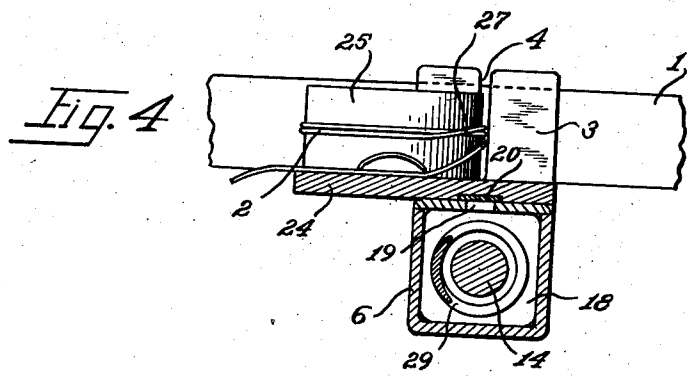


Fig. 4



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APPARATUS FOR STRINGING RACKETS

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Fig. 5

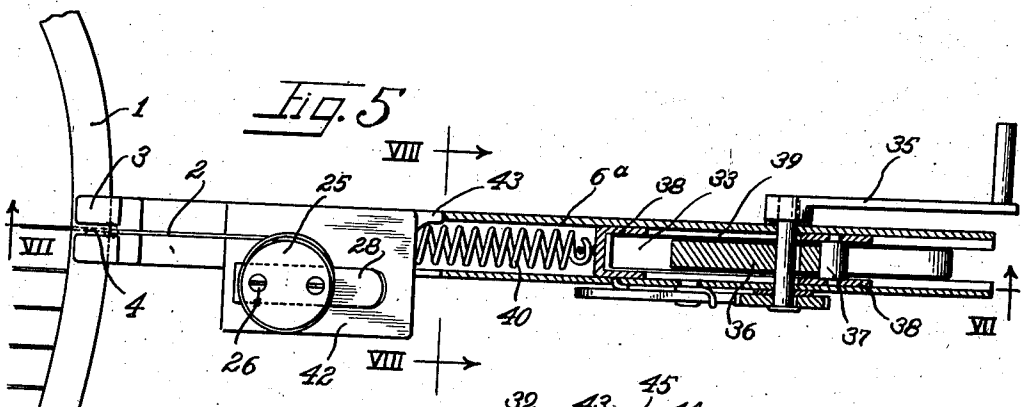


Fig. 6

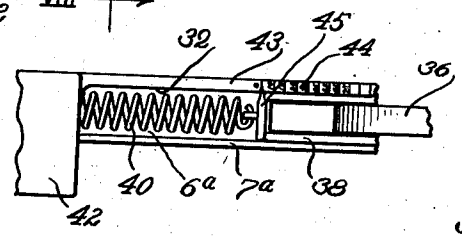


Fig. 7

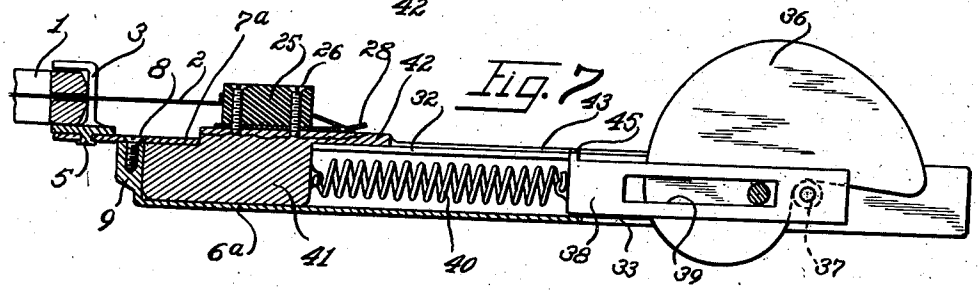


Fig. 8

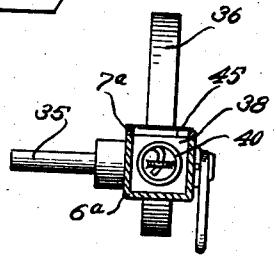
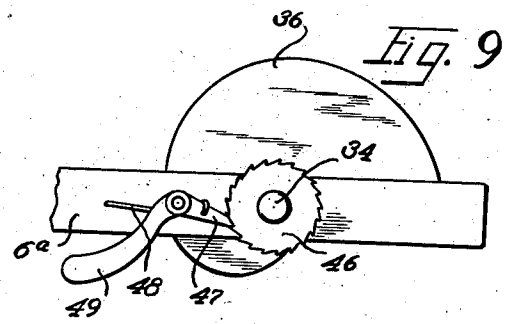


Fig. 9



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APPARATUS FOR STRINGING RACKETS

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Fig. 10

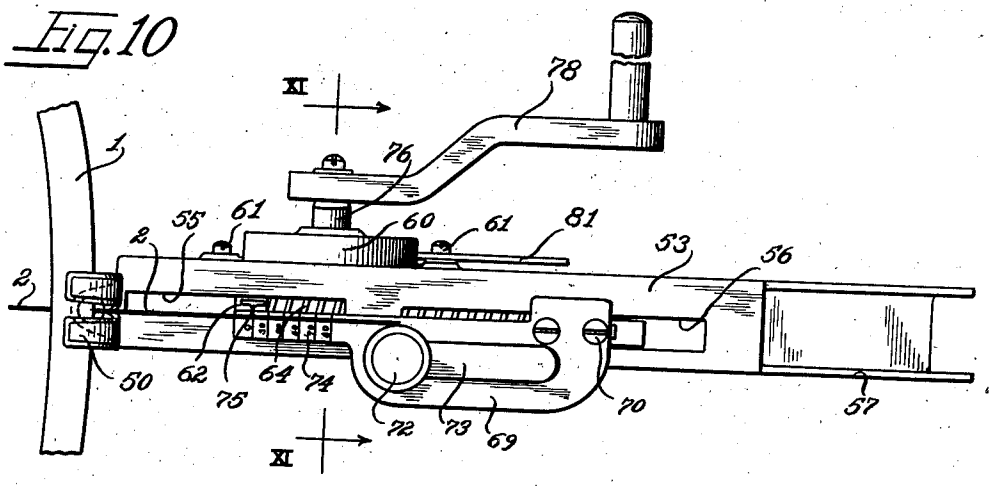


Fig. 12

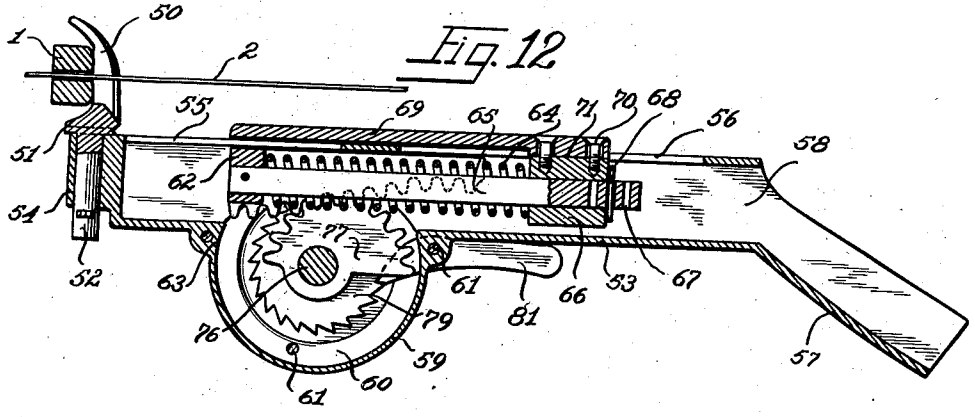
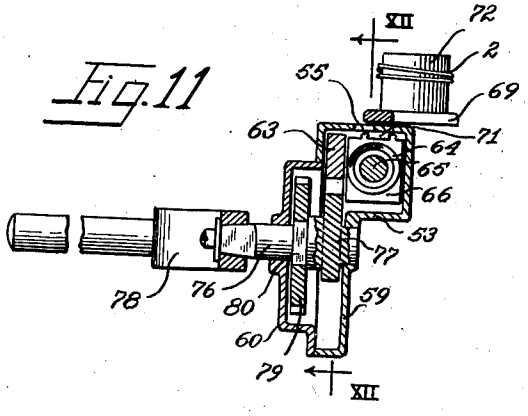


Fig. 11



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UNITED STATES PATENT OFFICE

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APPARATUS FOR STRINGING RACKETS

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Application January 21, 1935, Serial No. 2,626

10 Claims. (Cl. 265—1)

This invention relates to improvements in apparatus for stringing rackets, the invention being highly desirable for use in connection with the proper stringing of rackets of the character used in the playing of tennis, squash, racquets or similar games, although the invention will have other uses and purposes as will be apparent to one skilled in the art, such as the stringing of snowshoes, for example.

Difficulty has heretofore been experienced in the stringing of rackets, especially in connection with the use of portable hand manipulated stringing apparatus. In all such formerly known stringing devices of which we are aware, the racket string was either pulled or tightened at such an angle that it would bear forcibly against the edge of the hoop portion of the racket or, if the string were pulled straight or substantially parallel to the axis of the hole in the racket, the tension was not applied to the string by means of the apparatus but by the hand of the user, and the apparatus was not capable of sustaining the tension after the pulling of the string. Rackets are customarily strung with a substance commonly known as catgut, and it is desirable to have the racket strings under relatively great tension. If, during tensioning thereof, the protruding part of the string is turned at such an angle to the inside part of the string or to the hole in the racket that forcible rubbing of the string against the edge of the racket occurs, it is practically impossible to determine satisfactorily what tension the inner part of the string is under, even though a tension gauge be used to designate the amount of pull upon the protruding part of the string. In addition, pulling a string in this manner results in a fraying of the string which materially weakens and hastens the deterioration of an animal substance such as catgut.

Such stringing in nearly every instance resulted in different portions of the same string or parts of different strings being under different degrees of tension, thereby hastening the warping or distortion of the hoop portion of the racket. Pulling of the string in the proper direction manually by means of a tension indicator, such as a spring scale, was obviously inaccurate, and when the protruding part of the string was swung sidewise to permit an anchoring element to be inserted in the aperture in the racket, the string would rub against the edge of the racket sufficiently to render very indefinite the amount of tension upon the inner part of the string, or else the radius of swing would vary and yield the same results. In addition, holding means for the protruding portion of the string as used heretofore were, in nearly every instance, of a character to fray or permanently distort a part of the string. Also, devices of this character heretofore known of which we are aware included no provision for initially loading the device to a desired extent; in other words, selectively placing a desired amount of tension upon the spring of the device or other tension means prior to exerting the pull upon the racket string. In addition, the hands of the user could not both be removed from the device itself, holding the previously applied tension upon the string.

With the foregoing in mind, it is an object of the present invention to provide a racket stringing device which mechanically places a string under tension by pulling the protruding portion of the string in a direction insuring minimum contact of the string with the racket frame.

It is also an object of this invention to provide a mechanical stringing apparatus which pulls the string as aforesaid and at the same time indicates the tension under which the string is placed.

It is also an object of this invention to provide apparatus for engaging the protruding portion of a string and pulling this portion in a direction to minimize contact of the string with a racket frame until the string is under a desired amount of tension, holding the string under such tension, and permitting the string to be swung sidewise or out of the line of pull while the amount of tension and radius of swing remain constant.

A further object of this invention is the provision of racket stringing apparatus capable of pulling the extruding part of a string in a direction to minimize contact of the string with the racket frame until a desired tension is reached, and automatically holding the string under such tension until the holding mechanism is manually released.

It is also an aim of this invention to provide mechanical means capable of applying tension to a racket string with a minimum fraying of the string against the wall of the aperture in the racket through which the string passes.

An additional aim of the invention is the provision of racket stringing apparatus including string holding means of a character designed so as not to injure or permanently distress the string.

Another object of the invention is the provision of racket stringing apparatus including string holding means of such a character and disposition as to maintain the portion of the string without the racket in parallel relationship with

the portion of the string within the racket during the tensioning of the string.

Still another object of the invention is the provision of apparatus capable of applying tension to a racket string in a direction to minimize the contact of the string with the racket frame, indicating the amount of tension, holding the string under such tension for a desired length of time, and permitting the shifting of the external part of the string without variation in the tension upon the interior part of the string.

Also an aim of this invention is the provision of racket stringing mechanism including means for applying tension to a string which may be selectively loaded to a desired extent prior to the tensioning of a string.

Another object of the present invention is the provision of a racket stringing mechanism including apparatus for applying tension to a racket string, which apparatus functions in such a manner that both hands of the user may be removed from the apparatus after tension has been applied to the string and the apparatus itself will retain such tension for a desired period of time.

Still another object of this invention is the provision of means for applying tension to a racket string by means of a manually operable lever arm, the construction being such that substantially the same amount of pull is used on the lever arm by the operator, regardless of the amount of tension on the string, there being a mechanical increase of leverage in substantial proportion to the increase in tension.

The invention includes in general a member for engagement with the hoop portion of a racket, which member is provided with an aperture or opening substantially in alignment with the aperture in the racket through which the string projects. A supporting element is pivotally secured to said member and carries a pair of separate members movable relatively to each other and also relatively to the supporting element. One of this pair of members carries a string holding or snubbing device thereon, and tension indicating means is associated with both the members. Spring means are interposed between the members and suitable means, including a hand crank, are provided for moving one of the members, resulting in a movement of the other member through this spring means. The holding or snubbing device is preferably made of yieldable material, such as rubber, and is of such a size that the string may be wound therearound without danger of fraying or injurious distortion. Further, the holding device is so disposed that when the string is wound therearound ready for the application of tension, that portion of the string between the racket and the holding device may be parallel to that portion of the string within the racket, or may be in alignment with the hole in the racket. Such relationship is maintained during the application of tension to the string, and the apparatus automatically maintains such tension for as long a time as may be desired.

The pivotal connection between the supporting element of the apparatus and the member which engages the racket permits the external portion of the string to be shifted sidewise out of its relationship with the internal portion without altering the tension or without changing the distance between the racket and the point where the string is held, to permit the insertion of an anchoring element, such as an awl, in the racket aperture alongside the string. It will be seen therefore that the tension upon that part of the string within the racket may be accurately ascertained and the string is not injured during the operation.

While some of the more salient features, characteristics and advantages of the present invention have been above pointed out, others will become apparent from the following disclosures.

The invention includes these and other features of construction, combinations of parts, and process steps hereinafter described, and the invention is illustrated in preferred forms in the drawings, as more particularly indicated by the claims.

On the drawings:

Figure 1 is a fragmentary plan view of an apparatus embodying the present invention shown in operative association with a racket to be strung, with dotted line indications in the figure of a part of the process of stringing.

Figure 2 is a fragmentary vertical sectional view, with parts in elevation, taken substantially on the staggered section line II—II of Figure 1, looking in the direction indicated by the arrows.

Figure 3 is an end elevational view of the apparatus itself, taken substantially as indicated by the line III—III of Figure 2.

Figure 4 is an enlarged fragmentary transverse sectional view taken substantially on the line IV—IV of Figure 2, looking in the direction of the arrows.

Figure 5 is a fragmentary part plan, part sectional view of a different form of apparatus embodying the present invention, showing the same in operative association with a racket.

Figure 6 is a fragmentary top plan view of a portion of the structure shown in Figure 5.

Figure 7 is a fragmentary vertical sectional view taken substantially on the staggered section line VII—VII of Figure 5, looking in the direction of the arrows.

Figure 8 is a transverse vertical sectional view taken substantially on the line VIII—VIII of Figure 5, looking in the direction of the arrows.

Figure 9 is a side elevational view of the right hand portion of the structure as the same is seen in Figures 5 and 7.

Fig. 10 is a fragmentary plan view of a still different form of apparatus embodying principles of the present invention, showing the same in operative association with a racket to be strung.

Figure 11 is a vertical transverse sectional view, with parts shown in elevation, taken substantially as indicated by the line XI—XI of Figure 10, looking in the direction of the arrows.

Figure 12 is a fragmentary central vertical sectional view, with parts shown in elevation for the purpose of clarity, taken substantially as indicated by the staggered section line XII—XII of Figure 11, looking in the direction of the arrows.

As shown on the drawings:

Rackets are usually strung with two strings, one string extending through opposite holes or apertures in the frame portion of the racket, looping around the outer face of the frame portion and passing through the next adjacent hole, and so on, so that all parallel string portions within the hoop or frame portion of a racket are a part of the same string. The other string, of course, has its interior portions also parallel but extending substantially normal to the interior

portions of the first string. In the present instance, in all of the illustrated modifications of the present invention, the string hole in the frame part of the racket is shown as extending substantially horizontally through the racket frame for the purpose of clarity. However, in most instances, the string holes in a racket frame extend obliquely through the frame, one hole slanting upwardly from a horizontal plane and the next adjacent hole sloping downwardly from the plane, with the inside terminations of the holes in the same plane. This brings the outside terminations of the holes in two different planes, so that the loop of the string between two adjacent holes on the outside of the racket will not be parallel to the grain of the wood in the racket frame.

With any of the forms of the present invention herein set forth, it is possible to exert tension upon a string in such a direction that the portion of the string protruding from the racket frame will be substantially parallel to that portion of the same string within the racket frame. This results in a contact of the string against the racket frame at both the inside and outside termination of the hole through which the string is fed, due to the obliqueness of the hole. However, such contact is not such as to seriously injure the string or result in a serious indefiniteness as to the tension applied to the portion of the string within the racket.

The preferable way of using the invention is to adjust the apparatus in relation to the racket so that the protruding portion of the string will be pulled in alignment with the hole in the racket, so that there will be only one point of contact between the string and the racket frame. This results in the possibility of a slightly less injury to the string and a slightly more accurate determination of the tension placed upon the part of the string within the racket. Both settings of the apparatus in relation to the racket are hereinabove explained in view of the fact that while the second setting is the preferable one, the human element is such that in many cases the operator will set the apparatus so that the protruding part of the string will be parallel with the parts inside the racket frame.

The illustrated embodiment of the invention seen in Figures 1 to 4, inclusive, is shown in operative association with a partially strung racket 1, the stringing of the racket being completed with the string 2.

The stringing apparatus includes a substantially U-shaped member 3 for engagement over the hoop or frame portion of a racket, as best seen in Figures 1 and 2. The upper part of the member 3 is provided with a central aperture or opening 4 through which the protruding part of the string 2 may project. This opening or aperture 4 is preferably of such a size as to prevent shifting of the string. The lower portion of the member 3 is provided with a depending structurally integral pivot stud 5 to which a supporting or body member 6 is pivotally connected. The connection is established by means of a plate 7 (Figure 2) loosely engaged around the stud 5 and secured to the supporting element 6 in any desired manner, such as by means of a screw 8 engaged within a boss 9 upon the supporting member.

The supporting or body member 6 is preferably box-like in form, the forward top portion having a relatively narrow slot 10 therein extending in a lengthwise direction, and the rear portion having a relatively wide slot 11 therein. The rear end wall of the body 6 is thickened as at 12, and the plate 7 which forms the top of the body 6 is preferably secured to the rear end 12 by means of a screw 13. The rear end 12 is also provided centrally with a suitable aperture to accommodate the rear end of an elongated bolt 14 which is provided with a reduced portion 15 (Fig. 2) into which the inner end of the screw 13 is loosely engaged to hold the bolt in proper position. Fixedly secured in any desired manner to the rear end of the bolt, outside of the body 6 is a crank arm 16 carrying a handle 17 by means of which the bolt may be rotated.

The forward or most inward end of the bolt 14 is in threaded engagement with a block 18 slidable within the body 6. This block carries upon its upper surface an integral projection 19 of such a size as to fit within the slot 10 in the top member 7. A scale 20, suitably marked for indicating tension in pounds, or any other desirable unit, is connected at its forward end to the projection 19 on the block 18 and is movable with the block. The rear end of the scale is provided with integral cross arms 21 to ride upon the side edges of the top member 7.

Also slidable within the body 6 is another and separate block 22 provided with a central aperture 23 of such a size that the bolt 14 may move freely therein. In other words, there is preferably no direct connection between the block 22 and the bolt 14. Preferably structurally integral with the block 22 is a laterally extending plate member 24 provided with a suitable recess in the undersurface thereof to loosely accommodate the scale 20, as best seen in Figure 4. The connection between the plate 24 and the block 22 is had through the slot 11 in the cover 7 of the body. A string holder or snubber 25 is secured to the plate 24 in any desired manner, such as by screws 26. The snubber is preferably formed of live rubber and is of such a diameter that the string 2 may be wound therearound without fraying the jut of the string. It will be noted from the showing in Figure 1 that the snubber 25 is also disposed in an off-center position so that a string disposed tangentially to this member will be substantially straight; that is, the portion of the string without the racket may be either parallel to the portion of the string within the racket, or in alignment with the hole in the racket, as the case may be. Accordingly, a string may be readily wound around the snubber when the parts are in their full line position shown in Figure 1, and the string will have minimum contact with the racket frame. In placing the string around the snubber, it is preferable to use a suitable hitch, as indicated at 27, to insure positive holding of the string. The loose portion of the string is then tucked beneath a suitable leaf spring anchor 28 held between the snubber 25 and the plate 24.

In operation, the present invention is extremely simple. The U-shaped member 3 is engaged over the edge of the racket with the opening 4 in alignment with a string hole of the racket. The string 2 projects through the hole in the racket and the notch 4 and is engaged around the snubber 25 in the manner above described. The body portion 6 of the device is then placed in alignment with the member 3 in a manner tending to minimize the contact of the string with the racket frame. The handle 17 can then be turned in a clockwise direction, causing the block 18 together with the scale 20 to recede or move backward away from the racket within the body 6. Due to the pressure

of a coiled spring 29 loosely disposed around the bolt 14 between the blocks 18 and 22, the block 22 is also caused to move away from the racket, carrying therewith the plate 24 and snubber 25, and thus applying tension to the string 2. It will be noted that both the string holding device and the tension scale move relatively to the body 6 and relatively to each other, the movement of the string holding device depending upon the pressure of the spring 29, so that an accurate reading of the tension may be obtained by an indicating point 30 on the outer end of the plate 24 riding over the scale 20.

The turning of the handle is continued until the desired tension is placed upon the string, and it will be noted that since the outer portion of the string is parallel to that part within the racket, or in alignment with the hole in the racket, the tension indicated upon the scale by the point 30 will be a substantially accurate indication of the tension upon the portion of the string within the racket, since there will be only a negligible contact of the string with the walls of the hole in the racket. After a desired tension is applied to the string, which tension will be positively held by the apparatus until the handle is rotated in the opposite direction, the body 6 of the device, together with all of the apparatus carried thereby, is pivoted relatively to the member 3, as indicated by the dotted lines in Figure 1. It will be noted that during this pivotal movement, the radius of swing or the distance between the outer edge of the racket and the point where the string is held is not altered in any degree. Consequently, since the desired tension has been applied to the string before the pivotal movement, such pivotal movement does not in any manner alter the tension on the string. After the pivotal movement, an awl or other anchoring implement 31, shown in dotted lines in Figure 1, may be inserted in the aperture in the racket alongside the string to hold the same. The stringing apparatus may then be removed, the loose portion of the string threaded back through the racket in the next adjacent hole, and the apparatus operated in the same manner upon the opposite side of the racket, and so on until the racket has been strung.

In Figures 5 to 9, inclusive, I have shown a different form of apparatus associated with the same racket 1 for applying the same string 2. This form of apparatus includes the same member 3 for engagement with the racket having the slot 4 therein and the depending pivot stud 5 on the bottom thereof. A body portion 6a having a plate 7a secured thereto by means of a screw 8 engaged in a boss 9 is pivotally associated with the member 3 by means of a loose engagement of the plate 7a around the stud 5.

In this instance, the plate 7a is provided with a relatively large slot 32 in the upper portion thereof. The body portion 6a is box-like in shape with the exception of the rear or outer part of the apparatus wherein the central part of the bottom is slotted or removed, as indicated at 33. Near the outer end of the apparatus a transversely disposed shaft 34 is journalled in the side walls of the body 6a. This shaft fixedly carries a handle member 35 by means of which the shaft may be rotated. Also affixed to the shaft within the side walls of the body 6a and extending through the slot 33 in the bottom thereof is a cam member 36 which abuts a roller 37 journalled in the side walls of a yoke member 38. Suitable slots 39 are provided in the side walls of the yoke 38 to permit this member to move backwardly and forwardly within the body 6a over the shaft 34.

Hooked at one end to an eye on the yoke member 38 is a coiled spring 40, the other end of which is likewise attached to a block 41 slidable within the body 6a. Integral with the block 41 is a laterally extending plate portion 42 which has an outwardly extending rearward extension 43 overlying the plate 7a at one side edge thereof. This extension 43 is marked, as at 44, with suitable indicia for indicating the tension placed upon a string. The plate 42 also carries thereupon a snubber 25 and anchoring element 28, as previously described herein. The forward end of the yoke member 38 is upwardly extended and carries thereupon a pointer or indicator 45 which overrides the scale 44.

Outside of the body 6a and fixed to the shaft 34 is a ratchet wheel 46 engaged by a dog 47. The dog is urged into engagement with the ratchet wheel by a suitable spring 48 and is provided with a thumb lever 49 by which the dog may be released.

In operation, the apparatus shown in Figures 5 to 9, inclusive, is substantially similar to that shown in Figures 1 to 4, inclusive. All of the beneficial results and advantages obtainable with the apparatus shown in Figures 1 to 4 are also obtainable with that shown in Figures 5 to 9. It is simply necessary to mount the apparatus as previously described, rotate the handle 35 forwardly, thereby drawing backwardly the yoke 38 by means of the cam 36. The spring 40 will pull the block 41 rearwardly, applying tension to the string, both the yoke 38 and block 41 moving relatively to the body 6a and relatively to each other, depending upon the tension of the string. Consequently, an accurate reading of the tension applied to the string 2 will be had by means of the indicator 45 on the scale 44. When the desired tension is had upon the string 2, such tension is maintained for as long a period as may be desired by means of the dog 47 and ratchet wheel 46. The device may be tilted relatively to the member 3, as previously described herein, and further operation is the same.

In the illustrated embodiment of our invention shown in Figures 10 to 12, inclusive, the same racket 1 together with the same string 2 are illustrated.

The apparatus in this instance includes a racket engaging member 50 in the form of a pair of upright spaced prongs shaped for engagement with a racket frame of substantially any thickness consistent with the commercial construction of such frames. The prongs are spaced apart sufficiently to permit the string to extend therebetween but not freely enough to permit the string to vary out of the desired alignment. As seen best in Figure 12, the prongs are both attached to a base portion 51, to which is also attached a depending smooth-surfaced pivot pin 52.

The supporting element 53, in this instance, comprises a tubular member having an apertured boss 54 on the forward end thereof through which the pivot pin 52 extends, whereby the supporting element or body portion of the device is pivotal relatively to the pin and racket engaging member 50. The supporting element 53 is provided with a forward longitudinally extending slot 55 and a rear longitudinally extending slot 56 in its upper surface. At its rear or outer end, the supporting element is provided with an obliquely downwardly extending three-sided channel por-

tion 57 to provide in effect a pistol grip for the device. It will be noted that this grip 57 is so constructed as not to interfere with the central passage 58 through the member.

Preferably integral with the supporting member 53 and depending therefrom is a gear housing 59 closed by a cover 60 held in position by a plurality of stud bolts 61 or in any other suitable manner. Within the opening 58 in the supporting member is a slidable block 62 which carries preferably integral therewith and on one side thereof a substantially arcuate rack 63 toothed on its lower edge. The block 62 is normally urged forwardly towards the boss 54 by means of a coiled spring loosely engaged around a shaft 65, the spring having one end abutting the block 62 to which one end of the shaft is pinned and the other end abutting another block 66 through which the other end of the shaft freely extends. The stationary shaft 65 is provided at its outer or free end with a plurality of vertically extending apertures 67 through any of which a cotter pin 68 may be engaged to maintain the blocks 62 and 66 and the spring 64 in their proper relationship. By means of the apertures 67 and the cotter pin 68, a predetermined loading may be placed upon the spring, depending upon which aperture is selected for the insertion of the cotter pin.

A movable superstructure in the form of a plate 69 is secured to the block 66 by means of screws 70 or in any other desired manner. At the connection between the plate 69 and block 66, the plate is provided with a depending tongue 71 seated in a suitable groove in the block, as seen in Figures 11 and 12, the tongue 71 extending through the slot 56 in the top of the supporting member. Of course, the plate 69 is movable with the block 66, and this plate carries thereupon a string snubber 72 comprising a core of any desirable material surrounded by a rubber element to prevent injuring the string. Immediately behind the snubber 72 is a leaf spring anchor 73 for holding the free end of the string after the same has been wound around the snubber. The forward portion of the plate 69 is provided with a suitable tension scale, as indicated at 74, and a suitable pointer 75 carried by the other block 62 projects through the slot 55 adjacent the scale 74 to facilitate tension readings. It will be noted that when the block 62 is forced rearwardly in a manner to be later described, the spring 64 will also force rearwardly the block 66 together with the plate 69 and so impose tension upon the string. The two blocks 62 and 66 are not only movable relatively to the supporting member 53 but also relatively to each other, and with the scale on one of these blocks and the pointer or indicator on the other of the blocks, an accurate reading of the tension upon the string is provided.

The mechanism for moving the block 62 rearwardly to impose tension upon the racket string 2 includes a shaft 76 journalled in the gear housing 59 and cover 60. This shaft carries a cam-shaped pinion 77 thereon which engages with the arcuate rack 63. A handle or crank arm 78 is secured to the outer end of the shaft 76 in any suitable manner. It will be noted from the particular shapes of the pinion 77 and the rack 63, the pinion, being eccentrically mounted on the shaft 76, that as the handle is drawn away from the racket 1 to apply tension to the string, the same amount of pull upon the handle is utilized, regardless of the amount of tension on the string. As the tension upon the string increases, the leverage upon the crank arm 78 is also increased due to the shapes of the pinion and rack, so that maximum leverage is obtained when the pull is at a maximum.

As the structure is illustrated in the drawings, some tension is on the string 2, in view of the fact that the handle is shown substantially in a horizontal position or parallel with the supporting member 53. In many cases, when the handle is in such a position, sufficient tension will be upon the string. To maintain this tension upon the string while the supporting member is swung sidewise relatively to the racket engaging member 59 and the awl is inserted in the aperture in the racket to hold the string, a pawl and ratchet mechanism is provided. This mechanism includes a ratchet wheel 79 having a polygonal aperture seated over a polygonal portion 80 formed on the shaft 76 (Figure 11) and a pawl 81 pivotal upon the smooth shank of one of the screws 61. The pawl has a rearwardly extending shank portion so that the pawl will be self-counterbalanced and urged into engagement with the ratchet at all times.

In operation, the structure shown in Figures 10 to 12, inclusive, is substantially similar to that above described. It is simply essential to position the device against the racket, attach the string around the snubber 72, anchor the loose end of the string under the leaf spring 73, and pull away from the racket upon the handle 78 until the pointer 75 is opposite the desired tension. The body portion of the device may be swung laterally relatively to the racket engaging member 59 and anchoring means positioned alongside the string in the aperture of the racket. As the case may be, the protruding portion of the string when attached to the device is either parallel to that portion within the racket or in alignment with the aperture of the racket. Tension will be held by means of the pawl and ratchet until the pawl is manually released. In most instances, it is preferable for the operator to remove both hands from the apparatus after tension has been applied, the engagement of the apparatus with the racket under tension imposed upon the string holding the device in position. The unobstructed opening 58 through the supporting member 53 provides a very ready method of assembling the mechanism. The block 62 together with the rack 63, block 66, spring 64, shaft 65 and cotter pin 68 may be all previously assembled and loaded to a desired extent and then pushed into position into the opening 58. After this, the plate 69 may be engaged with the block 66 by means of the screw 70. The cover 60 together with the shaft 76, pinion and pawl and ratchet can then be assembled in an obvious manner.

From the foregoing, it will be apparent that we have provided apparatus for stringing a racket which is simple in construction and operation and which applies tension to a string in the proper direction so as to eliminate any objectionable contact of the string with the aperture in the racket and which does not fray or permanently distort the string. Further, the apparatus gives an accurate indication of the tension applied to that portion of the string within the racket and will not only provide and indicate such tension but will hold such tension as long as may be desired. In addition, the apparatus is portable and may be easily manipulated by hand. It is also apparent that we have provided a new and novel method of stringing a racket capable of giving better results than methods heretofore known.

We are aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and we, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

We claim as our invention:

1. As an article of manufacture, a device for stringing a racket, comprising a hand-portable member shaped for engagement with the hoop portion of a racket and having an aperture to be positioned substantially in alignment with the hole in said hoop portion, a body portion pivoted to said member with the pivot point in alignment with the outer end of the string hole in the racket, tension applying means associated with said body portion and movable relatively thereto, and a snubber carried by said tension means for holding the free part of a string extending through said aperture.

2. As an article of manufacture, a hand portable racket stringing device, including a member for engagement with a racket having an opening therein, and a supporting portion pivoted to said member and carrying mechanism for holding a string threaded through said member and applying tension thereto, said supporting portion being pivotal relatively to said member without changing the tension applied and without altering the distance between the racket and the point where the string is held.

3. As an article of manufacture, a racket stringing device, including a member for engaging a racket, a supporting element connected to said member, a pair of separate members movable relatively to each other and to said supporting element and carried by the latter, string holding means movable with one of said separate members, tension indicating means associated with said separate members, threaded means extending loosely through one of said separate members and engaged with the other, spring means disposed between said separate members, and means for actuating said threaded means.

4. As an article of manufacture, a racket stringing device, including a member for engaging a racket, a supporting element connected with said member, a pair of separate members movable relatively to each other and to said supporting element and carried by the latter, string holding means movable with one of said separate members, tension indicating means associated with said separate members, cam means for actuating one of said separate members, spring means connected between said separate members, and stop means for holding said cam means in a desired position.

5. As an article of manufacture, a racket stringing device, including a member for engaging a racket frame, a supporting element connected with said member, string holding means movable relatively to said supporting element, leverage means for moving said string holding means, and transmission means between said leverage means and said string holding means arranged to increase the leverage as the tension on the string increases so that substantially the same pull may be applied to said leverage means regardless of the increase of tension on the string.

6. As an article of manufacture, a hand-portable device for use in stringing a racket, including a member for engaging the hoop portion of a racket, and string tensioning mechanism arranged supportable by the racket and pivotally connected to said member with the pivot point in alignment with the outer terminus of the string hole in the racket.

7. As an article of manufacture, a hand-portable device for use in stringing a racket, including a member for engaging the hoop portion of a racket and supportable by the racket during the stringing operation, a body element pivoted to said member at a point adjacent the racket but to one side thereof, the pivot point being on a line with the outer terminus of the string hole in the racket, and string holding, tensioning and indicating mechanism carried by said body element whereby after the string is tensioned said body element and the protruding part of the string may be swung out of line with said member without altering the tension on the string.

8. A hand-portable stringing device for a racket having a frame provided with transversely extending bores through which a string is threaded, said device comprising a U-shaped member to embrace the upper and lower and outer faces of a portion of the frame where the frame is bored, and being provided with an aperture for disposition in alignment with the bore in the frame, a body pivotally connected to said member and arranged with the axis of rotation in substantially vertical alignment with the outer face of the frame, means on said body to engage and hold a string, and means on said body to tension the string.

9. A hand-portable stringing device for a racket having a frame provided with a transversely extending bore through which a string is threaded, said device comprising a body to be removably secured to the frame and swingable about a fixed turning point while so secured, said body comprising a first member to engage the outer face of the frame and being provided with an aperture for disposition in alignment with the bore in the frame, a second member having means to hold a string threaded through the bore and through the aperture in said first member, said second member being pivotally secured at a fixed pivotal point on said first member and arranged relative to said first member so that when it is swung about said pivotal point tension of the string is not affected by the swinging of said second member.

10. A hand-portable stringing device for a racket arranged to be supported by the racket and to be swingable about a fixed turning point relative thereto during the stringing operation, said device comprising a bracket to be placed on the frame of the racket and being provided with an aperture to be disposed in alignment with a hole of the frame for the string to be threaded therethrough, a body pivotally connected to said bracket and having means to tension the string whereby said bracket is clamped against the frame when the string is in tension and the device is then supported by the racket, said body being arranged swingable about said pivot and so disposed relative to said bracket and to the frame that it is swingable without changing the tension on a taut string.

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