March 21, 1944. T. B. BROWN ET AL 2,344,799

ARCHERY BOW

Filed June 12, 1941

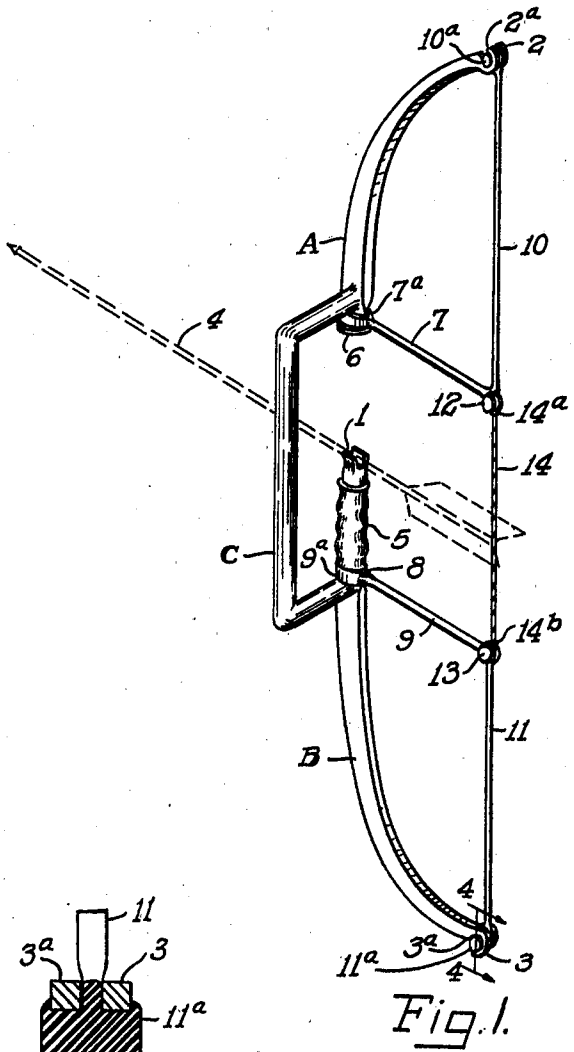


Fig. 1.

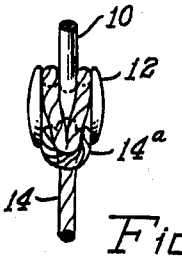


Fig. 2.

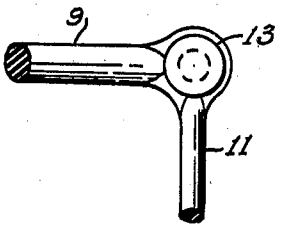


Fig. 3.

Fig. 4.

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Patented Mar. 21, 1944 2,344,799

UNITED STATES PATENT OFFICE

2,344,799

ARCHERY BOW

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Application June 12, 1941, Serial No. 397,780

8 Claims. (Cl. 124—23)

This invention relates to archery bows and has for its principal object the provision of an improved construction of bow enabling greater shooting accuracy and increased shooting power with the application of the same or a less shooting force than is required in the use of bows heretofore proposed.

Incidental to the objective of securing a bow construction of greater shooting accuracy, it is an object of the present invention to so construct the bow as to enable an arrow, when placed in cooperation therewith for propulsion therefrom, to be directly alined with the target in the plane of the bow without in any way sacrificing strength in the construction of the bow.

In the use of the conventional types of bows, the arrow, when it is engaged with the bow string for launching, bears against the metal portion of the bow at one side or the other when aimed at the target and thus is deflected somewhat out of the true plane of movement of the bow string, which when tensioned and let go moves in a plane through the center of the bow. This deflection of the arrow necessitated by its positioning at one side or the other of the conventional bow must be taken into account and allowance made therefor when shooting at a target with such conventional type of bow.

The construction of the present invention contemplates the provision of a bow comprising essentially two bow arms alined in the same plane as they would be if formed continuous, but having their inner ends separated at what may be termed the central portion of the bow, said arms being joined together by an offset portion of the bow which portion is laterally offset with reference to the central portion of the bow or in other words with reference to that portion of the bow at which the inner ends of the two bow arms are separated.

The inner end of the lower bow arm extends to a point adjacent the center of the bow unit and is provided thereat with a notch or groove receiving and supporting the arrow when the same is engaged with the bow string and being aimed at the target. The laterally offset bow portion connecting the two bow arms is joined to the lower bow arm at a point well below the aforesaid groove so as not to interfere with the ability of the lower bow arm to be gripped by the archer at a point adjacent the grooved inner end of the lower bow which is substantially at the center of the bow unit.

The construction of the bow is such therefore that the inner ends of the bow arms may be separated to enable the provision of the aforesaid groove in the lower bow arm without in any way weakening the bow structure, to thus enable an arrow positioned in the bow in engagement with the bow string for launching, to be directly alined with the target in the common plane of the bow and the bow string.

It is contemplated that the bow of the present invention shall be of nonresilient construction and that the propelling force to be applied to the arrow shall be supplied entirely by a bow string comprising a nonresilient element and elements of varying resiliency having a novel cooperative arrangement to the end that a far greater proportion of the force which is applied to tension the bow string for propulsion of the arrow shall be exerted in the direction of the arrow's intended flight than was heretofore possible in previous constructions.

In the conventional types of archery bow constructions where the bow string runs simply between the extreme ends of the bow, only a very small proportion of the force applied to tension the bow string is exerted in the direction of the arrow's flight when the bow string is released. This is because, although the force applied to tension the bow string is applied in the direction of the intended flight of the arrow, it reacts primarily upon the extreme ends of the bow and thus is broken into components which are expended not in the direction of the arrow's intended flight but in the direction of the ends of the bow from the point of application of the force, so that the component of force which is expended in the direction of the arrow's intended flight is only a small proportion of the total force applied.

The necessity for force applied to tension the bow string to react upon the ends of the bow is of course clear in resilient bow constructions where the arrow's propelling force is produced by the resilient or spring-like reaction of the bow to the force applied to tension the bow string.

Nevertheless in resilient as well as non-resilient types of bow constructions so much of the force applied to tension the bow strings as is expended in the direction of the ends of the bow upon release of the bow string is wasted so far as the propulsion of the arrow is concerned.

The bow string of the present invention contemplates the utilization of "heavy" resilient elements secured to the bow and extending therefrom parallel to each other in the direction of the arrow's intended flight, the employment of a non-resilient element interconnecting the outer ends of the aforesaid "heavy" resilient elements,

and the provision of "light" resilient elements extending to the extremities of the bow from the points of connection of the "heavy" resilient elements with said non-resilient element. Thus when force is applied to the non-resilient element to tension the bow string, the "heavy" resilient elements are maintained substantially in alinement with the arrow's intended flight and the force so applied is mainly utilized in the stretching of said "heavy" resilient elements, while only a small proportion of such force is applied to the stretching of the lighter resilient elements. Thus a greater proportion of the reacting force is expended in the direction of the arrow's intended flight and only a small proportion of the reacting force is expended in the direction of the ends or extremities of the bow.

In the accompanying drawing:

Figure 1 is a perspective view of an archery bow embodying our invention.

Figure 2 is a detail view of the connection of the non-resilient element of the bow string to the resilient elements thereof.

Figure 3 is a detail view of the interconnection of one of the "heavy" resilient elements of the bow string with one of the lighter resilient elements so as to form an integral resilient member.

Figure 4 is a sectional view on the line 4—4 of Figure 1 through one extremity of the bow and showing the connection of the bow string thereto.

Now describing the invention in detail by reference to the accompanying drawing, the archery bow of our invention includes an upper arm A, a lower arm B and an intermediate interconnecting bow portion C. The bow arms A and B have their inner ends separated but said arms are generally in a common plane as they would be if they were continuous; that is, without any separation between their inner ends. The intermediate bow portion C is laterally offset and serves to join the bow arms A and B into a unitary construction. The inner end of the bow arm B is provided with a recess or groove 1 and is located at a point substantially centrally intermediate the extremities 2 and 3 of the bow arms A and B.

The recess or groove 1 is provided to receive and support an arrow such as indicated at 4 when the same is to be engaged with the bow string for shooting at a target. The bow arm B is provided immediately below the groove or recess 1 with a hand grip 5 which may be engaged by the hand of the archer in the use of the bow for shooting the arrow at a target.

It will be noted that the bow arm B is somewhat longer than the bow arm A so as to enable the groove 1 to be positioned substantially centrally intermediate the extremities 2 and 3 of said arm and that the intermediate bow portion C which interconnects the arms A and B into an integral unit is joined to the arm B at a point below the hand grip portion 5 of said arm so as to enable the bow to be grasped by the archer by said hand grip 5 at a point immediately adjacent the groove or recess 1 and thus as close as possible to the center of the bow unit to facilitate ease of balancing the bow in the hand of the archer in use.

The inner end of the bow arm A is formed as an abutment 6 to engage the looped end 7*a* of a resilient element 7 to maintain the same in proper position relative to the bow. Likewise the lower arm B is provided with an annular groove 8 for reception of the looped end 9*a* of a resilient element 9. The resilient elements 7 and 9 extend from the bow in directions substantially parallel to the intended line of flight of the arrow 4 and comprise what are termed herein the "heavy" resilient elements of the bow string.

The ends 2 and 3 of the bow arms A and B are bifurcated as shown and notched as at 2*a* and 3*a* to receive the knobbed ends 10*a* and 11*a* of the "light" resilient elements 10 and 11 respectively. The resilient elements 7 and 10 may be formed integral or of a single piece of rubber or other suitable resilient material and provided at their juncture with an enlarged or knobbed portion 12. Likewise the resilient elements 9 and 11 may be formed integral or of a single piece of rubber or other suitable resilient material and formed at their juncture with an enlarged or knobbed portion 13. (See Figure 3.) The enlarged or knobbed portions 12 and 13 are interconnected by a non-resilient element 14 which may be made of catgut, nylon or the like or any other material suitable for such purpose which is substantially nonstretchable. This element 14 is provided with loops 14*a* and 14*b* at its ends which are looped respectively around the knobs 12 and 13 for interconnecting the juncture of the elements 7 and 10 with the juncture of the elements 9 and 11. (See Figure 2.)

It will be noted that although the elements 7 and 10 may be formed integral as shown, nevertheless the element 7 is substantially heavier or of substantially greater thickness than the element 10, and likewise it will be noted that element 9 is substantially heavier or of greater thickness than the element 11. It is contemplated that the elements 7 and 9 shall have a greater resistance to forces tending to stretch them than shall the elements 10 and 11.

In use, an arrow such as indicated at 4 may be positioned as shown with its rear end engaging the non-resilient element 14 and supported in the groove 1. When the element 14 and the rear end of the arrow 4 engaging the same are pulled back to tension the bow string (which may be said to comprise the elements 7, 10 and the elements 9, 11 together with the interconnecting element 14), it will require a greater proportion of the force so applied to said element 14 in order to stretch the "heavy" resilient elements 7 and 9 than will be required to stretch the "light" resilient elements 10 and 11. In other words the "light" resilient elements 10 and 11 will stretch much more easily than the "heavy" resilient elements 7 and 9. Thus the force which is applied to tension the bow string (when the non-resilient element 14 is pulled back) will be directed primarily to overcoming the resistivity or resistance to stretch of the elements 7 and 9 and only incidentally to overcoming the much lesser resistivity of the elements 10 and 11. Since the tensioning force is mainly directed in a line parallel to the intended direction of flight of the arrow, likewise the reacting force which is expended when the bow string is released, will be exerted primarily in the direction of the intended flight of the arrow.

Because of the fact that the tensioning force applied to the non-resilient element 14 when the same is pulled back is primarily directed to overcoming the resistance of the "heavy" resilient elements 7 and 9, and only incidentally to overcoming the much lesser resistance of the "lighter" resilient elements 10 and 11, the reacting force expended when the bow string is released to launch the arrow will be largely directed in the line of the intended flight of the arrow and only

a very small proportion of the said force will be expended in the direction of the extremities of the bow. The function of the "light" resilient elements 10 and 11 is thus seen to be primarily to maintain the substantial parallelism of the "heavy" resilient elements 7 and 9 as the same are tensioned when the bow string is pulled back which in turn tends to assure that the greater proportion of the reacting force will be expended in the direction of the intended line of flight of the arrow when the bow string is released to launch the same and that only a comparatively small proportion of said reacting force will be expended in the direction of the extremities of the bow.

Thus on account of the arrangement of the elements of the novel bow string of our invention, the application of a comparatively much smaller force in the tensioning of the bow string serves to apply much greater power to the launching of an arrow than is the case in constructions previously devised. The curvature of the bow itself, the fact that the same is of non-resilient construction, together with the novel arrangement of elements comprising the bow string, all insure the elimination of bow string slap against the archer's bow hand which is incidental to the release of the bow string for launching of the arrow in other constructions of archery bows, so that in the use of the archery bow of the present invention it is not necessary for the archer to wear a glove or hand and wrist protector upon his bow hand as is necessary in practically all other types of archery bows heretofore known.

Other advantages of the construction of the present invention are that the bow on account of its non-resilient construction cannot warp or get out of shape and thus needs no special protection from the effects of damp weather. And since the propelling power of the archery bow of our invention does not in any way depend upon resiliency of the bow itself, the same is not subject to loss of life as is the case in resilient bow constructions and thus the archery bow of our invention may be made of cheaper construction and will last longer than bows of resilient construction. Furthermore, except when the bow string in the construction of our invention is being pulled back preliminary to launching the arrow, said bow string is under no tension and therefore may be left assembled upon the bow when the same is not in use without loss of life either to the bow or to the bow string, whereas in conventional constructions the bow string is usually required to be removed from the bow when the same is not in use.

It will be readily apparent that the bow string of our invention may be readily replaced at very nominal cost when required and that the same has been designed with a view to greatly facilitating the assembly of the bow string elements relative to one another and their attachment to the bow.

While the elements 7 and 10 are shown as being formed of a single piece of rubber or like material and likewise the elements 9 and 11 are shown as formed of a single piece of rubber or like material it will be understood that the elements 7 and 10 may be separate elements joined together at the point 12 by any suitable means and likewise that the elements 9 and 11 can be separate elements joined together at point 13 by any suitable means. It will be further understood that while we prefer that the element 14 shall be formed of catgut, nylon or other comparatively non-resilient or non-elastic material (as distinguished from the more resilient or elastic elements 7, 10 and 9, 11), the element 14 may nevertheless of course be formed of the same material as the elements 7, 10 and 9, 11. In the latter case it will be apparent that the elements 10, 14 and 11 may be formed as a single strand or element of the same suitably resilient or elastic material.

It will likewise be understood that while we prefer to make the elements 7 and 9 heavier or thicker than the elements 10 and 11, that nevertheless very good results may be obtained by the arrangement shown if the elements 7, 10 and 9, 11 and even 14 are all formed of the same material and each has like characteristics with reference to its resistivity to elongation. The term "resistivity to elongation" is used herein to refer to that characteristic of elasticity of the various elements which may require that a greater force be applied to one element in order to stretch the same a given degree than is necessary to be applied to another element to stretch the latter the same amount.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. In an archery bow, in combination, an upper bow arm, a lower bow arm, and an intermediate bow portion interconnecting said upper and lower bow arms, the inner ends of said bow arms being separated and one of the same extending to a point substantially midway between the outer extremities of said arms and being provided with a groove for receiving and supporting an arrow to be launched from the bow, the intermediate bow portion joining the last mentioned bow arm at a point spaced from the inner end of said last mentioned arm sufficiently to enable said last mentioned arm to be gripped by the hand of the user at a point immediately adjacent said groove.

2. In an archery bow, in combination, an upper bow arm, a lower bow arm, and an intermediate bow portion interconnecting said upper and lower bow arms, the inner ends of said bow arms being separated and one of the same extending to a point substantially midway between the outer extremities of said arms and being provided with a groove for receiving and supporting an arrow to be launched from the bow, the intermediate bow portion joining the last mentioned bow arm at a point spaced from the inner end of said last mentioned arm sufficiently to enable said last mentioned arm to be gripped by the hand of the user at a point immediately adjacent said groove, and a bow string for said bow comprising a pair of resilient elements secured to the bow at spaced points intermediate the extremities of the same, said elements extending from the bow in substantially parallel relation, a non-resilient element interconnecting the free ends of said first mentioned elements, a resilient element connecting one end of the non-resilient element to one extremity of the bow, and another resilient element connecting the other end of said non-resilient element to the other extremity of said bow, the resistivity to elongation of each element of said pair of resilient elements being greater than the resistivity to elongation of either of the other resilient elements.

3. In a device of the class described, in combination, an archery bow and a bow string therefor comprising a pair of resilient, shape retaining members, each member being integrally com-

posed of a body of rubber or like material and having a pair of arms integrally joined and disposed at right angles to each other, one arm of each member being of greater cross sectional area than the other arm of said member, said members having the arms of greater cross sectional area secured to the bow at spaced points intermediate the extremities of the bow with said last mentioned arms extending from the bow in substantially parallel relation, the other arms of said members being secured to opposite ends of the bow, and a non-resilient element interconnecting the respective points of juncture of the arms of said members.

4. In a device of the class described, in combination, an archery bow and a bow string therefor comprising a pair of resilient, shape retaining members, each member being integrally composed of a body of rubber or like material and having a pair of arms integrally joined and disposed at right angles to each other, one arm of each member being secured to the bow intermediate the extremities of the bow, said arms so secured extending from the bow in substantially parallel relation, the other arms of said members being secured to opposite ends of the bow, and a non-resilient element interconnecting the respective points of juncture of the arms of said members.

5. A device as claimed in claim 4 wherein the extremities of the bow are bifurcated and provided respectively with notches, said other arms of said resilient members each being provided with a knobbed portion at its bow engaging end, the latter being adapted to be received between the respective bifurcations and said knobbed portions received in the respective notches.

6. A device as claimed in claim 4 wherein the said resilient members are each provided with a knobbed portion at the respective points of juncture of the said arms, said non-resilient element being provided at each end with a looped portion adapted to cooperate respectively with the knobbed portion of one of said arms for detachably connecting said element to said arms.

7. A device as claimed in claim 4 wherein the bow comprises spaced upper and lower bow arms and wherein the said resilient members are each provided with a knobbed portion at the respective points of juncture of the said arms, said non-resilient element being provided at each end with a looped portion adapted to cooperate respectively with the knobbed portion of one of said arms for detachably connecting said element to said arms, said first arms having looped portions at their bow engaging ends adapted to cooperate respectively with the upper and lower bow arms.

8. In a device of the class described, in combination, an archery bow, and a bow string therefor comprising a pair of resilient, shape retaining members, each member being composed of a body of rubber or like material, said members being secured to the bow at spaced points intermediate the extremities of the bow and extending from the bow in substantially parallel relation, a second pair of resilient members each composed of a body of rubber or like material and each respectively connected to the free end of one of said first members and also connected to one of the bow extremities, said first members being of greater cross sectional area than said second members, and a non-resilient element interconnecting the points of juncture of said members.

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