United States Patent [19]

Trotter

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[54] **COMPOUND BOW**

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[21] Appl. No.: **498,970**

[52] **U.S. Cl.** ..... **124/24 R;** 124/30 A

[51] **Int. Cl.²** **F41B 5/00**

[58] **Field of Search** .... 124/23 R, 24 R, 30 R, 30 A, 124/41 A, 22 R, 20 R

[56] **References Cited**

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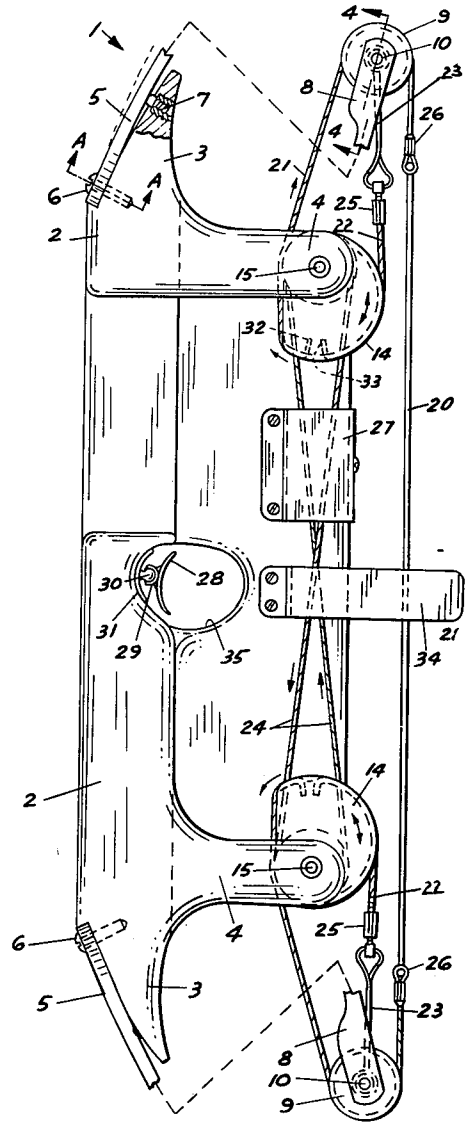
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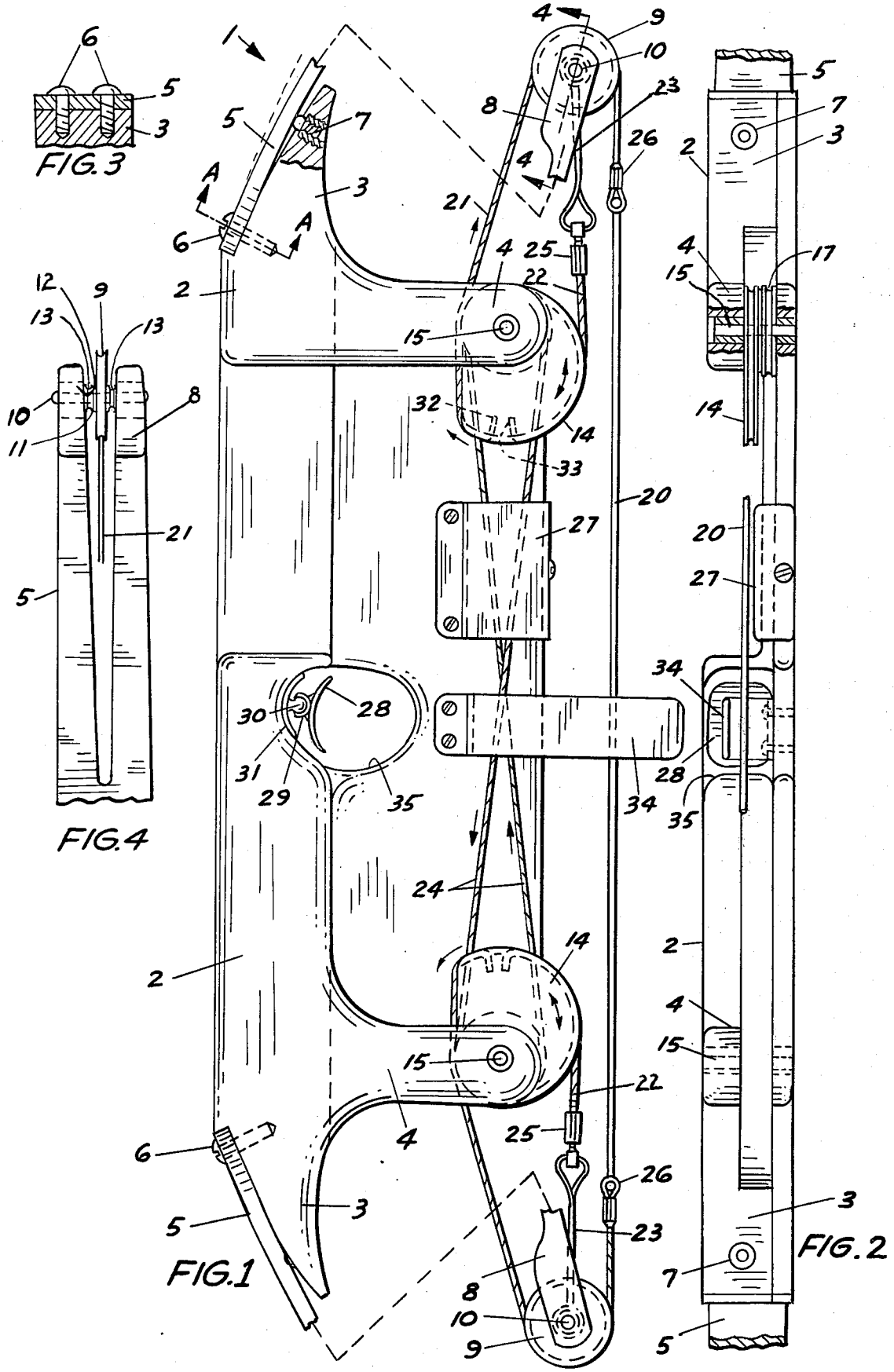
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Assistant Examiner—William R. Browne
Attorney, Agent, or Firm—John M. Harrison

[57] **ABSTRACT**

A compound bow including a frame having a pair of limbs with pulleys rotatably affixed to the free ends thereof for receiving the bowstring and a cable system. The cable system includes a set of cams mounted on the frame of the bow to effect a substantially constant bowstring pressure as the bow is drawn to a predetermined point, and a significant drop in bowstring pressure at said predetermined point for accurate aiming of an arrow placed in cooperation with the bowstring. The cable system has a first forward tension cable, one end of which is carried by one of the cams while the other end of the cable extends uninterrupted to a pulley on the free end of a bow limb. A second forward tension cable is positioned at the opposite end of the bow from the first tension cable and connects to a pulley on the free end of the opposite bow limb in the same manner as the first forward tension cable.

1 Claim, 7 Drawing Figures




FIG. 3
FIG. 4
FIG. 1
FIG. 2

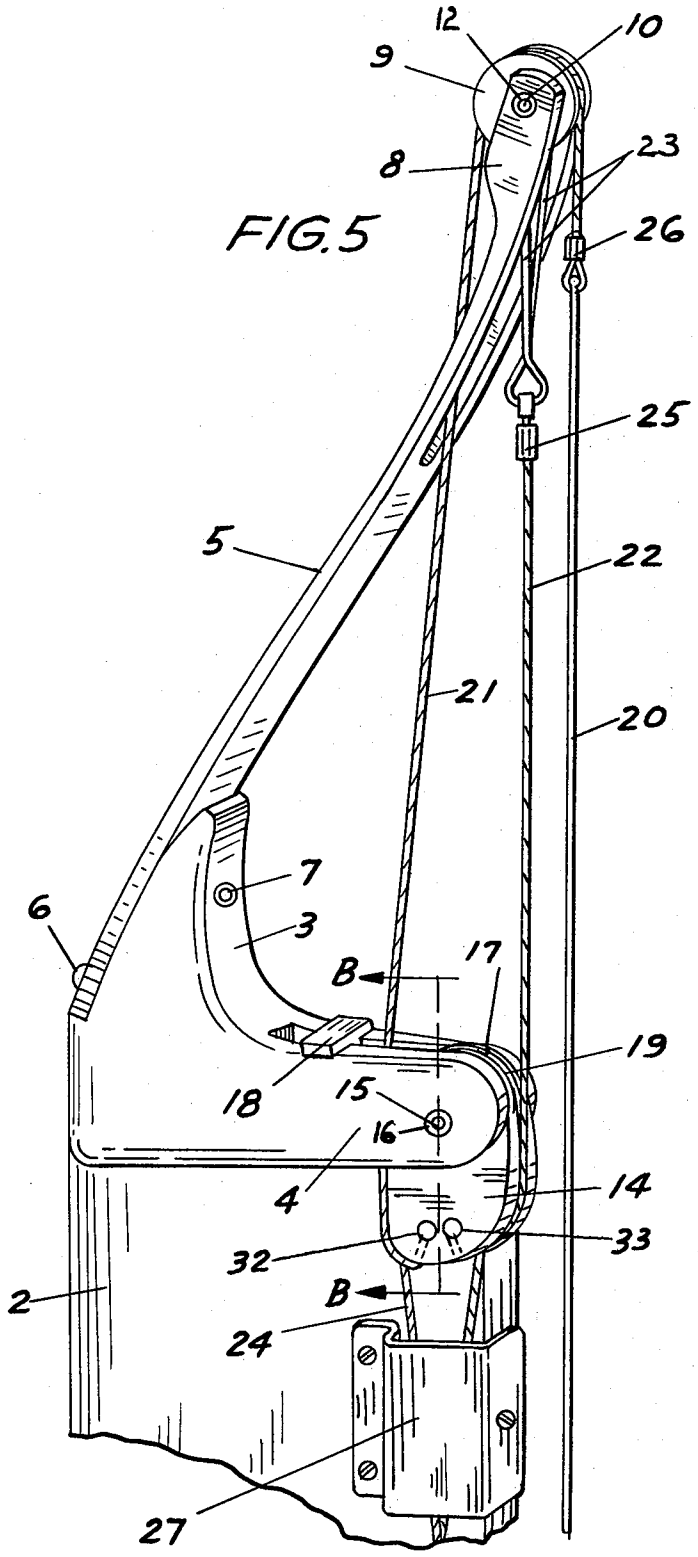


FIG. 5

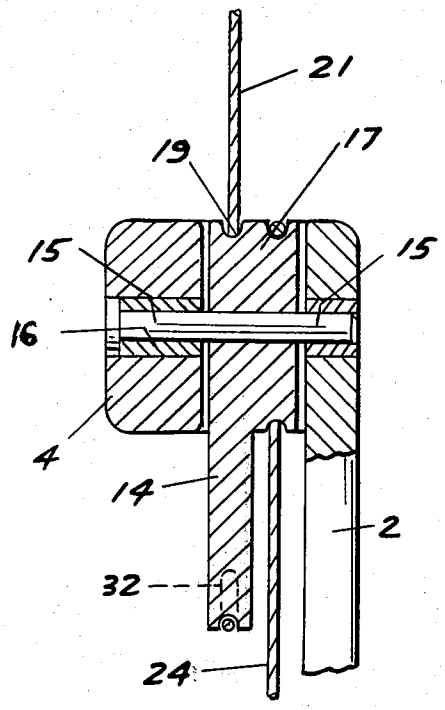


FIG. 6

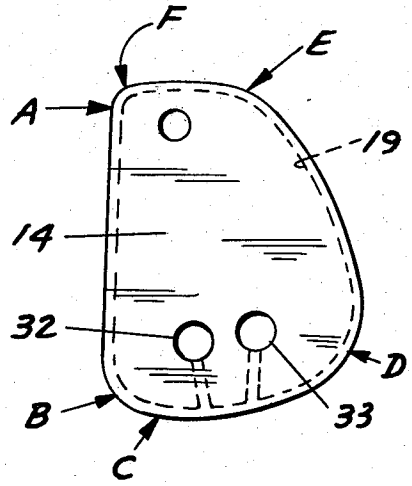


FIG. 7

COMPOUND BOW

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a new and improved bow, and particularly, a new and improved compound bow which enables the user to achieve and maintain an exceptionally accurate aim during use. The bow of this invention utilizes a frame and a pair of propelling limbs having pulleys at the end thereof. The pulleys are designed to cooperate with a set of cams which in cooperation with synchronizing cables and the bowstring, effect substantially constant pressure as the bow is drawn to a predetermined point, and abruptly reduced pressure thereafter to permit steady aiming of the arrow.

2. Description of the Prior Art

Heretofore, various compound bow designs have been proposed in order to achieve the combination of a powerful arrow propulsion system with optimum bowstring tension at full draw. Conventional bows are equipped only with drawing limbs and a bowstring, and the draw is characterized by increasing pressure or tension as the drawstring is fully drawn. In order to permit more accurate aiming at full draw, compound bows were developed with cables and pulleys to effect optimum drawstring tension under full draw conditions. For example, in the May, **1974,** issue of Archery World magazine at page **7,** a bow known as the "Kam-Act" bow is illustrated, this bow consists of a substantially rigid frame having cams mounted at either extreme, and carrying power limbs, the bowstring being adapted to extend from the power limbs across the cams and then in conventional fashion toward the user. As the bow is drawn, the limbs are depressed rearwardly, the cams are activated, and effect a reduction in draw tension, thereby enabling the user to take a steady aim before releasing the arrow. A typical compound bow design is also illustrated at page **47** of the same publication, which bow is fitted with a pair of limbs on a frame, the limbs having pulleys mounted at the extreme ends thereof and a pair of cams provided in cooperation with a bowstring to effect optimum bowstring pressure at a predetermined draw length in order to permit easy aiming of the arrow.

Conventional compound bows are characterized by a gradual increase in bowstring tension until a maximum tension is reached at approximately one-half of the full draw of the bow. After this point is reached, the bowstring tension gradually decreases until full draw is achieved. This causes difficulty in drawing the bow at the point of greatest tension.

Accordingly, an object of this invention is to provide an improved compound bow which combines the features of lightness of weight, simplicity, strength, durability, reliability and ease of manipulation.

Yet another object of the invention is to provide a new and improved compound bow which features minimal draw tension in an extended draw configuration, thereby permitting greater accuracy in bow function due to the requirement of less effort to draw the bow.

Yet another object of the invention is to provide a new and improved compound bow having pulleys at the extreme ends of the limbs in cooperation with a cam and cable arrangement and a drawstring, which combination permits a selected reduced bowstring tension at full draw in order to permit accurate aiming of the arrow.

Another object of the invention is to provide an improved compound bow equipped with a pivoting handgrip, which in combination with a reduced selected draw tension at full draw, permits maximum accuracy and maximum velocity with minimum effort on the part of the user.

Yet another object of this invention is to provide a compound bow having pulleys at the extreme ends of the limbs thereof, and a cam arrangement positioned on the frame of the bow at a point of maximum strength, which combination, in cooperation with the drawstring and a cable system, permits a steadily increasing drawstring tension until a predetermined tension is reached, a substantially constant drawstring tension through most of the draw, and a selected, reduced draw tension as the bow is drawn to maximum draw configuration.

A still further object of this invention is to provide a new and improved compound bow which is characterized by a bowstring tension which initially sharply increases at the beginning of the draw, to a maximum design tension, and maintains this maximum tension until full draw of the bow is approached, at which point the maximum design tension drops to an optimum design holding tension.

SUMMARY OF THE INVENTION

These and other objects of the invention are provided in a compound bow which includes a frame adapted to carry a pair of cams, a pair of limbs, and a pair of pulleys positioned at the extreme ends of the limbs. The pulleys are adapted to cooperate with the cams by means of adjustable cables and the drawstring, to provide a selected bowstring length of draw. The cams are synchronized by cables which cooperate with synchronizing pulleys attached to the cams.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood in view of the following description presented with reference to the accompanying drawings:

FIG. **1** of the drawings is a side elevation, partially in section, of the compound bow of this invention;

FIG. **2** is a rear elevation of the compound bow illustrated in FIG. **1**;

FIG. **3** is a sectional view of the limb and frame of the bow illustrated in FIG. **1,** taken along lines A—A in FIG. **1**;

FIG. **4** is a rear elevation of a limb of the bow illustrated in FIG. **1**;

FIG. **5** is a side elevation of the upper half of the bow illustrated in FIG. **1**;

FIG. **6** is a sectional view of a cam seat, cam and synchronizing pulley of the bow illustrated in FIG. **5,** taken along lines B—B in FIG. **5**; and

FIG. **7** is a top elevation of a cam of the compound bow illustrated in FIGS. **1–6.**

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to FIGS. **1** and **2** of the drawings, the compound bow of this invention, generally illustrated by reference numeral **1,** is provided, which includes frame **2** fitted with limb seats **3** and cam seats **4.** Limbs **5** are removably and adjustably affixed to limb seats **3** by means of limb bolts **6.** Limbs **5** may be adjusted with

respect to limb seats 3 by manipulation of adjustable fulcrums 7, which manipulation varies the power of limbs 5 as the bow is drawn. Cams 14, carried by cam pins 15 in rotatable registration with cam seats 4, are provided in order to produce the desired optimum bowstring tension at maximum draw. Cam pins 15 are preferably adapted to rotatably cooperate with cam pin bearings 16 which are set in cam seats 4. Synchronizing pulleys 17 are affixed to cams 14 and are also carried by cam pins 15. Limb tips 8 are bifurcated at the extremities, and limb pulleys 9 are mounted on limb pulley pins 10, preferably in cooperation with limb pulley bearings 12. Limb pulley pin spacers 11 are positioned between limb pulleys 9 and limb tips 8 in order to maintain proper spacing between limb pulleys 9 and limb tips 8.

Referring now to FIGS. 1, 2, 5 and 6 of the drawings, it will be appreciated that bowstring 20 is adapted to cooperate with forward tension cable 21 by means of bowstring mount 26, and forward tension cable 21 extends from bowstring mount 26 around limb pulleys 9 and into position in cam grooves 19 on cams 14, where it terminates in forward tension cable mount 32 in cams 14. Rear tension cable 22 communicates from rear tension cable mount 33 located in cams 14 around the periphery of cams 14 in cam grooves 19 to rear tension cable supports 23, in cooperation with limb pulley spacer grooves 13 in limb pulley spacer 11. Rear tension cable adjusting means 25 serves to lengthen and shorten bowstring 20 and accordingly, the length of draw of bowstring 20. Synchronizing cables 24 are adapted to cooperate with synchronizing pulleys 17 to facilitate synchronizing of cams 14 as bowstring 20 is drawn. Fletching slide 27 is positioned over synchronizing cables 24 in order to prevent damage to the feathers of the arrows as the arrows pass the frame 2. Arm guard 34 is provided immediately below fletching slide 27 in order to protect the user's arm from bowstring 20 when the bowstring is released.

Directing attention again to FIG. 1 of the drawing, the bow of this invention is equipped with pivoting handgrip 28 fitted with pivoting handgrip socket 29 adapted to cooperate with pivoting handgrip ball 30 attached to pivoting handgrip ball frame 31. Pivoting handgrip ball frame 31 is affixed to frame 2 inside frame aperture 35 in frame 2, and pivoting handgrip 28 is designed to pivot on the pivoting handgrip ball 30 as the user's hand is positioned over the grip. When the bow is in drawn configuration, pivoting handgrip 28 serves to facilitate a steady aim and greater accuracy in the shooting operation by minimizing the tendency of the user to twist and/or "yaw" the bow.

Referring again to FIGS. 1 and 3 of the drawing, limbs 5 are positioned on limb seats 3 by means of limb bolts 6, and are made adjustable thereon by means of adjustable fulcrum 7. Accordingly, if it is desired to increase the power of limbs 5, adjustable fulcrum 7 is manipulated to position limbs 5 further away from limb seats 3, and thereby increase the amount of bend in arms 5 for a given draw length of bowstring 20.

Referring now to FIG. 7 of the drawing, one of cams 14 is illustrated with forward tension cable mount 32 and rear tension cable mount 33 positioned at the flared end of the cam, and cam groove 19 positioned around the periphery of the cam to accommodate forward tension cable 21 and rear tension cable 22. As illustrated in the drawing, in a preferred embodiment of the invention, the cam-edge is essentially straight from point A to point B, and curved from point B to point C. The curve between point B and point C is preferably such that a tangent to this curve approximately equidistant from points B and C, describes an angle of about 120° with the straight cam edge located between points A and B. Furthermore, that portion of the cam edge located between points C and D is preferably curved to the extent that a tangent drawn to this curve at a point approximately equidistant between points C and D describes an angle of about 130° with respect to the tangent on the adjacent curve located between points B and C. Similarly, the cam edge located between points D and E is preferably curved such that a tangent to this curve at a point approximately equidistant between points D and E describes an angle of about 85° with respect to the tangent on the adjacent curve located between points C and D. The cam edge is essentially straight between points E and F, and describes an angle of about 110° with the tangent to the curve between points D and E. Likewise, the cam edge located between points F and A is preferably curved to the extent that a tangent drawn to this curve at a point approximately equidistant between points F and A describes an angle of about 120° with respect to the cam edge located between points E and F.

It will be appreciated from a consideration of the drawings that the bow of this invention provides outstanding strength, utility and efficiency. In operation, as bowstring 20 is drawn, cams 14 are constrained to pivot on cam pins 15 and cam pin bearings 16 in the direction indicated by the arrow in FIG. 1. Continued drawing of bowstring 20 effects continued rotation of cams 14 and unwinding of forward tension cable 21 from cam grooves 19, with a corresponding winding of rear tension cable 22, onto cam grooves 19 or the opposite side of cams 14. Synchronizing cables 24, in cooperation with synchronizing pulleys 17, operate to insure that cams 14 rotate at the same rate as bowstring 20 is drawn. At a point determined by a selected arcuate configuration of cams 14 and the length of bowstring 20, the heretofore substantially steady draw tension is markedly reduced to a predetermined holding and aiming tension at full draw of bowstring 20, and cams 14 contact cam stop 18 to prevent further movement of cams 14. This reduction of drawstring tension at a predetermined point in cooperation with pivoting handgrip 28 enables a steady and sure aim at the target and release of bowstring 20 and the cooperating arrow may be effected as desired.

It will be appreciated by those skilled in the art that limbs 5 may be selectively adjusted with respect to limb seats 3 by a number of mechanical techniques. In a preferred embodiment of the invention, and referring again to FIG. 2 of the drawing, an adjustable fulcrum 7 is provided in limb seats 3 for adjusting limbs 5 with respect to limb seats 3. In a further preferred aspect of the invention, the fulcrum comprises a threaded seat and cooperating bolt arrangement with a rubber guard in attachment with the bolt to contact limbs 5. The threaded bolt can then be turned clockwise to force limbs 5 away from limb seats 3, and counterclockwise to achieve the opposite result.

Arm guard 34 is positioned on frame 2 in order to prevent bowstring 20 from striking the user's arm as the arrow is released. This guard eliminates the necessity to

wear a guard, which is commonly strapped to the user's arm.

Fletching slide **27** is positioned immediately above arm guard **27** and serves to cover synchronizing cables **24** to prevent contact between the feathers of the released arrow and the synchronizing cables.

Having described my invention with the particularity set forth above, what is claimed is:

1. A compound bow comprising:

a. a frame;

b. a pair of limbs carried by said frame and adapted to bend when said bow is drawn;

c. a single pulley carried by each of said limbs and positioned at the free end of each of said limbs at the extremities of said limbs;

d. a pair of cams carried by said frame;

e. a first forward tension cable, one end of which is carried by one of said cams while the other end of which extends uninterrupted to said pulley on one of said limbs, and a second forward tension cable, one end of which is carried by the other of said cams while the other end of which extends uninterrupted to the other of said pulleys;

f. a bowstring, each end of which is respectively attached to the ends of said forward tension cables, whereby when said bowstring is drawn said cams are caused to rotate and said pair of forward tension cables causes rotation of said pair of pulleys;

g. a pair of rear tension cables in cooperation with said pair of limbs and said pair of cams, whereby when said bowstring is drawn, said pair of cams rotate, and said forward tension cable unwinds from said pair of cams, and said rear tension cables wind on said pair of cams, respectively;

h. synchronizing cable means in cooperation with said pair of cams to synchronize the rotation of said pair of cams when said bowstring is drawn;

i. synchronizing pulleys carried by said pair of cams and positioned on the frame with said synchronizing cable means reeved there about;

j. adjusting means in cooperation with said rear tension cable and said bowstring to permit adjusting the length of draw of said bow;

k. a frame aperture in said frame and a pivoting hand grip in said frame aperture to permit steady aiming of said bow;

l. a fletching slide means affixed to said frame between said cams and spaced from the frame toward a user to protect the feathers of an arrow being projected from engaging the synchronizing pulley means;

m. an arm guard positioned below said fletching slide on said frame; and

n. cam stop means mounted on cam seats in the rotational path of said cam to prevent further rotation of said cams at full draw of said bow.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,923,035 Dated December 2, 1975

Inventor(s) George H. Trotter

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 1, column 6, line 11, after "on", delete "the" and substitute --said--.

Claim 1, column 6, line 22, after "synchronizing", delete "pulley" and substitute --cable--.

Claim 1, column 6, line 22, after "engaging" delete "the" and substitute --said--.

Signed and Sealed this

Fourteenth Day of June 1977

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks