

[54] **FORCE MULTIPLYING TYPE ARCHERY BOW**

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[58] Field of Search **124/24 A, 24 R, 23 A, 23 R, 124/30 A**

[56] **References Cited**

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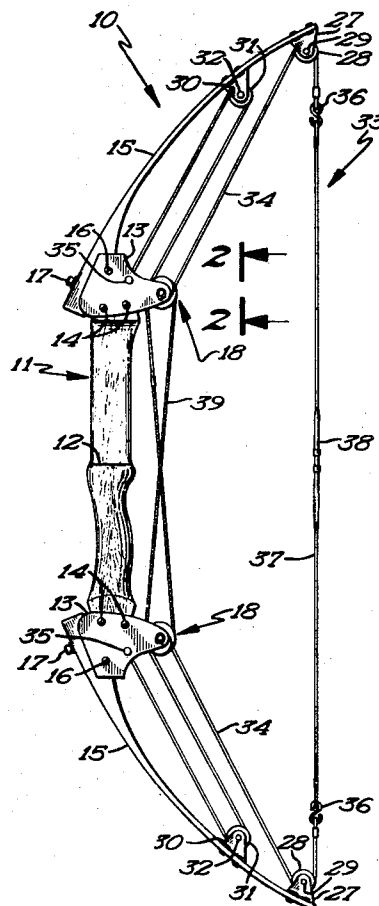
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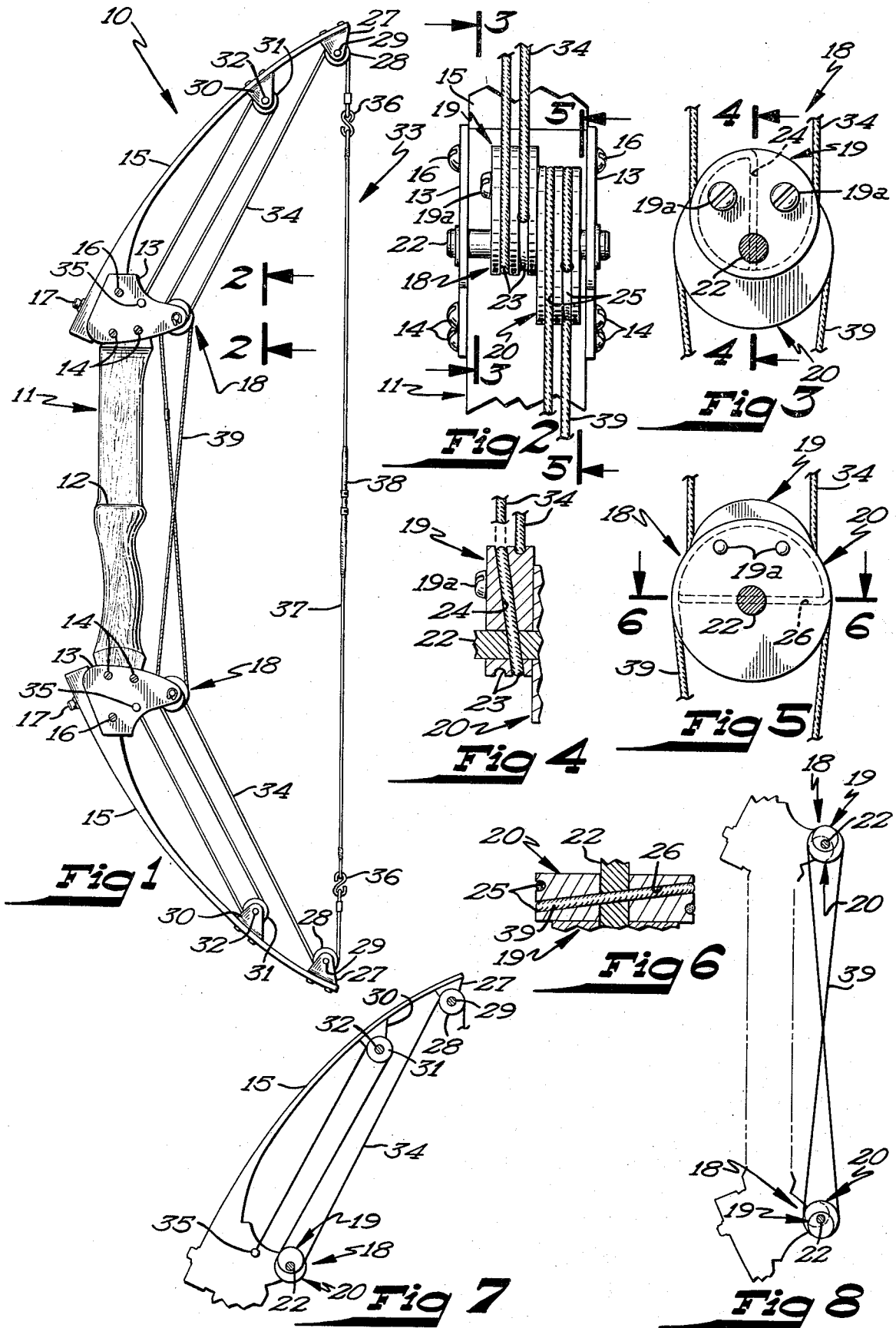
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[57] **ABSTRACT**

An archery bow includes a handle having resilient limbs secured thereto and extending outwardly therefrom. A pair of eccentric sheaves are revolvably mounted on the handle and a pair of pulleys are revolvably mounted on the ends of the limbs. A bowstring has its ends anchored to the handle and is trained about the eccentric sheaves and pulleys to define a nocking stretch. When the bowstring is drawn, the eccentric sheaves produce an overcenter action so that the force beyond this point is less than the force required at an intermediate draw position. A pair of concentric sheaves are each connected to one of the eccentric sheaves, and an endless crossed cable is trained about these concentric sheaves to thereby cause the eccentric sheaves to rotate in unison during movement of the nocking stretch between drawn and rest positions.

4 Claims, 8 Drawing Figures





FORCE MULTIPLYING TYPE ARCHERY BOW

SUMMARY OF THE INVENTION

This invention relates to an archery bow.

Certain archery bows have been developed to incorporate eccentric pulleys to produce an overcenter effect when the bowstring is drawn. In these bows, the bowstring is trained about the eccentric pulleys, which are usually mounted on the tips of the limbs or closely adjacent the limb tips. However, in archery bows of this construction, the eccentric pulleys may not rotate in unison if the eccentric pulleys are not subjected to the same pulling force. Unequal pulling forces may be exerted on the eccentric pulleys when the nocking stretch is gripped offcenter with respect to its longitudinal center point.

It is therefore a general object of this invention to provide an archery bow having a pair of eccentric sheaves revolvably mounted on the bow handle about which the bowstring is trained to produce an overcenter effect when the bowstring is drawn. In the present invention, a pair of concentric sheaves are each connected to one of the eccentric sheaves for rotation therewith, and the crossed connecting cable is trained about the concentric sheaves to assure simultaneous rotation of the eccentric sheaves when the bowstring is drawn.

These and other objects and advantages of this invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to the same or similar parts throughout the several views.

FIGURES OF THE DRAWINGS

FIG. 1 is a side elevational view of the novel archery bow;

FIG. 2 is an enlarged, cross-sectional view taken approximately along line 2—2 of FIG. 1 and looking in the direction of the arrows;

FIG. 3 is a cross-sectional view taken approximately along line 3—3 of FIG. 2 and looking in the direction of the arrows;

FIG. 4 is a cross-sectional view taken approximately along line 4—4 of FIG. 3 and looking in the direction of the arrows;

FIG. 5 is a cross-sectional view taken approximately along line 5—5 of FIG. 2 and looking in the direction of the arrows;

FIG. 6 is a cross-sectional view taken approximately along line 6—6 of FIG. 5 and looking in the direction of the arrows;

FIG. 7 is a diagrammatic elevational view illustrating a portion of the archery bowstring and

FIG. 8 is a diagrammatic elevational view illustrating the connecting cable and the concentric sheaves of the archery bow.

DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

Referring now to the drawings, and more specifically to FIG. 1, it will be seen that one embodiment of the novel archery bow, designated generally by the reference numeral 10 is there shown. The bow 10 includes an elongate handle member 11 which is provided with a conventional arrow shelf 12. Each end portion of the handle member 11 is provided with a pair of similar

side plates 13, the side plates being rigidly secured to the handle member by suitable screws 14.

The archery bow 10 also includes a pair of elongate flexible resilient limbs 15, each having its inner end positioned between and pivotally secured to a pair of side plates by a pivot 16. Each limb 15 is provided with a limb adjustment member 17, which in the embodiments shown, comprises a threaded bolt which extends through a slot in the limb base and which is secured to the handle by means of a threaded insert. Manipulation of the limb adjustment member 17 for each limb, permits each associated limb to be pivotally adjusted for tiller and pullweights.

It will be noted that the side plates 13 project rearwardly from the handle member 11 and each pair of plates accommodates therebetween a compound sheave structure 18. Each compound sheave structure 18 includes an eccentric sheave 19 and a concentric sheave 20 keyed to a sheave axle 21, the latter being journaled in openings in the side plates 13. Suitable retaining clips 22 secure the ends of the sheave axle in mounted relation within the associated side plates 13. It will also be noted that the eccentric sheave 19 of each compound sheave structure 18 is fixedly connected to the associated concentric sheave 20 by a pair of bolts or screws 19a. Thus each eccentric sheave and its associated concentric sheaves are adapted to rotate as a unit relative to the associated side plates.

Referring now to FIGS. 2, 3 and 4, it will be seen that each eccentric sheave 19 has a pair of grooves 23 therein, each groove extending throughout the circumference of the eccentric sheave. It will be noted that these grooves are disposed in substantially parallel planes, and each is connected by a cable passage 25 which extends generally diametrically through the eccentric sheave from one groove 23 therein into the other groove therein. Referring now to FIGS. 2, 5 and 6, it will be seen that the concentric sheave 20 also has a pair of grooves 25 therein, each extending throughout the circumference of the sheave. The grooves 25 in the concentric sheave are also disposed in substantially parallel planes, and each is connected by a cable passage 26 which extends substantially diametrically through the concentric sheave to intercommunicate one groove with the other.

Referring now to FIGS. 1 and 7, it will be seen that each of the limbs 15 is provided with a generally U-shaped pulley bracket 27, fixedly mounted thereon adjacent the tip of the limb, each pulley bracket revolvably mounting a pulley 28 by means of a pulley axle 29. Each resilient limb 15 is also provided with a second pulley bracket 30 fixedly mounted thereon and which has a conventional pulley 31 journaled thereon by means of an axle 32. It will be noted that each pulley 31 is mounted adjacent but is spaced from the associated pulley 28.

The archery bow also includes a bowstring assembly 33 which is comprised of a pair of elongate similar anchor cables 34, each having one end thereof secured to an anchor 35. In this respect, it will be noted that each anchor 35 actually comprises a transverse shaft which extends between and which is journaled in the associated side plates 13. Although not shown in the drawing, each anchor shaft may be adjusted by means of meshing gears (one of which is a worm gear) to wind or unwind the anchored end of the anchor cable attached thereto. Each anchor cable extends upwardly from its

associated anchor and is trained about the pulley 31 and is thereafter trained about the grooves 23 in the eccentric sheave 19. In this respect, each anchor cable is positioned in one of the grooves 23 in an eccentric sheave 19, and the cable then extends through the cable passage 24 to be positioned in the other groove of the eccentric sheave. Thereafter, the anchor cable is trained about the pulley 28 and is secured to a terminal 36 at its other end.

The bowstring assembly also includes a bowstring 37 which is secured at opposite ends to the cable terminal 36. The bowstring 37 actually constitutes the nocking stretch of the bowstring assembly and may include a nocking point 38. It will be seen that when the bowstring is pulled from a rest position as illustrated in FIG. 1, to a drawn position, the anchoring cables will cause the eccentric sheaves to rotate as the bowstring assembly is progressively tensioned or drawn. Thus the eccentric sheaves will pass through an overcenter position wherein the maximum force required during drawing of the bowstring assembly occurs at an intermediate position. Since the maximum draw force occurs at an intermediate position, less force is required to hold the bowstring beyond the overcenter position of the eccentric sheaves and it is therefore easier for an archer to hold the bow in a shooting position.

It is also desirable to have the eccentric sheaves rotate in unison in order to have the arrow subjected to a balanced uniform impelling force. In order to assure rotation of the eccentric sheaves in unison, an endless connecting cable 39 is trained about the concentric sheave 20 of the compound sheave structures 18. In this respect, it will be noted that the connecting cable 39 is trained about one of the grooves 25 in one of the concentric sheaves and the connecting cable is then directed through the cable passage 26 and is positioned in the other groove of the concentric sheave. It will also be noted that the connecting cable 39 is crossed, as best seen in FIGS. 1 and 8. It will be appreciated that the cable is first applied to the grooves and cable passages in the concentric sheaves, and the ends of the cable are thereafter spliced.

During use of the bow, the bowstring will be drawn from the rest position to a drawn position and this movement of the bowstring assembly will cause rotation of the eccentric sheaves 19. As pointed out above, when the eccentric sheaves are rotated through an overcenter position, the bowstring may be more easily held in a shooting position since the maximum drawing force occurs in an intermediate drawn position. It will be noted that since each eccentric sheave is fixedly connected to its associated concentric sheave, movement of either eccentric sheave will impart the same rotative movement to the other eccentric sheave. It is also pointed out that by directing each of the anchor cables through the cable passages of the eccentric sheaves, the bowstring assembly is, in effect, connected to the eccentric sheaves. Similarly, by passing the connecting cable through the cable passages in the concentric sheaves, the connecting cable is connected to the concentric sheaves. Therefore, a very positive rotative action is exerted on the compound sheave structures 18 at all times. It is also pointed out that by mounting the compound sheave structures 18 on the handles, the present bow avoids the use of a plurality of stretches

which extend completely between the respective tips of the limbs. Thus, my novel archery bow is capable of obtaining the mechanical advantage (overcenter action) through the use of eccentric sheaves, but these eccentric sheaves are interrelated with each other to assure rotation of the eccentric sheaves in unison.

From the foregoing description, it will be seen that I have provided a novel archery bow, which is not only of simple and inexpensive construction, but one which functions in a more efficient manner than the heretofore known comparable archery bow.

What is claimed is:

1. An archery bow comprising:

an elongate handle member having spaced apart ends,

a pair of elongate resilient limbs connected to the ends of said handle member and projecting outwardly therefrom, said limbs having free terminal ends,

a bowstring support means mounted on said limbs adjacent the free terminal ends thereof,

a pair of similar eccentric sheaves, each eccentric sheave of said pair of eccentric sheaves being revolvably mounted on said handle immediately adjacent each end thereof, a pair of concentric sheaves, each concentric sheave of said pair of concentric sheaves being fixedly connected to an associated one of said eccentric sheaves and revolvable therewith,

a bowstring assembly having opposite free ends thereof connected with said handle and being trained about said spaced apart eccentric sheaves and about said bowstring support means and defining a nocking stretch between said bowstring support means, said nocking stretch being movable between drawn and rest positions, said eccentric sheaves being revolvable in response to movement of the nocking stretch between the drawn and rest positions,

an elongate flexible, endless connecting cable trained about said spaced apart concentric sheaves to define a pair of stretches which cross each other and cooperating with said concentric sheaves to cause said eccentric sheaves to rotate in unison in response to movement of the nocking stretch between drawn and rest position.

2. The archery bow as defined in claim 1 wherein each eccentric sheave has a pair of circumferential grooves in the surface thereof, and a passage extending generally diametrically through each sheave intercommunicating one groove in eccentric sheave with the other groove thereof.

3. The archery bow as defined in claim 1 wherein each concentric sheave has a pair of circumferential grooves in the surface thereof, and a passage extending diametrically through each concentric sheave intercommunicating one groove in an eccentric sheave with the other groove thereof, said bowstring assembly being positioned in the grooves of each concentric sheave and extending through the passage therein.

4. The archery bow as defined in claim 1 wherein said bowstring support means comprises at least one pair of pulleys, each pulley being mounted on one of said limbs adjacent the end thereof.

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